A1. Title & Approval

Quality Assurance Program Plan (QAPP) for the Underground Storage Tank LTF Program In Alabama

Prepared by: Dorothy Malaier
Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110

Date Prepared: 11/14/2014
Date Revised: 06/22/2015
Revision 0.1

Dorothy Malaier, ADEM UST Corrective Action Program Manager	Date 7/10/15
Sonja Massey, ADEM Ground Water Branch, Land Division	Date 7-10-15
Joseph Price, ADEM Laboratory Manager	Date 7-14-15
Phillip Davis, ADEM Land Division Chief	Date 7/10/15
Scott Hughes, ADEM Field Operations Division Chief	Date 7/14/15
Vickie Hulcher, ADEM Quality Assurance Manager	Date 7-13-2015
Bobbi Carter, EPA Quality Assurance Manager	Date

ADEM

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A3. Distribution List

This Quality Assurance Program Plan (QAPP) and associated documents and Standard Operating Procedures (SOPs) are distributed to the individuals listed in Appendix A. Copies of the QAPP will also be provided to all Leaking Underground Storage Tank (LUST) Trust Fund Contractors who are under contract with the Alabama Department of Environmental Management (ADEM). These firms under contract with the ADEM where funding is provided by the U.S. Environmental Protection Agency (EPA) to the Department are known as LUST Trust Fund (LTF) Contractors. It will be the responsibility of the LTF Contractors to provide the QAPP to any analytical laboratories or other subcontractors that they utilize.

The Underground Storage Tank Corrective Action (UST-CA) Section Chief is responsible for distributing the ADEM QAPP and associated documents to respective project staff within ADEM, to the LTF Contractors, and to the appropriate EPA personnel.

In addition, an approved copy of this QAPP will be posted to the ADEM Intranet and notification will be included in the monthly Department-wide email that lists intranet postings.

When data are collected by LTF Contractors, they will develop QAPPs and site-specific Study Plans. When data are collected by ADEM staff, a separate site-specific Study Plan will be developed. These documents will also have a distribution list of those personnel specific to the project that will be receiving copies.

A PROJECT MANAGEMENT

A4. Project/Task Organization

A4.1 General

This QAPP describes the methods and procedures used by ADEM to ensure the quality, accuracy, precision, and completeness of the data collected and analyzed for UST-CA Program LTF project activities and describes the data quality objectives for the final use of the data. This QAPP covers UST-CA LTF projects where data are directly collected by ADEM staff or by LTF Contractors

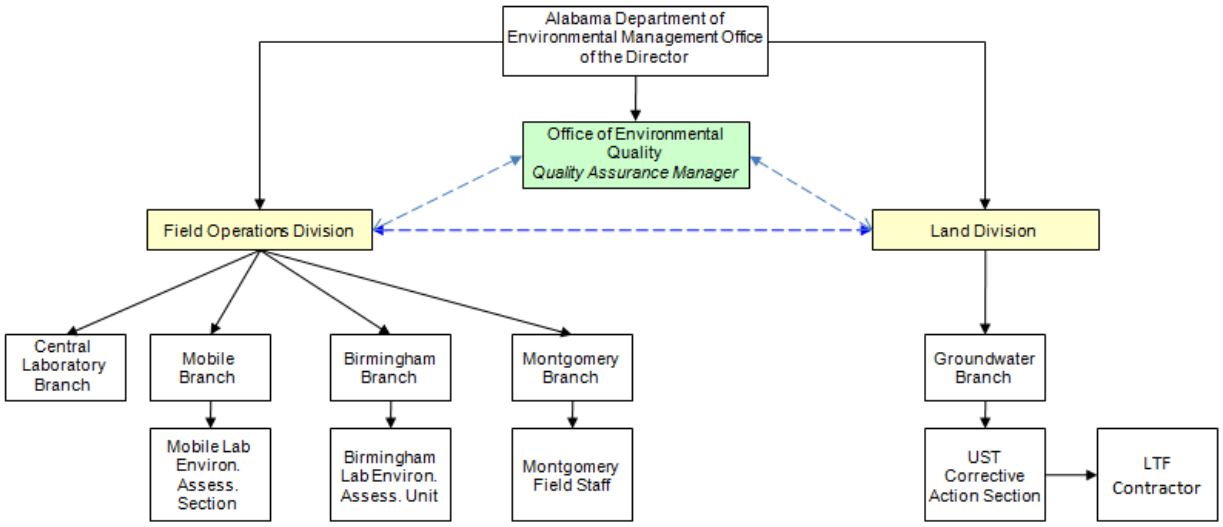
LTF Contractors prepare QAPPs which adhere to the requirements of this ADEM QAPP and also prepare site-specific Study Plans for each site. The Department may also utilize the services of the ADEM Field Operations Division staff and/or ADEM UST-CA staff. These staff members may perform site activities similar to the actions of the LTF Contractors. The ADEM staff also prepares a site-specific Study Plan for each site.

This QAPP covers all soil, water, and soil gas vapor quality data collection from underground storage tank (UST) sites, as well as analysis activities conducted by, overseen by, or contracted by the ADEM UST-CA Program at sites designated as LTF sites. Environmental data collected from LTF sites are critical to decision-making concerning the protection of the public and the environment from the adverse effects of pollutants from leaking underground storage tanks. Environmental data are key to decisions and actions pertaining to environmental protection efforts in the air, land, and waters of the state.

The Land Division is the primary user of the data produced and is responsible for approving the Data Quality Objectives (DQO) for final use of these data.

All ADEM staff are responsible for implementing quality assurance and quality control (QA/QC) procedures for their field sampling and laboratory activities according to established ADEM protocols. The LTF Contractors are responsible for implementing QA/QC procedures for their field sampling and laboratory activities according to established ADEM protocols and in accordance with this QAPP.

Figure 1. Organizational Chart Outlining the Relationship Between the Parties Involved in this Program.



A4.2 Roles and Responsibilities

To implement this QAPP, the UST-CA Program has established a suitable management structure. Personnel from the UST-CA Section provide technical management and oversight of the site activities to be performed. Management and support personnel involved should be qualified, by training and/or expertise, to assume the necessary responsibilities. The successful implementation of this QAPP involves a large educational component and cannot be accomplished in a brief time period. The relationships between the various organizational entities within ADEM are illustrated in Figure 1. The staff positions assigned to each of the following roles are located in Table 1. The complete ADEM organizational structure is located in Appendix Y.

The site-specific Study Plan will list roles for specific responsible parties and may also list additional roles depending on the LTF Contractor and the scope of the project. An organizational chart specific to a UST release site will be included in each site-specific Study Plan. The monitoring/investigation report will include the names and qualifications of personnel that actually performed activities for the site.

Below are listed the responsibilities for key positions.

Quality Assurance Manager – The Quality Assurance Manager (QAM) serves as the Chief of the Office of Environmental Quality (OEQ) and reports directly to the Director/Deputy Director of ADEM. The QAM functions independently of direct environmental data generation, model development, or technology development responsibility. Key responsibilities of the QAM include reporting on quality issues to senior management; providing independent oversight; assuring the implementation of the organization's quality system; facilitating the development and maintenance of the Department's Quality Management Plan; providing expert assistance to program personnel on quality assurance and quality control issues; developing and implementing quality assurance training workshops; reviewing and/or approving quality management

documentation; providing quality management support to program personnel; and overseeing and assessing the organization's quality system. The QAM has the authority to interject at any point within these processes (including halting further activities) if there are questions involving non-representativeness or data integrity issues during field collection, analysis or reporting of data.

Division Chiefs – The Field Operations and Land Division Chiefs will provide necessary liaison with the QAM, the Program Manager, and the various ADEM staff to help ensure that the UST-CA Program QA requirements are met.

Branch Chiefs – The Groundwater Branch Chief and Montgomery Field Operations Branch Chief are responsible for ensuring that appropriate coordination between the Branches occurs so that project goals are met.

Program Managers – The Program Managers are responsible for oversight of the Project Managers. The Program Managers assign projects to the Project Managers to ensure work goals are met. The Program Managers provide input to site-specific decisions in addition to ensuring consistency with policies and procedures of the UST-CA program. The Program Managers (or their direct supervisor) have the authority to interject at any point within these processes (including halting further activities) if there are questions involving non-representativeness or data integrity issues during field collection, analysis or reporting of data. Program Managers will address QA matters with the Project Managers, the ADEM sampling staff, and the LTF Contractors at the site level. Program Managers will approve Contractor QAPPs, approve site-specific Study Plans, and sign work orders for LTF Contractor sites.

Project Managers – Project Managers are responsible for direct oversight of contractors conducting project activities at LTF sites. Project Managers perform day-to-day review of plans and reports related to site activities on their assigned sites. These reviews include verification and analysis of data submitted to the UST-CA Section by LTF Contractors and ADEM staff. Project Managers are responsible for the review of and approval of the site-specific Study Plans and their revisions to ensure compliance with the ADEM QAPP. The Project Managers are responsible for validating the project data. Project Managers perform site inspections of the LTF Contractors work products and observe LTF Contractor and ADEM staff data collection activities.

LTF Contractors - The LTF Contractor is an environmental consulting firm who has entered into a contract with the Department. Work is assigned to the LTF Contractor by the Program Manager(s). The LTF Contractor is responsible for performing necessary activities for the project including collection, project data verification, data analysis, and interpretation.

ADEM Sampling Coordinator - The Sampling Coordinator, or designee, is responsible for developing the site-specific Study Plan and coordinating soil, surface water, and groundwater sampling within the Department to conduct the required project activities. The Sampling Coordinator is responsible for reviewing and reporting results of Departmental project activities to the Program Manager.

ADEM Sampling Staff - The sampling staff are responsible for collecting all soil, surface water, and groundwater data from the LTF sites as assigned using ADEM SOPs and submitting those samples to the appropriate ADEM Laboratory location for analysis.

Analytical Laboratory - The Analytical Laboratory, either an ADEM Laboratory or an independent laboratory, receives the soil and water samples from the ADEM sampling staff or LTF Contractor, performs the requested analyses, and provides analytical reports. All sample handling and analyses must be performed in accordance with appropriate quality assurance documents (Quality Assurance Manuals, QAPPs, SOPs) and approved analytical methods.

Table 1. List of Assigned Roles

Role	***Position***	***Location***
Quality Assurance Manager	Chief	Office of Environmental Quality
Division Manager	Chief	Land Division Field Operations Division
Branch Managers	Chief	Land Division, Groundwater Branch Field Operations, Montgomery Branch
Program Managers	Chief	Land Division, UST Corrective Action Section Land Division, UST Corrective Action Unit
Project Managers	Assigned Senior Staff	Land Division, UST Corrective Action Section
LTF Contractors	Environmental Consultant	Various Locations
Sampling Coordinator	Assigned Senior Staff	Field Operations Division, Montgomery Branch
Sampling Staff	Assigned Staff	Field Operations Division, Montgomery Branch Land Division, UST Corrective Action Section
Laboratory Analysis – Independent Laboratory	Laboratory Manager & Staff	Various Locations
Laboratory Analysis – Montgomery Branch	Laboratory Branch	Field Operations Division

A5. Problem Definition/Background

A5.1 Historical and Background Information

The Alabama Department of Environmental Management is the state agency designated to implement the provisions of the Alabama Underground Storage Tank and Wellhead Protection Act. Regulations regarding the response to releases from USTs are included in ADEM Administrative Code 335-6-15 and 16.

Over 10,000 releases have been reported from regulated USTs in Alabama. The Department becomes aware of these through various mechanisms including citizen complaints, environmental real estate audits, and closure site assessments. Some are ultimately addressed as LTF sites. The ADEM UST-CA Section located within the Groundwater Branch of the Land Division implements the regulatory program that addresses the chemicals, primarily petroleum, which are released from leaking USTs. The petroleum chemicals of concern present in the soil, surface water, and groundwater constitute potential risks to human health and to the environment and require investigation in order for decisions to be made regarding appropriate levels of site remediation or possible closure. All such decisions must be technically defensible and must be protective of human health and the environment.

Where a tank owner is non-viable, the Department will take site actions as appropriate and as resources allow to address the risks posed as a result of a release from a UST. For these sites, §§22-36-6 of the UST and Wellhead Protection Act authorizes the Department to administer the expenditure of any funds made available from the LUST Trust Fund established by the Superfund Amendments and Reauthorization Act of 1986. These types of sites are managed by the Department and are typically assessed through the use of an LTF Contractor. The LTF Contractors are competitively selected by the Department to perform various activities at UST release sites.

Each reported release from a LTF site will be addressed on a case-by-case basis. The Project Manager assigned to the site ensures progress and decides on the degree of action required based on several factors. The primary factor to be considered will be whether a direct threat to human health or the environment currently exists. Such cases will receive top priority and direct action will be taken to protect the public. Sites are ranked following the Site Classification Checklist (Appendix H). Where necessary, at a minimum, free phase product removal will be required wherever encountered. Each release will be addressed so that chemical concentrations will be reduced to site-specific target levels based on current and all potential receptors as measured by the sampling of monitoring wells throughout the contaminant plume.

Because every site will be treated on a case-by-case basis, the site-specific Study Plans will be developed by the ADEM Sampling Coordinator or the LTF Contractor along with assistance from the UST-CA Program staff. The Project Manager will ensure that all required information from the site is addressed in the site-specific Study Plan. The site-specific Study Plan will be submitted to the Project Manager and approved before site work begins.

The UST-CA Program standard is to collect water and soil quality data that is scientifically valid, defensible, and of known accuracy using existing guidance, SOPs, and the procedures outlined in this QAPP.

A5.2 Problem Statement

When a UST release has been identified which may impact human health or the environment, the contamination must be assessed. The release must be assessed to determine the horizontal and vertical extent of the contamination in soil, surface water, and groundwater, and to determine if there are any impacts to waters of the state. The typical contaminants of potential concern (COPCs) for tank releases are listed in Appendix F. The actual contaminants analyzed for at a specific LTF site will be a site specific decision and addressed in the associated site-specific Study Plan.

Concentrations of chemicals of concern (COCs) at LTF sites will be evaluated to determine if the concentrations present pose an unacceptable risk to human health and the environment. If there is an unacceptable risk, then a corrective action plan may be developed and site cleanup is undertaken to reduce concentrations of chemicals of concern.

A6. Project/Task Description

A6.1 Purpose/Background

Sites are selected for the LTF Program based on a ranking system. Most UST releases do not pose an immediate threat to the public. Those sites without a viable responsible party and which pose the greatest risk to human health and the environment, utilizing the ADEM UST Site Classification Checklist (Appendix H), are selected for the LTF Program. Some sites are selected for evaluation that have a low classification score in order to obtain enough information to properly classify the site.

The typical sequence of project activities where environmental data are collected includes the following:

- Site reconnaissance
- Preliminary investigation
- Secondary investigation
- Groundwater monitoring events
- Development of risk-based corrective action limits
- Development of a corrective action plan
- Implementation of a corrective action plan

Each of these activities is not necessarily conducted at every LTF site. Activities to be performed are based on risk to human health and the environment in addition to the availability of program funding. The site classification may drop as additional information is obtained about a site, and therefore, due to limited funding may be held in abeyance until the site rises in site classification or funding is available.

For those releases which pose an imminent risk, this QAPP will also be utilized. Emergency actions will be taken to abate the threat to the public by various emergency response agencies and any data collection during that emergency stage may not be performed specifically as stated in this QAPP due to the dynamic nature of the response. Once the emergency is abated, all data collection activities performed by ADEM sampling staff or an LTF Contractor should comply with this QAPP and additional site-specific Study Plans as appropriate.

A6.2 Applicable Standards, Criteria or Objectives

Site efforts are to be conducted in accordance with the latest version of the documents listed in Appendix E and Appendix Z. The Program will also use appropriate EPA guidance and ASTM Standards.

A6.3 Description of Work to be Performed

For each LTF site where data collection occurs, a Project Manager is assigned to the site who will oversee the activities of the LTF Contractor or ADEM sampling staff. Each site will have a site-specific Study Plan. The site-specific Study Plan will specify when monitoring/investigation reports are due to be submitted to the ADEM UST-CA Section. These may be due after the

completion of each sampling event or at the end of the project. The report documents the scope of work conducted, including all applicable QA information. Not all of the items required in the report are specifically covered in this QAPP. Appendix X is a checklist that includes all of the elements required in the report in addition to any items specified in this QAPP. Appendix D is the monitoring/investigation report template and also includes other elements required in the report.

Prior to developing each site-specific Study Plan, the ADEM staff or LTF Contractor performing the data collection will review the site files for the LTF site. Each UST release will be researched to determine the availability of historical data regarding the operation of the tank system, concentrations, and trends. This information will be utilized to determine the media to be sampled (soil, groundwater, surface water, and/or soil vapor) and what parameters should be analyzed in each sample collected. The historical and background information on each project (as required in the site-specific Study Plan) must be documented in detail in the initial monitoring/investigation report that is prepared and submitted to the ADEM UST-CA Section.

The site-specific Study Plan will include details on the type of field measurements and lab analyses that will be performed. For a complete list of potential analyses see Appendix F. The methods selected must be included in the site-specific Study Plan and have Method Detection Limits (MDLs) lower than the applicable screening value. The type of data to be collected at an LTF site may include the following depending on site-specific needs for data:

- Obtaining locational data for the site (latitude and longitude)
- Collecting soil vapor screening readings of the subsurface during drilling
- Collecting subsurface soil samples for laboratory analyses
- Collecting groundwater samples for laboratory analyses
- Measuring depth to groundwater
- Measuring ph, temperature, and dissolved oxygen in groundwater
- Collecting surface water samples for laboratory analyses
- Performing aquifer tests, such as slug tests, to determine hydraulic conductivity
- Collection of fractional organic carbon
- Collection of soil moisture content
- Collection of soil for geotechnical parameters such as dry bulk density

Data collection at LTF sites involves the collection of a sufficient quantity of data to properly assess the impacts to soil, surface water, and groundwater quality in the State of Alabama from a UST release. The data collected is used to determine what the impacts to human health and the environment may be from the UST release.

A6.4 Geographical Locations

UST release sites are located in every county in Alabama. For LTF sites, Project Managers are assigned LTF sites based on various factors which include the geographic location of the site. Globally, the sites that will be addressed under this QAPP will be located within the borders of

the State of Alabama. Site specifically, the projects will be conducted on identifiable and well-defined release source areas.

The site-specific Study Plan will include a map showing property boundaries and the location of the USTs and possible receptors (both on the property and off-site). Descriptions and maps indicating the proposed sampling points, borings, and any groundwater monitoring/recovery wells for each project must be included in the site-specific Study Plan. The monitoring/investigation reports will contain the actual georeferenced locations of sampling points, borings, and any groundwater monitoring/recovery wells.

A6.5 Personnel or Equipment Requirements

The field equipment possibly used by ADEM sampling staff to collect the samples is listed in Appendix L and the ADEM Laboratory equipment is discussed in Section B6. Specific personnel to work on an LTF project will be determined during the preparation of the site-specific Study Plan. The required equipment for each project's data collection will be part of the site-specific Study Plan. The decisions on personnel and equipment should conform to this QAPP document.

A6.6 Work Schedule

Work schedules will be established for each site based on the complexity of the site, the nature of the release, and other factors. Site-specific Study Plans will present information specific to the site including location, topography, work schedules including the proposed field activity start and completion dates, report submittal dates, and any resource constraints. Monitoring/investigation reports will document the actual start and completion dates, the dates of data collection, and other significant site activities.

A6.7 Project and Quality Records

Documentation of all project efforts are required to be submitted to the UST-CA Program by the ADEM sampling staff or by the LTF Contractor within the timeframe established in the approved site-specific Study Plan. Paper copies are required for all submittals to the Project Manager. Larger documents (e.g. corrective action plans, monitoring/investigation reports) are also required to be submitted as an electronic file either sent via email or submitted on a CD. Each release incident has a unique incident file in which all documents are placed. The files are maintained in the ADEM FileNet system. All data is retained according to the Department's record retention policy. Table 2 lists some of the documents and records to be included with the facility file.

Table 2. Applicable Documents and Records

Document/Record	Purpose	Disposition
Complaint Form	Initial notification to Department for citizen complaints	FileNet, ADEM Complaint System Database
Contractor QAPP	Contractors description of their Quality System and Procedures	FileNet
Work Orders	ADEM UST-CA contractor directive to initiate and approve work activity	FileNet
Site-Specific Study Plans	Plan for conducting a site-specific study including proposed locations, procedures, activities, and parameters	FileNet
Site Inspection Form	Documentation of Project Manager's site visit	FileNet
On-Site Sample Collection Audit Checklist	Documentation of Project Manager's audit	FileNet
Laboratory Analytical Data Package	Final Laboratory analysis result reports and chain of custody	FileNet, LIMS (ADEM)
Monitoring/Investigation Reports	Technical reports documenting items including sampling locations, activities conducted, and results	FileNet

A7. Quality Objectives and Criteria

A7.1 Purpose and Background

Data Quality Objectives (DQOs) are qualitative and quantitative statements that specify the intended use of the data, define the type of data needed to support the decision, identify the conditions under which the data should be collected, and specify tolerable limits on the probability of making a decision error due to uncertainty in the data (if applicable). DQOs are developed by data users to specify the data quality needed to support the specific decisions.

Data are evaluated primarily from a standpoint of consistency with the situation, using the expertise and experience gained from past investigations. The Project Manager should evaluate all data for accuracy, validity and defensibility within the context of the overall investigation. For example, data used for field screening to determine the general location of the contaminant plume need not be as definitive as data used to determine the level of impact to a drinking water source. Hydrogeology, surface topography, the physical location of the site, and the presence of possible receptors are taken into account when evaluating data. Where appropriate, data verification is employed. Repeat measurements, check samples and "split" samples are all measures that are employed in addition to routine review of laboratory QA/QC to ensure that the data being evaluated is accurate.

The evaluation of data with respect to a site is always performed relative to the history or the future of the particular release, whether preliminary (part of a site assessment or subsurface investigation), or the evaluation of a corrective action system effectiveness through monitoring. Data are evaluated, along with previous data, to ascertain the present condition of a site and to project future actions necessary to mitigate the health and environmental impacts of the release. The most important factor in the evaluation of most data (such as groundwater levels and analytical results) is the fact that they are generally a "snapshot in time" for a release. It is important not to attach excessive significance to such data, which may only reflect a short-term fluctuation. Groundwater is a slow-moving medium, and long term monitoring is generally required before definite fate and transport characteristics of a release can be defined. However, employing professional judgment in the evaluation of preliminary data can reduce the investigation period substantially.

The data requirements for this program encompass aspects of field sampling and observation and laboratory analysis and database management to reduce sources of errors and uncertainty in the data. Whether that uncertainty is acceptable or not is determined by the ultimate data user.

A7.2 DQO Process

Step1: State the Problem

What contaminant concentrations are present at a site and are there any risks to human health and the environment?

Step2: Identify the Decision

Determine whether or not the assessed area contains COCs above screening levels leading to further assessment and/or remedial action.

Step 3: Identify the Inputs to the Decision

Data obtained and/or collected by LTF Contractors or ADEM sampling staff.

Step 4: Define the Boundaries of the Study

The boundaries are defined in the site-specific Study Plan designed for each LTF site and approved by the Project Managers.

Step 5: Develop a Decision Rule

If the analytical data indicated COC concentrations above the applicable screening levels, then the appropriate action designated in the decision-making flow chart (Appendix I) is taken.

Step 6: Specify Performance or Acceptance Criteria

Identify total measurement error and reduce this error as much as possible by minimizing sampling and measurement error through the use of standardized procedures for sample collection and processing, quality assurance activities, data reviews, and evaluations.

Step 7: Optimize the Change of Design for Obtaining Data

This program requires no changes in the design to meet the acceptability of the decisions. Preliminary and Secondary Investigation sampling protocols are based on experience with characterizing the leaking UST's contamination plume and impact on receptors. Thus, these protocols have optimized the design for obtaining the data, making a decision based on accurate information and obtaining outcomes that will protect human health and the environment through specifying the location of the sampling sites and the number of samples to be collected.

A7.3 Measurement Performance Criteria

A7.3.1 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical or substantially similar conditions. Precision for all groundwater quality field measurements are listed in Appendix M and are also incorporated in the applicable ADEM SOPs. Duplicate sampling procedures as described in ADEM SOP #9021 should be utilized during the collection of samples as a relative measure of the precision of the sample collection process (See Section B5). Precision measurements will also be included in each site-specific Study Plan.

A7.3.2 Bias

Bias is systematic or persistent distortion of a measurement process that causes errors in one direction. With multiple sample collectors, techniques, and locations, the inadvertent introduction of human bias is a possibility. It is only through the adherence to protocols set forth in ADEM guidance and SOPs that bias can be minimized and acceptable studies performed. The data generated in each project is only as sound as the established methodology for its collection.

A7.3.3 Representativeness

Representativeness is expressed as the degree to which a sample accurately reflects the true site conditions. This definition encompasses the sampling design, sampling collection, and lab analyses. Sampling frequency for a specific site is determined by the Project Manager. In

addition, field blanks are collected to verify proper field cleaning and rinsing techniques of sampling equipment and sample containers to prevent contamination of samples between sampling locations (SOP #9021). Any deviations or modifications from SOPs or site-specific Study Plans are documented and retained with the site file.

A7.3.4 Completeness

A measure of the amount of valid data and/or samples obtained from a measurement system as compared to the amount that was expected under normal conditions. In order to meet this objective, LTF Contractors or ADEM sampling staff collects 100% of the samples at the specific sites during the initial groundwater complaint investigation as outlined by the Project Manager. Completion of data collection and tracking is ensured by implementing a chain-of-custody form at the beginning of sample collection, through laboratory analysis, data input/manipulation, and dedicated storage location. Maximum volumes required for each analysis by the laboratory are collected at each site to ensure adequate duplication is possible should erroneous or outlier results occur. Evaluation of completeness for all laboratory analytical data will include a data set (batch) that contains all QC check analyses verifying precision and accuracy for the analytical protocol and records of pertinent dates (dates received, analyzed, etc.). All requested analyses are performed or documentation provided as to the reason for non-performance.

A7.3.5 Comparability

Comparability is defined as “the confidence with which one data set can be compared to another” (Stanley and Verner, 1985). The use of and adherence to EPA-approved field and laboratory methodology increases the ability to share and distribute scientific data to other agencies.

A7.3.6 Method Sensitivity

For Analytical Methodology and Sensitivity, refer to Section B4.

A8. Training and Certification

A8.1 Department Requirements

All ADEM UST-CA Section staff involved in LTF projects must have the following training:

- 40-hour OSHA HAZWOPER
- OSHA HAZWOPER Annual Refresher

Most personnel with QA responsibilities within the UST-CA Section have acquired their QA experience through on-the-job training. Those designated to serve in the program have a technical (scientific, geologic, engineering) background that includes previous experience with QA concepts and with evaluation of data generated from environmental measurements. Management within the UST-CA Section encourages and supports the acquisition by personnel of quality assurance experience or pertinent experience and information. This is done through:

- Participation in QA-related EPA or ADEM seminars;
- Attendance at appropriate professional meetings, conferences or workshops, and;
- Enrollment in appropriate short courses.

The Department encourages participation in specific training activities relating to groundwater contamination, corrective action technologies, and health and safety issues for personnel involved in leaking UST investigations (as resources allow). ADEM sampling staff will undergo all necessary training to ensure compliance with the Department's SOPs regarding applicable field activities (acceptable sampling techniques, sample collection, preservation and handling procedures, and field instrument operation and documentation procedures). Training is maintained through in-house on-the-job training and by attending technical workshops and training seminars provided by EPA and other organizations.

Training documentation should be maintained by each staff member and include records of intra-Divisional training efforts, dates of training, and procedures followed. Personnel conducting initial environmental site assessments should have sufficient formal training prior to being responsible for project management.

At present all employees in the UST-CA Section are Geologists with a minimum of a four-year Bachelor's degree in Geology. The ADEM-CA Section staff is trained in various aspects of hydrogeological investigations, corrective actions, sampling procedures, aquifer analyses, etc. as resources allow.

The sampling staff from Field Operations Division are primarily Environmental Scientist (ES) series staff. The minimum level of training for an ES is an undergraduate degree from an accredited college or university in the physical or biological sciences.

A8.2 LTF Contractor Requirements

Each LTF Contractor must have at least one Alabama Registered Professional Engineer and one Alabama Licensed Professional Geologist on staff. Each firm must also be an Alabama Licensed General Contractor. Information (including license numbers/seal) for the Geologist and Engineer must be included in the monitoring/investigation report, as appropriate.

Contractor personnel must be experienced in performing groundwater investigations, monitoring, risk assessments, and corrective actions.

LTF Contractor personnel are to have received training as required by OSHA. The 40-hour HAZWOPER and annual refresher training is recommended. LTF Contractors will be required to provide educational and training information on personnel utilized in the LTF site work as part of their contractor QAPP and site-specific Study Plans.

A9. Documentation and Records

A9.1 Field, Laboratory, and Data Handling Records

Each LTF site will have a working file set up by the Project Manager in order to maintain a repository of information for the project while in progress.

A9.1.1 ADEM Sampling Staff Records

Field observations by the ADEM sampling staff should be documented in field notes. Copies of the field notes should be included in the facility file. The paper copies of raw field data, meter calibration, and/or maintenance log books are maintained in the Montgomery Field Office Branch or the UST-CA Section, as applicable.

A9.1.2 ADEM Laboratory Data and Records

Due to possible parameter degradation, samples are analyzed within the specified holding time for the individual parameters. These holding times are determined by the method used to analyze the parameter. A listing of the holding times for common parameters is in Appendix P. Once a sample has been analyzed for all of the requested parameters, the data are reported to, and validated by, the Laboratory Quality Assurance Officer (LQAO), or designee. The reports are reviewed for individual parameters, holding time validity, and other quality control issues. This is the final quality control check of the laboratory data and generally occurs no later than one month after the longest parameter holding time. After the analysis has been validated according to the procedures set forth in ADEM SOP #4903 Laboratory Data Validation, the analytical report is generated and forwarded to the requesting party.

A9.1.3 LTF Contractor Data and Records

LTF Contractors are to create an appropriate filing system to file documents and data related to each LTF site. Details of the LTF Contractor filing procedure and data handling must be in the LTF Contractor QAPP. The LTF Contractor is to submit all documents including plans, reports, photos, copies of property access agreements, copies of field notes, field sampling forms, waste handling and disposal manifests, completed chain-of-custody forms, and laboratory data reports to the ADEM UST-CA Section. The LTF Contractor's contact information (including name, address, and phone number) must be included in the monitoring/investigation report.

All records and reports submitted to the UST-CA Section from the LTF Contractor that contain interpretation of the data provided must be signed and sealed by an Alabama Registered Professional Engineer or an Alabama Licensed Professional Geologist, whichever is appropriate.

A9.2 Reports and Electronic Files

All documents relating to a LTF site will be stored in the ADEM FileNet system. This includes work orders, contractor QAPPs, site-specific Study Plans, inspection logs, site notes, field sheets, photographs, historical information, analytical data, reports, and correspondences pertinent to the site. Documents are submitted in paper format and scanned by trained ADEM scanners for storage in FileNet, or the documents are submitted via email or on a CD in electronic format for loading directly into FileNet.

Each LTF site is entered into the ADEM UST-CA Tracking Database. There are two potential numbers that may be assigned to the site. The first is a unique release incident number that is

assigned to UST releases to track a specific reported or identified UST release. The incident number includes 3 parts: A fiscal year is documented as "UST13", for example. The month that an incident number is issued is the second part of the number, and is listed as "09" for September, for example. The last part of the incident number is the sequential incident assigned during a particular month, such as "03". Thus, the third release incident recorded in September of 2013 would be assigned "UST13-09-03".

The second unique identifier number assigned is for each LTF site where data is collected. The identifier is assigned based on a geographic locality. Appendix J includes a map showing the designation of the LTF code regions that are utilized. The identifier is created in the format: "LTF-2501". This example LTF number represents the first LTF site number assigned in the region covered by the 2500 – 2999 numbers, which is in southeast Alabama. The site is listed in the Groundwater Branch LTF Assignment Book and is entered into the UST database for tracking purposes.

A9.3 Record Retention

All original records and reports submitted to the UST-CA Section by the ADEM sampling staff or the LTF Contractor are stored in the ADEM FileNet indefinitely.

A9.4 Data Backup and Archiving

The UST Tracking system database and the Laboratory Information Management System (LIMS) are backed up daily by the Information Systems Branch of the ADEM Permits & Services Division. ADEM SOPs and QAPPs are archived in the Department's FileNet System.

LTF Contractors are to submit copies of all documents relating to the project to the UST-CA Section for the Department's archiving.

A9.5 ADEM Program Plan and Contractor QAPP Revisions

A9.5.1 *ADEM Quality Documents and Revisions*

The final approved QAPP, any updates to this QAPP, and all SOPs (including field and laboratory SOPs) are maintained on the ADEM Intranet. Monthly emails are distributed Department-wide by the QAM regarding updates to quality documents, new quality documents added, and other useful information available on the Intranet.

ADEM has established procedures for the timely preparation, review, approval, issuance, use, control, revision, and maintenance of documents and records. The categories and types of records and documents which are applicable to document control for this QAPP are represented in Table 3.

A9.5.2 *ADEM Site-Specific Study Plan and Revisions*

Site-specific Study Plans prepared by the ADEM Sampling Coordinator will be reviewed and revised on a continual basis as the project progresses (Section A4.2).

A9.5.3 *Contractor QAPP, Site-Specific Study Plan, and Revisions*

LTF Contractors will be provided a copy of the ADEM QAPP electronically by the Program Manager. The contractor will be required to sign a statement indicating receipt of the ADEM QAPP as part of the contract process. The Program Manager will provide the LTF Contractors

with a revised ADEM QAPP if changes are made during the contract term and a new statement by the LTF Contractor will be required to be submitted.

LTF Contractors will be required to review their QAPP at least every two years, or when significant changes occur, and submit revisions to the Department for review. If no revisions are necessary, a written statement that the previously approved QAPP is still being implemented must be submitted at least every two years, or upon request by the Department.

Site-specific Study Plans prepared by an LTF Contractor will be reviewed and revised on a continual basis as the project progresses. The contractor's site-specific Study Plan will include a signature page signed by all parties involved in the project that they have received the most recent version of the ADEM QAPP and the site-specific Study Plan.

Table 3: Document Review Schedule

Document Type	Review/Approving Agency	Minimum Frequency
Quality Management Plan	EPA Region 4 ADEM	Every Five Years
Quality Assurance Program Plan Review	EPA Region 4 ADEM	Every Five Years
LTF Contractor Quality Assurance Project Plan	ADEM	Every Two Years
LTF Contractor site-specific Study Plan	ADEM	Continually as project progresses
ADEM site-specific Study Plan	ADEM	Continually as project progresses
ADEM Standard Operating Procedures	ADEM	Annually/Biennially

B DATA GENERATION AND ACQUISITION

LTF Contractors and ADEM staff will need to provide information as indicated below for their LTF project(s).

B1. Sampling Process Design

B1.1 Purpose/Background

Each site will have a unique sampling protocol based on the COPCs that might be encountered. The Project Manager provides the FOD Sampling Coordinator or LTF Contractor with a list of COPCs for which analyses are requested so that a site-specific Study Plan can be created prior to implementing the data collection efforts. Typical COPCs based on fuel type released are shown in Appendix F. All constituents listed in Appendix F are considered COPCs for petroleum UST releases.

Since all information is potentially critical in nature, any problems with sample collection or access to the sites must be reported to the Project Manager to determine what actions should be taken (resampling, etc.) Variability is expected in these samples due to the nature of sampling for contamination. The Project Manager is also to be contacted when anomalies are found in the data or in the site itself.

The site-specific samples are collected and analyzed. Analytical results are then compared to the appropriate screening levels. Sites with no exceedances will likely require no further sampling. For sites with exceedances, further actions may be required of the site owner or responsible party as required under the UST regulations. Further sampling by the LTF Contractor and/or ADEM sampling staff will not be necessary if the responsible party begins performing required actions. If the responsible party performs the required actions, then the site will not continue to be covered under this QAPP. Where there remains a non-viable responsible party and site concentrations exceed appropriate screening levels, further sampling by the LTF Contractor or ADEM sampling staff will likely occur.

B1.2 Sample Matrices and Types

Sampling design and rationale will vary among sites. The type and number of samples are dependent on the contaminant, if present, and the media being sampled. Project Managers, LTF Contractors, and ADEM sampling staff will coordinate to obtain representative samples for analysis. This is detailed in the site-specific Study Plan submitted to the UST-CA Program and approved before field activities are initiated.

The typical media that are sampled at LTF sites are:

Surficial soil (0 – 1’ below land surface)

- Collected when a surface spill or shallow UST leak has occurred
- Collection is biased in the known areas of the spill or leak
- Collection of samples is typically performed during the initial site investigations
- The proposed location, number of surficial soil samples, and COPCs will be included in a site-specific Study Plan.

- Surficial soil samples will be visually inspected for soil type, appearance, any indication of contamination (e.g. staining, odors) and for soil saturation. Observations will be recorded in a field notebook for later inclusion into the monitoring/investigation report.
- Soil samples are collected following ADEM SOP #2150 or LTF Contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

Subsurface soils (1' – projected depth)

- The number of borings installed to provide for collection of subsurface soils is dependent on the UST tank, dispenser and piping locations, as well as the extent of the contamination.
- Samples are collected in a horizontal array to define the horizontal extent of contamination
- Samples are collected vertically every 5' to determine COPC concentrations to the top of the shallowest water bearing zone
- Subsurface soil samples will be visually inspected for soil type, appearance, any indication of contamination (e.g. staining, odors) and for soil saturation. Observations will be recorded in a field notebook for later inclusion into the monitoring/investigation report.
- The proposed location, number of subsurface soil samples, and COPCs will be included in a site-specific Study Plan.
- Soil samples are collected following ADEM SOP #2150 or LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

Groundwater

- The number of groundwater sample locations will be dependent on the UST tank, dispenser and piping locations, as well as the extent of contamination
- Groundwater samples are collected from each installed temporary monitoring well or permanent monitoring well which are installed to determine the horizontal and vertical extent of groundwater contamination. A minimum of three (3) wells are typically installed at sites.
- The proposed location, number of samples, COPCs/COCs, and frequency of sample collection will be outlined in a site-specific Study Plan.
- Groundwater samples are collected following ADEM SOP #2100 or LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

Surface water

- Surface water samples will not be collected at every LTF site
- The need for surface water samples to be collected will be dependent on the interconnection of groundwater to surface water and the observations of any free product in a surface water body.
- The proposed location, number of samples, COPCs/COCs, and frequency of sample collection will be outlined in a site-specific Study Plan.
- Surface water samples are collected following ADEM SOP #2061 or LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

Soil Gas Vapor

- Soil gas vapor samples will not be collected at every LTF site
- Where a risk of indoor vapor intrusion may be present at a site, soil gas vapor samples may be collected.
- The locations of soil gas vapor samples to be collected will be dependent on subsurface soil and groundwater concentrations measured at the site that have concentrations that may volatilize into an enclosed structure.
- The proposed location, number of samples, COPCs/COCs, frequency and procedures for sample collection will be outlined in a site-specific Study Plan.

B1.3 Sampling Locations and Frequency

Details regarding the sampling locations and frequency will be provided in a site-specific Study Plan submitted to the UST-CA Program and approved before field activities take place.

B1.4 Project Activities Schedule

Details regarding the sampling schedule will be provided in a site-specific Study Plan submitted to the UST-CA Program and approved before field activities take place. Variations from the approved site-specific Study Plan should be discussed with, and approved by, the Project Manager.

B1.5 Locational Data Collection

The objective of locational data collection is to accurately locate features associated with a site for the purpose of map production, data management, and navigation. All locational data will be collected utilizing GPS or will be collected by an Alabama Licensed Professional Land Surveyor, as appropriate for the scope of work. Details regarding the locational data collection for a specific site will be included in the site-specific Study Plan

Locational data should be collected for facilities, UST system components, surface water features, property boundaries, buildings, drainage pathways, sampling locations, monitoring wells, subsurface utilities, and any other pertinent site features. GIS software should be used to generate site maps using these locational data. Data will be collected in accordance with the ADEM SOP #8400 or LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

B1.6 Potential Sources of Variability

Potential sources of variability include sampling and analysis activities. Sampling variability may include the equipment, matrix, and conditions under which the sample was collected. Laboratory equipment may also introduce variability. Sample variability is identified through regularly collecting duplicate samples and equipment calibration logs. Laboratory replicate analyses are conducted to establish the variability of laboratory methods. All laboratory and field instruments are to be properly calibrated, on an appropriate schedule, according to the manufacturer’s instructions and/or applicable quality document. Observation of site conditions that may introduce variability are documented in the site notes/field sheets and monitoring/investigation reports. The sources and extent of variability encountered should be evaluated against the site-specific DQOs to determine data usability.

B2. Sampling Methods Requirements

B2.1 Standard Operating Procedures

Samples should be collected using ADEM SOPs. If a variation in sampling protocol or sample handling is recommended by the Contractor for a site, details must be provided in the site-specific Study Plan. LTF Contractors may submit alternate procedures in their QAPP or site-specific Study Plan for review and are subject to ADEM approval

A list of ADEM SOPs is included in Appendix Z.

B2.2 Sample Collection, Preparation and Decontamination Procedures

Samples are collected and prepared as described in the ADEM SOPs, as appropriate. All samples are preserved onsite at the time of collection. LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval. Appendix P lists the appropriate COPC sampling containers, volumes, preservations, and holding times for the ADEM laboratory.

B2.2.1 Decontamination Procedures

Field sampling equipment are cleaned by ADEM sampling staff following procedures outlined in ADEM SOP #9025; all field sampling equipment are non-dedicated.

LTF Contractors will follow ADEM SOP #9025 or provide for similar acceptable decontamination procedures in their QAPP or site-specific Study Plan for approval.

B2.3 Measurement of Field Water Quality Parameters

The site-specific Study Plan details the field measurements that are planned for collection at a site. *In-situ* field measurements may include but are not limited to: dissolved oxygen, pH, ORP (oxidation/Reduction Potential), temperature, conductivity, and turbidity.

Field water quality measurements by ADEM sampling staff are conducted as described in the appropriate ADEM SOP. LTF Contractors will be required to utilize the ADEM SOPs or may submit procedures/alternate procedures in their QAPP or site-specific Study Plan for approval (Section A4.2).

B2.4 Support Facilities and Equipment for Sampling Methods

B2.4.1 ADEM Laboratory

At sites where the ADEM sampling staff is performing the sample collection duties, the analyses will be conducted by the ADEM Laboratory. Samples are transported via Departmental vehicle to the ADEM laboratory.

B2.4.2 LTF Contractor Laboratory

Where the LTF Contractor is performing the sample collection duties, the analyses will be conducted by a laboratory listed in the site-specific Study Plan. The laboratory's information (name, address, phone number, and any certifications) must be included in the site-specific Study Plan and monitoring/investigation report(s).

B2.4.3 ADEM Equipment

Site-specific Study Plans will list all field measurement equipment that may be used during the project. Appendix L lists ADEM field equipment that may be used, including the make, model and applicable calibration and maintenance schedule. Field equipment may also include: sample bottles, preservatives, coolers, ice, camera, safety clothing (hard hat, steel toed boots, eye protection, hearing protection) waders, camera, field book, waterproof markers, pens, and ADEM identification card. The preparation of all equipment to be used in an investigation or monitoring event should be performed in accordance with the appropriate ADEM SOP.

Technical support for any of the meters is available from each of the respective manufacturer's customer service departments. All calibration standards, pH buffers, and sample-stabilizing acids are purchased from credible sources. All containers are purchased in bulk by the Department for sample collection.

B2.4.4 LTF Contractor Equipment

Details, including make, model and applicable calibration and maintenance schedule, for each piece of equipment to be used must be included in the site-specific Study Plan. The preparation of all equipment to be used in an investigation or monitoring event should be performed in accordance with the appropriate ADEM SOP or LTF Contractors must provide for similar procedures in their QAPP and/or site-specific Study Plan for approval.

B2.5 Sampling/Measurement System Failure Response and Correction Actions

Every attempt is made to collect all of the samples and parameters required by the site-specific Study Plan at each site. If a scheduled sample cannot be collected at the prescribed site, the reason for not collecting the sample is noted in site notes/field sheets. If, after a sample location is established, there is some change in the accessibility of the locations that appears permanent, the location will either be dropped or a suitable replacement selected and approved by the Project Manager. The new location selected should represent, as much as possible, the conditions of the inaccessible location. If samples are lost for any reason or arrive at the laboratory after the holding time has expired, or the samples are lost due to laboratory accident, the Project Manager is notified and the affected sample sites are rescheduled at the discretion of the Project Manager.

B3. Sample Handling & Custody

Sample handling will utilize the procedures listed below or, LTF contractors may submit alternate procedures in their QAPP or site-specific Study Plan for approval.

B3.1 Sample and Data Record Identification

The project identification number (LTF Number) is assigned by the Program Manager. The site-specific Study Plan must ensure that the field identification of sampling points, media types, and sample types are uniquely identified. The method of sample identification utilized depends upon the type of sample collected and the sample container-type.

A sample is defined as physical evidence (including photographs) collected from a facility, site, or from the environment.

Samples collected for *in-situ* field parameters are those collected for specific field analyses or measurements where the data are recorded directly in site notes/field sheets with identifying information while in the custody of the sampling team or using a data logger for direct export into a computer application (Microsoft EXCEL, etc.).

Samples for laboratory analysis are identified by writing in waterproof ink directly on plastic bottles, on labels affixed to glass jars, or on labels with a tethering device (string, tape, rubber band, etc.) affixed to containers. The information recorded on the sample container includes the sample ID; date and time of sample collection (24-hour clock); preservation method (iced, HCl, HNO3, etc); and laboratory performing analysis (if more than one laboratory is used). All sample containers for blank or duplicate samples are marked “blank” or “duplicate”, respectively. If more than one set of duplicate samples is collected during any one day, the containers are marked Duplicate 1 (Dup 1), etc. This information is also recorded in site notes/field sheets and/or the chain-of-custody form.

All photographs taken are identified in site notes/field sheets to include

- the project name (LTF number)
- the date the photograph was taken
- an accurate description of what the photograph shows
- the name of photographer

Printed photos should be labeled with the above information. Digital photos should be downloaded from the camera using the accompanying software and saved including identifying information in the file name that would allow association with the site notes/field sheets.

Photographs of the location and site activities must be provided in the monitoring/investigation report and labeled appropriately.

B3.2 Chain of Custody

ADEM samples or other physical evidence chain-of-custody procedures are outlined in ADEM SOP #9040.

LTF Contractors must provide chain-of-custody procedures in their QAPP and/or site-specific Study Plan. Completed chain-of-custody forms must be included with the analytical information in the monitoring/investigation report.

B3.3 Sample Transport

Samples are properly packaged for transport to the ADEM laboratory according to ADEM SOP #9040. LTF Contractor must provide the packaging and transporting procedures for the selected laboratory in their QAPP and/or site-specific Study Plan.

B3.4 Laboratory Sample Check-In

ADEM Laboratory personnel follow SOP #4901 for procedures to check-in samples. Personnel review the chain-of-custody form(s) to confirm that all samples are included on the corresponding chain-of-custody form and that all desired parameters are requested and correspond to the samples collected. The laboratory check-in personnel will inspect the sample for damage and the use of an appropriate container. All appropriate samples are checked for pH and temperature upon receipt in the laboratory. This information is noted on the chain-of-custody form and signed by the person checking in the samples.

LTF Contractors will provide laboratory sample check-in procedures in their QAPP and/or site-specific Study Plan.

B4. Analytical Methods

B4.1 Purpose/Background

All ADEM collected samples will have the analytical analyses performed by the ADEM Laboratory (or appropriate approved external laboratory). If an LTF Contractor uses a private laboratory, then the methods must be equivalent and stated in their QAPP and/or site-specific Study Plan.

The ADEM Laboratory will follow and maintain documentation for standardized QA/QC procedures. Samples are analyzed to the lowest detectable levels dependent upon the instrumentation used; however, the sampling staff will notify laboratory personnel if samples collected are expected to contain high concentrations of contaminants. Likewise, the Laboratory requires notification if there are any potential hazards associated with samples.

Each ADEM laboratory location has two staff designated for taking corrective actions regarding errors or discrepancies in laboratory generated data. These people are:

- Montgomery – Chief Laboratory Branch, Chief Inorganic Unit;
- Mobile – Chief Laboratory Unit, Assigned Senior Staff - Chemist II;
- Birmingham – Chief Laboratory Unit, Assigned Senior Staff - Chemist II.

B4.2 Preparation of Samples

All samples are prepared for analysis (including QC) according to the procedures documented in the applicable method-specific ADEM Laboratory SOP, contract laboratory SOP, the latest approved edition of Standard Methods for the Examination of Water and Wastewater, or EPA publication Test Methods for Evaluating Solid Waste (SW-846), Physical/Chemical Methods.

B4.3 Analytical Methods

Approved procedures are utilized for all analytical methods (Appendix F). The methods selected must have MDLs lower than the applicable screening value. Alternate analytical methods must be included in the contractor QAPP or site-specific Study Plan for approval. Each site-specific Study Plan will list the constituents, analytical methods, and method detection limits (MDLs) for all project parameters.

The ADEM Laboratory completes sample analysis and quality control checks, and the turnaround time for data is no later than two weeks after the longest holding time of the parameter(s) requested. Any specific method performance criteria are specified in ADEM Laboratory SOPs.

Contract laboratory turnaround time is stated in the site-specific Study Plan.

Method validation procedures for non-standard methods may be found in the latest edition of Standard Methods Examination of Water and Wastewater, or EPA publication Test Methods for Evaluating Solid Waste (SW-846), Physical/Chemical Methods.

B4.4 Sample Disposal

Due to limited storage space in the ADEM laboratories, samples are generally discarded upon completion of the analysis following procedures set forth in ADEM SOP #4917.

If the sample is labeled as being held for a legal proceeding, then the sample will remain in the appropriate custody area until released by the Department's Office of General Counsel or the appropriate Division or other agency. These samples are tracked in a dedicated logbook.

A brief description of sample disposal and legal sample handling procedures used by each contract laboratory must be included in the LTF Contractor QAPP and/or site-specific Study Plan.

B5. Quality Control Requirements

B5.1 Purpose/Background

Quality control is the overall system of technical activities whose purpose is to measure and control the quality of a product or service so that it meets the needs of users. The aim is to provide quality data or results that are satisfactory, adequate, dependable, and economical. If nonstandard procedures are used at any time, the reasons for the change in protocol are clearly documented in the field notes and in the data files for the site.

B5.2 Field Procedures

Field instrumentation is calibrated and documented according to established procedures. Duplicate field measurements are conducted for 10% of the total number of field measurements for each site-specific Study Plan.

B5.2.1 *Field QC Samples*

The procedures for the collection of quality control samples that will be used during this program are outlined in ADEM SOP #9021.

Field Duplicates: Field duplicates are collected or prepared and sent to the laboratory for analysis. For each site-specific Study Plan where samples are collected, at least one field duplicate sample is collected for each environmental matrix evaluated (i.e. groundwater, surface water, soil) and for each parameter sampled (i.e. VOCs, SVOCs, and metals). Field duplicate samples will comprise at least 5% of the total number of samples collected for a site-specific Study Plan with a minimum of one field duplicate sample

Trip Blanks: One trip blank is collected for each cooler on a round trip where VOCs are collected.

Equipment Blanks: If field cleaning is conducted for reusable equipment (e.g. bailers, trowels), then one equipment rinse sample is collected after the field cleaning is conducted for each site-specific Study Plan's sampling event.

The site-specific Study Plan must include a description of the method used to assure that the preservatives and containers used are free of contamination. This may include the collection of a field blank sample at the same rate as the duplicate samples (ADEM SOP #9021).

B5.2.2 *Field Corrective Action*

Corrective actions may occur as a result of improper functioning field equipment. In situations where the equipment failure cannot be rectified in-house, the equipment will be returned to the manufacturer for correction or replacement. In some cases, corrective action may extend beyond equipment failure to sampling personnel or processes. Under these circumstances, the corrective action leads to re-sampling as resources allow and review of field practices as needed to prevent future occurrences.

B5.3 Laboratory Procedures

The quality of all data produced at the ADEM or contract laboratory is demonstrated by the analysis of required quality control samples in addition to the specified method performance criteria such as calibrations. Additionally, the actions to be taken when the QC sample results do

not meet acceptance criteria must be defined in the appropriate laboratory quality document. Appropriate corrective actions must be taken to prevent non-acceptable results.

B5.3.1 *Laboratory QC Samples*

Each laboratory SOP or quality assurance document for analytical methodology must include method-specific requirements for the type of QC samples, their frequency, and acceptance criteria. Laboratory QC samples may include: laboratory blanks, replicates, spiked samples, QC reference samples, and EPA Performance Evaluation Studies. These are discussed in Chapter 5 of the ADEM LOQAM.

B5.3.2 *Laboratory Assessments*

Laboratory accuracy, precision, and completeness are assessed for each sample batch using analyses from duplicate samples and standard reference samples.

Accuracy

Accuracy is measured via reference samples. Reference samples should comprise at least five (5) percent of the samples analyzed. Laboratory accuracy also is measured by comparing results of standard reference sample analyses to established laboratory recoveries and through analysis of laboratory performance tests (PT). Accuracy is calculated as a percent recovery of the known reference sample. The percent recovery equation varies with the analytical method and should be included in the method specific SOP.

Precision

The precision estimate for duplicate measurements can be expressed as the relative percent difference (RPD). RPD (in percent) is calculated as:

RPD= ((value1 – value2) / ((value1+value2)/2)) X 100

Method-specific precision acceptance criteria must be defined in the Laboratory QAM or SOPs.

Completeness

Completeness is estimated for each set of data by dividing the number of valid analyses (those meeting the data quality goals) by the number of samples analyzed. The program's completeness goal is 100% of requested analyses; however, if less than 100% is achieved, then the overall dataset is evaluated to determine if additional sampling is required.

B5.3.3 *Laboratory Corrective Action*

Corrective action is required whenever a measurement system generating the data is found to be out of control. The determination of whether a system is out of control is made based upon the correlation between predetermined limits and the actual analytical values. The corrective action is intended to be initiated by the person closest to the actual problem or by the first person to determine that a problem exists. Corrective actions may also be employed as a result of internal performance audits, or when conditions in sampling and/or analysis systems are shown to be in error or in any other way to be unsatisfactory.

Corrective action procedures are outlined in the ADEM SOP #9201 Documentation and Tracking of Laboratory Corrective Actions. Contract Laboratories must include appropriate corrective action procedures in their respective quality documents.

There are two types of corrective actions: 1) immediate, to correct or repair nonconforming data or equipment; and (2) long term, to eliminate causes of nonconformance. Depending on the nature of the problem, the corrective action employed may be formal or informal. In either case, the occurrence of the problem, the corrective action employed, and the verification that the problem has been eliminated is documented. Steps comprising a closed-loop corrective action system are as follows:

- Define the problem
- Assign the responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Determine a corrective action to eliminate the problem
- Assign and accept responsibility for implementing corrective action
- Establish effectiveness of the corrective action and implement the correction
- Verify that the corrective action has eliminated the problem

Corrective action may include, but is not limited to:

- Recalibration of instruments using freshly prepared standards
- Replacement of solvent lots or other reagents responsible for unacceptable blank values
- Additional training of chemists and technicians
- Re-extraction and/or reanalysis of sample per method requirements.
- Instrument check for possible maintenance needs.
- Revision(s) in methodology.
- Reassignment of personnel

B5.3.4 *Laboratory Acceptance Limits*

The measurement system is considered out of control when any of the items listed below occurs. If the laboratory is able to demonstrate that the problem is beyond the control of the laboratory, the samples need not be reanalyzed. If the problem is within the control of the laboratory, then the samples must be reanalyzed, if possible. The client must be notified by the laboratory via phone or email that a problem exists with the data. The following examples are problems that would prompt client notification:

- Whenever the method blank exceeds the detection limit of the method, the client is notified. An exception would be detection of common solvents in the volatile organic blank (ADEM LOQAM Chapter 6).
- Whenever the laboratory replicate exceeds the limits established in the method or 20% RPD, whichever is greater.
- Whenever the laboratory fortified blanks fall outside the acceptance limits in the method or the range 70-125%, whichever is more stringent.
- Whenever the surrogate recoveries exceed the limits established in the method.

B6. Instrument/Equipment Testing, Inspection, and Maintenance

B6.1 Field Equipment/Instruments

All field instrumentation must be tested for performance and accuracy by the sampling staff prior to the use of the equipment. It is the responsibility of the sampling staff to maintain the instrumentation in proper working order and to perform and document maintenance and pre/post trip equipment inspections. Commonly used spare parts should be kept in-house and available to the sampling staff for repairs. All surplus supplies and spare parts should be located in an area accessible to the sampling staff.

Maintenance of records for each of the instruments must be conducted by the sampling staff or other designee. Quality assurance of equipment integrity and calibration must be conducted on a regular basis and recorded in a dedicated equipment logbook (maintained with the instrument) or a calibration database. Equipment used in the field is calibrated prior to each daily use. Standards used for calibrations/verifications must not be used if expired.

B6.2 Laboratory Equipment/Instruments

All ADEM laboratory instruments are listed in Appendix Q and include the maintenance and calibration schedule for equipment type. The corresponding information applicable to the planned analyses for each contract laboratory must be included in the site-specific Study Plan.

Appropriate spare parts for all laboratory equipment must be available in each of the respective laboratories, including contract laboratories.

B6.3 Equipment Failure Resolution

All equipment failing to meet documented standards set by the manufacturer and/or quality document guidelines, should be returned to the manufacturer, or replaced, if the situation cannot be corrected by experienced in-house personnel. If any equipment is in need of replacement parts, such as, probes, batteries, etc., the staff member should coordinate with the appropriate personnel that such parts are needed. After replacement of defective parts, or upon receipt of the equipment back from the manufacturer, the equipment must be subjected to in-house calibration to ensure its effectiveness and all corrective actions must be logged into the equipment's logbook or database.

B7. Instrument/Equipment Calibration and Frequency

B7.1 Field Equipment

All site-specific Study Plans must include the field instruments and equipment requiring calibration and the corresponding frequencies. These instruments and equipment must be calibrated prior to sampling and the results must be documented in the appropriate calibration logbook or database.

B7.1.1 ADEM Field Equipment

A complete list of the ADEM field instruments and equipment requiring calibration and the corresponding frequencies is in Appendix K. General procedures for calibration and quality control checks are described in ADEM field measurement SOPs. See Appendix L for a list of all in-situ testing instruments and field equipment.

B7.1.2 Contractor Field Equipment

A complete list of contractor in-situ testing instruments/field equipment and the associated calibration frequencies must be included in the contractor QAPP. Procedures for calibration and quality control checks for each instrument must also be included in the contractor QAPP.

B7.2 Laboratory Instruments

B7.2.1 ADEM Laboratory Instruments

A listing of all Montgomery, Mobile, and Birmingham laboratory equipment and the standard equipment performance and maintenance schedule is listed in Appendix Q. General procedures for calibration and quality control checks, details on the calibration standards, and documentation requirements for calibration records are described in the laboratory method-specific SOPs. All instruments have a unique identification number with a corresponding calibration log book that is retained with the instrument at all times. This log book contains such information as date, time, place of calibration, and the person calibrating the instrument.

B7.2.2 Contractor Laboratory Instruments

A listing of all laboratory equipment and the standard equipment performance and maintenance schedule must be included in the contractor QAPP and/or site-specific Study Plan. Procedures for calibration and quality control checks, details on the calibration standards, and documentation requirements for calibration records must be included. All instruments must have a dedicated calibration log book that is retained with the instrument at all times or similar mechanism for tracking calibrations such as a database. The following information must be included in the record: date, time, and the person calibrating the instrument.

B8. Inspection/Acceptance of Supplies and Consumables

B8.1 Critical Supplies and Consumables

B8.1.1 ADEM Supplies and Consumables

General field (Appendix N) and laboratory (Appendix R) supplies may be requested from the designated staff for ordering. General laboratory supplies are acquired from scientific equipment and supply warehouses which are under contract with the State of Alabama for the current year. Items not available through contracted supply warehouses can be specially ordered from other vendors (i.e. direct from the manufacturers) by following proper Departmental procedures.

It is the ADEM sampling staff's responsibility to have appropriate amounts of preservatives and ice for the preservation of samples prior to every sampling event. It is the cooperative responsibility of the Project Manager and the ADEM sampling staff to verify the status of the supplies.

Vehicle-related consumable items including fuel, motor oil, and other maintenance items are obtained by the Project Manager or any of the ADEM sampling staff. These supplies are usually acquired from designated support facilities that handle vehicle maintenance. Other methods of purchase are available and can be used in cases of emergency when a support facility cannot be reached.

B8.1.2 Contractor Supplies and Consumables

A list of general field and laboratory supplies, such as those found in Appendices N and R, must be included in the contractor QAPP. It is the sampling staff's responsibility to have appropriate supplies prior to every sampling event. It is the cooperative responsibility of the LTF Contractor staff to verify the status of the supplies.

B8.2 Establishing Acceptance Criteria

Only a few of the listed consumable supplies require monitoring. Manufacturer certification of cleanliness of containers and American Chemical Society (ACS) certification of reagents meets the acceptance criteria. The critical supplies for sampling include sample bottles, buffers, standards, and sample preservatives.

The quality of the deionized water produced by the ADEM Laboratory is monitored on a quarterly basis and through field blanks at 5% of all sample locations, which provides adequate verification of consumable acceptance. If problems occur in either field blanks or laboratory blanks, then further investigation is undertaken.

Contractor procedures for verification of the quality of the deionized water used in the field blanks and contracted laboratories must be included in the contractor QAPP.

Buffers and standards are required to meet the manufacturer's standard solution specifications. Each lot of bottles and each lot of sample preservative must be quality assured. To document sampling container integrity, blank samples are collected as described in Section B5.

All arriving consumables must be inspected. Damaged, expired, or unacceptable supplies (such as a broken contact seal on reagents) violate acceptance criteria and the consumable is properly discarded or returned to the manufacturer or shipper. The receiving date should be marked on all sealed materials or on the material containers, and the expiration dates noted.

ADEM uses ACS-certified laboratory-grade reagents and the expiration dates are written on the containers.

B9. Data Acquisition Requirements for Non-direct Measurements

In addition to data generated through direct sampling and laboratory analysis, several non-direct measurement techniques may be employed to produce data for LTF sites. For most projects, a significant amount of non-direct data is gathered from online resources. Common sources of online information are federal agencies such as the U.S. Geological Survey (USGS), EPA, U.S. Fish and Wildlife Service, and the U.S. Census Bureau. State and local governments also provide online resources that are regularly utilized for projects. County tax records and regional climate surveys are common sources of non-direct data used in projects. Private companies such as Google Inc. are also important providers of non-direct data. Most projects are facilitated by the use of GIS software, which allows program staff to manage site data, measure geophysical features, and survey nearby places of interest (e.g. schools, daycares, residences, and businesses). Peer-reviewed published literature may also be used to obtain values related to site geology and pedology. References for these documents must be included in the associated report. Intra-Departmental databases are also common sources of non-direct data. The ADEM UST database provides data regarding tank locations, tank sizes, fuel types, and previously performed investigations, if applicable. The Department's electronic filing system, FileNet, is frequently used to locate electronic records relevant to a specific site or project. In lieu of electronic records, ADEM also maintains hard-copy records at its main offices in Montgomery, Alabama.

There are general limitations to the various types of non-direct data typically used in projects. A universal limitation for these data is the error in accuracy that can occur from the lag time between when the data are gathered and when they are published. An example of this would be the lag time between when property data are collected and when they are updated on a county tax assessor's online information system. Incomplete records are another potential limitation to non-direct data. Stream flow data collected by USGS gauging stations are sometimes incomplete; older data from decommissioned stations are often all that is available during a specific project. For GIS software like Google Earth, errors can occur when features are mislabeled or when measurements of features are inaccurate. Data entry errors represent another potential limitation to projects. Intra-Departmental records may not always be complete or accurate, and sometimes these errors may be compounded by subsequent records that replicate the errors. Project Managers and staff must be aware of the limitations of non-direct data and must be vigilant to ensure that potential errors are minimized and/or mitigated during projects.

Each LTF Contractor will be required to list the data source, describe its limitations, and provide a reason for use of any non-direct measurements to be used in the site-specific Study Plan and the associated report(s).

B10. Data Management

B10.1 Data Management Process

B10.1.1 *ADEM Data Management Process*

The data from the sample collection activities of the project are stored in a dual method of archiving laboratory reports and as an attachment to the monitoring/investigation report in FileNet. Data collections from the project are stored in multiple locations. Original chain-of-custody forms, notes, and laboratory results are part of the permanent record and are maintained in the Land Division filing system under the specific LTF site number. Upon completion of field activities and receipt of laboratory data, a monitoring/investigation report is written by the Sampling Coordinator and/or Project Manager. All inspection information, site notes/field sheets, reports, and site data are scanned into FileNet.

Work performed by an LTF Contractor is received by the Department, reviewed for accuracy, and if acceptable, placed into FileNet under the applicable LTF number.

All work products (ADEM or LTF Contractor) including work orders, site-specific Study Plans, status reports, and monitoring/investigation reports are tracked in the UST Tracking Database.

B10.1.2 *Contractor Data Management Process*

The contractor QAPP must include the over-all QAPP-specific data management process including data archival procedures for both the contractor and the potential labs.

Each LTF Contractor will be responsible for providing any site-specific modifications to the data management scheme in the site-specific Study Plan for both the contractor and the selected lab.

B10.2 Data Recording

Field datasheets, checklists, or logbooks may be used as applicable to the specific data collection activity being performed. However, the minimum data elements listed in Section B10.2.1 must be included. Field books, notes, and chain-of-custody forms are checked by the sampling staff and then checked again upon return to the office for completeness and accuracy. If problems are found, the sampling staff consults with any other staff who assisted with the data recording and makes any needed changes to the records. The changes must be crossed out with one line and the new value or information is written above, followed by the date the changes were made and the initials of the individual who documented the changes. All entries on field records and chain-of-custody forms must be written in ink and legible (no correction fluid or erasures are allowed). The site-specific Study Plan must include a signature page for all participants conducting field data collection that includes a printed full name, signature, and initials (as used for initialing corrections).

B10.2.1 Minimum Data Elements by Field Activity

The following minimum information must be obtained as part of the field activities, as applicable, and as required by the issued ADEM work order. The General Site Information must be recorded regardless of the type of field activity conducted. Details regarding the proposed methods utilized to record this information must be included in the site-specific Study Plan and the information must be properly documented in the monitoring/investigation report(s). Other information may be pertinent to the specific project and should be proposed in the site-specific

Study Plan. Contact information (including address and phone number) for all companies used to conduct field activities must be included in the monitoring/investigation report.

General Site Information

- Site Name and Address
- LTF Number
- UST release incident number (if applicable)
- Facility ID number (if applicable)
- UST owner/operator name, address, and phone number (if applicable)
- Locational (latitude/longitude) information
- Locations of public water supply wells within 1 mile
- Locations of private water supply wells within 1,000 feet
- Land use of site and adjoining properties
- Property owner and adjacent property owner name, address, and phone number
- Temperature and weather conditions at time of field activities

Boring Logs: Required Data Elements		
Site Name	Name of Geologist/Engineer logging borings and company affiliation	Interval sample collected
LTF Number	Date(s) and time borings drilled	% Recovery of samples for a specific interval
Boring/well number	Ground elevation of well	PID (ppm) reading collected at minimum 5’ intervals
Name of drilling company	Initial Depth to water and groundwater elevation	Soil and Lithologic Description at minimum 5’ intervals (such as U.S.C.S.*)
Name of driller	Depth of drilling	Total depth of boring/well and subsurface elevation
Drilling method	Remarks	

*Unified Soil Classification System

Soil Sampling: Required Data Elements	
Name of person sampling soil and company affiliation	Preservatives used for samples
Procedure used to sample soil	Transportation method to laboratory
Interval sample collected	Sample collection dates and times
Containers used to collect samples	

Well Completion Log: Required Data Elements		
Site Name	Date(s) and time well completed	Wellhead completion information
LTF Number	Ground elevation of well	Location of grout placement
Boring/well number	Depth to water at well completion and groundwater elevation	Well screen length and slot size
Name of drilling company	Total depth of well and subsurface elevation	Sand pack description
Name of driller	Casing materials	Thickness of bentonite seal and description of seal materials
Drilling method	Outer casing diameter	Remarks
Name of Geologist/Engineer overseeing well installation and company affiliation	Inner casing diameter	

Monitoring Well Development: Required Data Elements	
Name of person(s) developing well, company affiliation	Amount of groundwater removed during development
Method used to develop monitoring/recovery wells	Criteria used for completing development
Date and time of well development	Handling and disposition of groundwater produced during development
Cleaning procedures for equipment used for well development	Depth to groundwater and groundwater elevation after development

Well Purging: Required Data Elements	
Name of person purging well and company affiliation	Field measurements such as pH, conductivity, dissolved oxygen, or oxidation/reduction potential (ORP), temperature indicating stabilization
Method used to purge monitoring/recovery well prior to sampling	Handling and disposition of groundwater purged
Amount of groundwater removed from each well purged	Purging date and time

Groundwater Level Measurements: Required Data Elements	
Name of person collecting groundwater level measurement and company affiliation	Handling and disposition of waste produced during measurement process
Procedure used to collect measurement	Measurement date and time
Datum point described for each well	Depth to sediment or total depth of well
Cleaning procedures of water level measurement device	

Groundwater Sampling: Required Data Elements	
Name of person sampling well and company affiliation	Transportation method to laboratory
Procedure used to sample well	Field parameter collection procedures and results
Containers used to collect samples	Sample collection dates and times
Preservatives used for samples	

Surface Water Sampling: Required Data Elements	
Name of person collecting surface water sample, and company affiliation	Preservatives used for samples
Procedure used to sample water body	Transportation method to laboratory
Containers used to collect samples	Sample collection dates and times

Soil Physical Property Data Collection: Required Data Elements	
Name of person collecting fate and transport samples and company affiliation	Preservatives used for samples
Procedures used to collect various soil physical properties	Transportation method to laboratory
Containers used to collect samples	Sample collection dates and times

B10.2.2 ADEM Data Recording

Samples received at the Laboratory are accompanied by the original chain-of-custody forms (included in ADEM SOP #9040). Upon completion of the analysis, the laboratory reports and original chain-of-custody forms are filed in each facility's file. The ADEM Laboratory tracks received samples with a unique batch number in the LIMS. The LIMS is a Microsoft SQL database used for tracking samples, recording analytical results, and general data storage associated with laboratory techniques. All laboratory analytical data generated by Laboratory personnel are either imported into the LIMS directly from the instrument/data management module or are entered directly into the LIMS by the Laboratory personnel performing the analysis. If any field forms, other than chain-of-custody forms, are used, they must be included in the site-specific Study Plan.

B10.2.3 Contractor Data Recording

Copies of all field forms and laboratory-specific chain of custody forms must be included in the contractor QAPP and/or site-specific Study Plan.

B10.3 Data Validation

B10.3.1 *ADEM Data Validation*

Data validation for field measurements is handled manually by project-associated staff members. Data validation in the Laboratory is a two-step process with data validation by the analyst and by algorithms within the LIMS and data validation conducted by the Laboratory Quality Assurance Manager or other designated staff. Any laboratory data not passing the required QA is qualified

according to ADEM SOP #4910. Section D contains additional information related to the laboratory validation process. Any laboratory data qualifiers and an evaluation of field QC results will be included in the final report.

If any data are found to be questionable after review by the ADEM sampling staff, they are noted on the field record and laboratory data report, along with the reasons for questioning the data. The ADEM sampling staff will then ask the Laboratory to re-validate or re-run the analysis. Data that cannot be re-run and pass laboratory re-validation are qualified. Any qualified laboratory data will be reviewed by the ADEM sampling staff to determine the usability for the project. This determination will be documented in the project file.

B10.3.2 Contractor Data Validation

The contractor QAPP and/or site-specific Study Plan must outline the process for validation of the data by the laboratory and the project staff.

B10.4 Data Entry QC

B10.4.1 *ADEM Data Entry QC*

Quality control occurs at all levels of data acquisition, assimilation, verification, and distribution. In an effort to ensure accuracy of data, the Project Manager (in conjunction with the ADEM sampling staff) is responsible for overseeing all sample collection activities for each site and ensuring that all required sample parameters are collected. The sampling staff is responsible for entering all field and laboratory data into project spreadsheets or tables and transferring the site visit material to another program staff member for secondary QA of data results/entry. Documentation of the confirmed or corrected values is included in a report that includes the name of the staff member responsible for the decision. These reports are submitted to the Project Manager for verification of compliance with this QAPP.

B10.4.2 *Contractor Data Entry QC*

Quality control must occur at all levels of data acquisition, assimilation, verification, and distribution. These efforts to ensure data accuracy, including peer-review by experienced staff, must be included in the contractor QAPP and/or site-specific Study Plan.

B10.5 Data Transmittal

B10.5.1 *ADEM Data Transmittal*

For both *in-situ* data and field observations, it is the responsibility of the sample collector to ensure the timeliness of data downloads, data entry, and data assimilation. The field data and observations, and laboratory data associated with a site visit must be included in the monitoring/investigation report submitted to the Project Manager within two weeks of receipt of the final laboratory reports. It is ultimately the responsibility of the Project Manager to ensure entry of all of the finalized data into the monitoring/investigation report.

B10.5.2 *Contractor Data Transmittal*

The field data and observations, and laboratory data associated with a site visit must be included in the monitoring/investigation report submitted to the Project Manager. Copies of the raw field data and observations, and laboratory data may be requested by the Project or Program Manager

prior to the submittal of the monitoring/investigation report to ADEM. The raw data must be submitted within one week of the request receipt or as specified in the request.

The due date of the monitoring/investigation report(s) will be designated in the LTF work-order.

B10.6 Data Analysis

The analytical data are compared to the appropriate screening or site-specific values. All other data are used to interpret or characterize the site conditions and support decisions.

B10.7 Schedule Tracking

The data collection activities must be tracked by the LTF Contractor and Project Manager, as applicable, to ensure reasonable adherence to the schedule outlined in the site-specific Study Plan.

B10.8 Data Storage and Retrieval

B10.8.1 *ADEM Data Storage and Retrieval*

ADEM uses a centralized document storage system called FileNet. This system is managed by ADEM IT staff and backed up on a regular basis. The UST data are stored electronically within the FileNet System Water Library under the appropriate LTF number. Individual project data may be retrieved from the Project Manager, associated staff members, or anyone who has access to the Land Division records through FileNet. Outside entities may access electronic copies through e-file or request available hardcopies of information through the Permits and Services Division. These data are considered permanent records for the purpose of records retention.

B10.8.2 *Contractor Data Storage and Retrieval*

All contractor raw data, reports, and other information associated with the site-specific project must be maintained in site-specific files during the study and until the expiration or termination of the contract. All drawings, specifications, data, photos and other work products, finished or unfinished, prepared by the Contractor in the performance of its obligations under the executed contract, shall be exclusive property of the Department and shall be remitted to the Department upon the expiration or termination of the contract or upon request by the Department.

C ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

C1.1 Purpose/Background

The Project Manager is responsible for assessing the completeness and integrity of data collection and data management activities as outlined in this QAPP. The Project Manager is also responsible for adequately addressing deficiencies in the data collection and data management activities. The Project Manager (or his /her designee) reviews progress, reports problems (including QA-related problems) that are encountered, and recommends actions to resolve these problems.

The essential steps in the QA program for this project are:

- Identify and define the problem
- Assign responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Assign and accept responsibility for implementing appropriate corrective action
- Establish the effectiveness of a corrective action and implement
- Verify that the corrective action has eliminated the problem

C1.2 Number, Frequency, Types, and Documentation of Assessments

C1.2.1 ADEM Program Assessments

The Project Manager has the discretion of conducting on-site visits. As a part of these visits, a sample collection audit using a standard ADEM form/checklist (Appendix T) or a site inspection using a standard ADEM form/checklist (Appendix S) may be conducted. The sample collection audit assesses the performance of the LTF Contractor or ADEM staff in accordance with the applicable quality documents. The site inspection is used to verify the condition of the site, ensure that the status matches the progress reported by the LTF Contractor or ADEM staff, and note any situations that would affect the project. Any issues noted during these observations must be documented on the appropriate form. The issues are discussed with the appropriate personnel (if applicable) and may require corrective actions. The results are reported to the Program Manager and stored with the project file. Depending upon the severity of the noted issue(s), further coordination with the LTF Contractor may be necessary to determine corrective actions planned or taken.

Management system reviews should be conducted at least once per quarter. This engages the Program Manager and Project Managers that review progress of all ongoing site-activities to check and verify that the required activities are occurring per the schedule, report problems encountered (including QA-related problems), and recommend actions to resolve these problems. Documentation of these reviews is included in the LTF Progress Meeting notes.

Reports submitted by LTF Contractors or ADEM sampling staff must be reviewed by program staff for accuracy, completeness, and correct interpretation of data. Any issues noted during the review must be documented and may require corrective actions to address the problem. These issues are included in a Document Review Letter submitted to the LTF Contractor ADEM Sampling Coordinator.

C1.2.2 Sampling Staff/Field Assessments

Surveillance of data collection should occur continuously. Field books, notes, and chain-of-custody forms are checked by the sampling staff and then checked again upon return to the office for completeness and accuracy. Any necessary corrections are made appropriately.

Peer-review of all data tables must be conducted to assure that the tabulated data are accurate and complete. The name of the contractor or ADEM staff member, as applicable, conducting the peer-review must be documented in the monitoring/investigation report.

C1.2.3 ADEM Laboratory Assessments

Laboratory Performance Evaluations (PE) are quantitative audits of the ability of an analytical system to obtain acceptable results. For the most part, these are national audits such as the Water Supply PE Studies or the Water Pollution PE Studies. Proficiency Testing (PT) samples are obtained from commercial or federal agency suppliers and the obtained results are submitted for evaluation of performance. The ADEM laboratory routinely participates in these evaluations through its analysis of PT samples. The samples are either part of national studies or provided by the Laboratory Quality Assurance Officer (LQAO) for internal audit purposes. The LQAO tracks all PE results and conducts follow-up for any noted PT deficiencies to ensure they are remedied. Corrective actions for all PT deficiencies are initiated by the LQAO and/or the Laboratory Manager. Each Laboratory Manager is responsible for implementing all corrective actions and tracking their respective completion.

Laboratory assessments by the ADEM OEQ include such activities as

- periodic method audits,
- non-method laboratory audits including logbook, expiration, and general overview,
- review of semi-annual and/or annual Minimum Detection Limit (MDL) studies, and
- review of annual Performance Evaluations.

C1.2.4 Contractor Laboratory Assessments

The contract lab must ensure the accuracy of the data generated. These efforts may include: evaluations of Initial Demonstration of Capability (IDC) and MDL studies, PT studies, peer review of data, and other internal audits. The assessment activities conducted and how they are tracked must be included in the contractor QAPP and/or site-specific Study Plan.

C1.3 Corrective Actions

Many of the technical problems that might occur can be solved by trained staff members in the field by modifying the technical approach, repairing instrumentation that is not working properly, or correcting errors or deficiencies in documentation. Immediate corrective actions form part of normal operating procedures and are noted in records for the project. Problems not solved this way require more formalized long-term corrective action. In the event quality problems are identified, the Project Manager will determine whether attainment of acceptable quality requires either short- or long-term actions.

Corrective action is completed by a cooperative effort between staff involved. Possible types of corrective actions that may be implemented include adjusting acceptance criteria, collecting additional data, investigating other data sources, and modifying technical approaches.

Auditors/evaluators should have experience with procedures or are accompanied by technical experts who would assist during the auditing/evaluation process.

C2. Reports to Management

Quarterly and/or Semi-Annual Reports will be submitted to EPA in accordance with approved Grant Work Plans. Supervisory staff within the UST-CA Section of the Groundwater Branch are responsible for preparing and submitting these reports.

Monitoring/investigation reports must be submitted by the LTF Contractor or ADEM Sampling Coordinator to the Program Manager and Project Manager on the timetable delineated in the site-specific Study Plan. A template for the monitoring/investigation report is included in Appendix D.

The LTF Contractor or ADEM sampling staff will provide the Project Manager and Program Manager with a monthly Project Status Report (Appendix V), which includes the following:

- Site name
- LTF number
- Location (Address, City, County)
- Reporting month
- Current project status
- Activities performed during the reporting month
- Any issues that have arisen, along with the corrective action measures taken to correct deficiencies
- Discussion of any monitoring or investigative derived waste on-site
- Changes to the anticipated monitoring/investigation report date(s)
- Any sample handling procedures that deviated from the requirements in the quality documents, along with the implemented corrective action
- Discussion of activities planned/scheduled for the upcoming month(s) as required in the issued work order

The LTF Contractor or ADEM sampling staff will notify the Project Manager within 24 hours via phone or e-mail concerning any of the following issues. The Project Manager, in consultation with the LTF Contractor or ADEM sampling staff, will determine appropriate corrective action measures to be taken.

- Site access
- Quality assurance problems requiring modification to the activities or time frames outlined in the site-specific Study Plan
- If an issue arises that cannot be satisfactorily resolved between the contractor and analytical laboratory to determine the appropriate corrective action measures to be taken

Audits/evaluations of field personnel are reported to the Program Manager upon completion. Any corrective actions taken either by the LTF Contractor or ADEM sampling staff are documented. Both reports are filed with the facility file and archived electronically in FileNet.

D DATA VALIDATION AND USABILITY

D1.Data Review, Verification, and Validation

To ensure that data generated are of appropriate quality, all data will be verified and validated. These are procedures for reviewing a dataset against established criteria to provide a level of assurance that it is valid prior to its intended use. In order to be objective in the approach, the verification techniques used must be applied systematically and by those that collected or produced the data (review) and also by those who are independent of the data production (verification). The validation process reconciles the data with the site-specific Study Plan and/or applicable QAPP(s) and determines the usability and limitations of the data. Any deviations will be documented and provided in the monitoring/investigation report(s).

If verification or validation indicates that samples have been collected and/or analyzed out of compliance with the site-specific Study Plan and/or applicable QAPP(s), re-sampling may be required.

D1.1 ADEM Laboratory Data Qualifiers

Data qualifiers are “flags” added to data in an effort to best describe the quality or some other information regarding the sample, analysis, or reporting of the analysis results to the end user. Some qualifier codes are assigned during the sample login process (SOP #4901, Sample Receiving and LIMS Login). Qualifier codes resulting from problems encountered during sample receiving are assigned to all associated samples/results by the LIMS Login staff. Each analyst is responsible for checking all data he/she produces and assigning any appropriate data qualifier codes. A list of qualifier codes, corresponding results entries, and descriptions of the proper use of codes can be found in ADEM SOP #4910, Laboratory Data Qualification.

D1.2 Contractor Laboratory Data Qualifiers

The LTF Contractor must provide a list of data qualifier flags and definitions for each laboratory in the Contractor QAPP or site-specific Study Plan.

D2. Verification and Validation Methods

D2.1 ADEM Laboratory Data Verification and Validation

The analyst at the ADEM Laboratory has primary responsibility for correctness and completeness of the data before release. Each analyst reviews a data package to ensure that the sample preparation information is correct and complete, the analysis information is correct and complete, the appropriate SOPs have been followed, the analytical results are correct and complete, the QC samples are within established control limits and special preparation and analytical requirements have been met, and that documentation is complete (e.g. all anomalies have been reported, holding times have been reported, etc.).

Data validation is the process by which a body of data is accepted or rejected based on its conformance to a set of criteria and its accuracy. Data validation applies to all the data in a test batch. A run log is maintained for all analyses. All data are recorded on parameter sheets or output sheets from instrument systems. These data sheets are specially designed for each parameter. All pertinent information is recorded on each sheet (i.e., analyst, analytical data, analyte, blank sample, peak integrity factors, dilutions).

Laboratory personnel perform an independent review of laboratory data to ensure that the:

- calibration data are scientifically sound, appropriate to the method, and completely documented;
- QC samples are within established guidelines;
- qualitative identification of sample components is correct;
- documentation is complete and correct, including documentation that instruments are operating according to method specifications and documentation of dilution factors, standard concentration, proper reagent solutions, and chemicals;
- numerical calculations are correct;
- interpretation of all data produced is correct;
- data are ready for incorporation into the monitoring/investigation report; and,
- data package is complete and ready for data archival.

After data validation by the analyst, the results are entered into the LIMS either manually or through instrument interfaces. The LQAO, or designee, reviews the data using the LIMS QA/QC validation SOP (SOP #4903, LIMS Data Validation). This is the final check prior to production of the monitoring/investigation report. After validation in the LIMS, the final analysis report is generated by the Laboratory using a standard report format. The reports include all qualifier codes and the explanatory text. After reporting, the original data sheets are placed in parameter folders/boxes for future use or reference and maintained by the laboratory. A copy of all final laboratory reports and a copy of the chain-of-custody forms are kept electronically in the Laboratory office prior to being archived in the ADEM FileNet system (SOP #8023). The originals of the reports and chain-of-custody forms are maintained in the UST-CA program's FileNet LTF Site files. Contractor Laboratory Data Verification and Validation

The LTF Contractor must provide information on laboratory verification and validation methods in their Contractor QAPP and/or site-specific Study Plan.

D2.2 Final Data Verification

A checklist is used by the ADEM sampling staff/LTF contractor staff (Appendix X) to ensure a thorough check on not only the completeness of the data but adherence to the QAPP. This checklist will be part of the monitoring/investigation report so that validation can be completed. The checklist will include explanations of any anomalies noted in the field notes, the data, or the sample narrative from the laboratory and any deviations from the final site-specific Study Plan. All deviations from the acceptable criteria and potential impacts affecting the usability of the data shall be reported. The monitoring/investigation report along with the checklist will be submitted to the Project Manager for final validation.

D2.3 Data Validation by Project Manager

The Project Manager will validate the analytical and project data supplied in the monitoring/investigation report to ensure compliance with the requirements in the appropriate quality documents (Table 4). Validation of the data by the Project Manager shall include a check on:

1. Completeness of the data;
2. Adherence to proper sample preservation, transport, or handling protocols;
3. Proper use of sample collection procedures;
4. Proper analytical methods;
5. Proper use of quality control criteria;
6. Documentation of all data;
7. Ability to reconstruct all field sampling procedures through documentation and records of such procedures;
8. Ability to trace data in the monitoring/investigation report to a specific sampling site, date, and time;
9. Appropriateness of the data as related to specific data quality objectives.

Upon receiving the monitoring/investigation report, the Project Manager will validate the project data by first reading the report, reviewing the raw data, and reviewing the checklist and noting the anomalies listed. Then the Project Manager will determine that all of the required samples were obtained or that a reason was given as to why a sample was not collected. The chain-of-custody form is examined to ensure that it is properly completed and documents the condition of samples during their preparation, packing, transportation, and analyses. The time the sample was collected until it was received by the laboratory is checked for consistency and for time travel (meaning the sample was received before it was collected or other inconsistencies). The temperature upon receipt is also checked.

The laboratory reports are examined to make sure that all required analytes are present and were analyzed according to the requirements in the appropriate quality documents. The data are further examined against historical data to note changes and anomalies. If data anomalies become a concern and cannot be explained, the Program or Project Manager may arrange for an independent verification by re-sampling or investigate for a potential subsequent release. QC data are examined for completeness and adherence to the requirements of the QAPP. This includes an examination to ensure that necessary corrective actions have been taken when QC does not meet QAPP requirements. The LTF contractor is responsible for ensuring that the QC

requirements have been met and is not supposed to submit a report until this has been done. This review by the Project Manager serves as a second check.

Validation is also done on the well construction and boring logs. The records are reviewed for completeness, appropriate use of well drilling methods and decontamination procedures and any anomalies. Documentation of appropriate project personnel to include associated Alabama Registered Professional Engineer or Alabama Licensed Professional Geologist is checked. The field measurements are examined to ensure that the wells were purged in accordance with the QAPP and/or site-specific Study Plan. Lastly, the purge water and soil handling, storage, and disposal methods are reviewed for appropriateness. The documentation of proper disposal is checked.

Any anomalies or items that do not meet the requirements of the QAPP and/or site-specific Study Plan are noted in a final Review Letter sent to the LTF contractor or in the internal review process for ADEM Sampling Staff. The Review Letter is generated by the Project Manager, based on the findings during the verification and validation process, and filed in the FileNet LTF site file.

Table 4. Validation Activities

Item	***Activity***
Data Deliverables and QAPP	Ensure that all required information on sampling and analysis was provided (including planning documents).
Analytes	Ensure that required lists of analytes were reported as specified.
Chain-of-Custody	Examine the traceability of the data from time of sample collection until reporting of data. Examine chain-of-custody records against contract, method, or procedural requirements.
Holding Times	Identify holding time criteria, and either confirm that they were met or document any deviations. Ensure that samples were analyzed within holding times specified in method, procedure, or contract requirements. If holding times were not met, confirm that deviations were documented, that appropriate notifications were made (consistent with procedural requirements), and that approval to proceed was received prior to analysis.
Sample Handling	Ensure that required sample handling, receipt, and storage procedures were followed, and that any deviations were documented.
Sampling Methods and Procedures	Establish that required sampling methods were used and that any deviations were noted. Ensure that the sampling procedures and field measurements met performance criteria and that any deviations were documented.
Analytical Methods and Procedures	Establish that required analytical methods were used and that any deviations were noted.
Data Qualifiers	Determine that the laboratory data qualifiers were defined and applied as specified in the QAPP and/or site-specific Study Plan.
Deviations	Determine the impacts of any deviations from sampling or analytical methods and SOPs. Consider the effectiveness and appropriateness of any corrective action.
Site-Specific Study Plan	Determine whether the site-specific Study Plan was executed as specified (i.e., the number, location, and type of field samples were collected and analyzed as specified in the site-specific Study Plan).
Sampling Procedures	Evaluate whether sampling procedures were followed with respect to equipment and proper sampling support (e.g., techniques, equipment, decontamination, volume, temperature, preservatives, etc.).
Project Quantitation Limits	Determine that quantitation limits were achieved, as outlined in the QAPP and/or site specific Study Plan
Review Letter	Summarize deviations from methods, procedures, or quality documents.

D3.Reconciliation of Data with User Requirements

The Project Manager shall also ensure that these data collected address the needs to evaluate the LTF site and meet the requirements specified previously (Table 5). This is done in conjunction with data verification and validation.

The Review Letter discussed in section D2 will also comment on findings in the report that appear to be anomalous and whether these significantly impact the usability of the data as a whole. Because data generated with significant deviations from the requirements of the QAPP may be rejected it may be more cost effective to delay project decisions until additional data is obtained and the validation of the entire dataset can be conducted.

Table 5. Considerations for Usability Assessment

Item	***Assessment Activity***
Data Deliverables and QAPP	Ensure that all necessary information was provided.
Deviations	Determine the impact of deviations on the usability of data.
Sampling Locations, Deviation	Determine if alterations to sample locations continue to satisfy the project objectives.
Chain-of-Custody, Deviation	Establish that any problems with documentation or custody procedures do not prevent the data from being used for the intended purpose.
Holding Times, Deviation	Determine the acceptability of data where holding times were exceeded.
Damaged Samples, Deviation	Determine whether the data from damaged samples are usable. If the data cannot be used, determine whether re-sampling is necessary.
PT Sample Results, Deviation	Determine the implications of any unacceptable analytes (as identified by the PT sample results) on the usability of the analytical results. Describe any limitations on the data.
SOPs and Methods, Deviation	Evaluate the impact of deviations from SOPs and specified methods on data quality.
QC Samples	Evaluate the implications of unacceptable QC sample results on the data usability for the associated samples. For example, consider the effects of observed blank contamination.
Matrix	Evaluate matrix effects (interference or bias).
Meteorological Data and Site Conditions	Evaluate the possible effects of meteorological (e.g., wind, rain, temperature) and site conditions on sample results. Review field reports to identify whether any unusual conditions were present and how the site-specific Study Plan was executed.
Comparability	Ensure that results from different data collection activities achieve an acceptable level of agreement.
Completeness	Evaluate the impact of missing information. Ensure that enough information was obtained for the data to be usable (completeness as defined in the QAPP).
Background	Determine if background levels have been adequately established (if appropriate).
Usability Decision	Determine if the LTF contactor data usability recommendations are appropriate considering the implications of all deviations and corrective actions.
Review Letter	The Project manager discusses the overall acceptability of the monitoring/investigation report and associated recommendations.

E REFERENCES

ADEM Standard Operating Procedure #2061. 2014 (as amended). General Surface Water Sample Collection, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #2100. 2012 (as amended). General Groundwater Sample Collection, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #2150. 2014 (as amended). General Soil Sample Collection, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #4901. 2014 (as amended). Sample Receiving and LIMS Log-In, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #4903. 2012 (as amended). LIMS Result Validation, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #4910. 2013 (as amended). Laboratory Data Qualification, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #4917. 2007 (as amended). Waste Handling and Disposal, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #8023. 2006 (as amended). Field Operations Division FileNet Procedures/Guidelines – Laboratory Information, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #8400. 2012 (as amended). Global Positioning System, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #9021. 2013 (as amended). Field Quality Control: Measurements and Samples, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #9025. 2013 (as amended). Field Equipment Cleaning and Storage Procedures, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #9040. 2014 (as amended). Station, Sample Identification and Chain-of-Custody Procedures, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

ADEM Standard Operating Procedure #9201. 2011 (as amended). Documentation and Tracking of Laboratory Corrective Actions, Alabama Department of Environmental Management (ADEM), Montgomery, AL.

APHA. 1997. Standard Methods for the Examination of Water and Wastewater, 20th edition. American Public Health Association (APHA), Washington, DC.

"Test Methods for Evaluating Solid Waste (SW-846)." *SW-846 On-line.* 9 September 2013. U.S. Environmental Protection Agency. 15 August 2014. <http://www.epa.gov/osw/hazard/testmethods/sw846/online/index.htm>.

Stanley, T.W., and S.S. Verner. 1985. The U.S. Environmental Protection Agency's quality assurance program. Pp12-19 in: J.K. Taylor and T.W. Stanley (Eds.). Quality Assurance for Environmental Measurements, ASTM SPT 867. American Society for Testing and Materials, Philadelphia, PA.

F CHANGE TRACKING FORM

Revision # Rev. Date: (m/d/yy)	Section or Table Affected	Description of Modifications
Rev. 0 11/14/2014		Original version
Rev. 0.1 06/22/2015		Corrected formatting throughout document, changed FOD Chief on signature page, clarified Program/Project Managers roles in A4.2, added Appendix H reference in A5.1, added Section A4.2 reference in A9.5.2 & B2.3, and modified Table 3. Revised the following sections: A7.1, A7.2, A7.3, B1.6, B2.1, B2.2, B5.2.1, B5.3, B9, B10.3.1, B10.8.1, C1.2, and D2.3

APPENDIX A: DISTRIBUTION LIST

Appendix A QAPP Distribution List

Name	Contact Information	Address
Mr. Scott Hughes, Chief Field Operations Division	ash@adem.state.al.us (334) 394-4304	1350 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Mr. Philip D. Davis, Chief Land Division	wgh@adem.state.al.us 334-271-7732	1400 Coliseum Blvd. P.O. Box 301463 Montgomery, Alabama 36130-1563
Ms. Sonja Massey, Chief Groundwater Branch Land Division	smm@adem.state.al.us 334-271-7832	1400 Coliseum Blvd. P.O. Box 301463 Montgomery, Alabama 36130-1563
Ms. Dorothy Malaier, Chief UST-CA Section Land Division	dsm@adem.state.al.us 334-270-5613	1400 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Mr. John Dean, Chief UST-CA Unit Land Division	jdean@adem.state.al.us 334-271-7846	1400 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Ms. Vickie Hulcher, Chief Office of Environmental Quality Quality Assurance Manager	vjh@adem.state.al.us 334-260-2702	1350 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Mr. Fred Leslie, Chief Montgomery Branch Field Operations Division	fal@adem.state.al.us 334-260-2748	1350 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Mr. Joe Price, Chief Laboratory Branch Field Operations Division	jfp@adem.state.al.us 334-260-2719	1350 Coliseum Blvd P.O. Box 301463 Montgomery, Alabama 36130-1563
Mr. Bill Truman Region 4 Project Manager Environmental Protection Agency	truman.bill@epa.gov 404-562-9457	USEPA Region 4 61 Forsyth Street, S.W. Mail Code: 9T25 Atlanta, GA 30303-8960

APPENDIX B: CONTRACTOR QAPP TEMPLATE

Note to Contractors and those using this QAPP Template:

1. Once the form is completed, DELETE THESE INSTRUCTIONS
2. Instructions for filling in this template are in red. **Anything in red should be deleted out of the template when finalized.**
3. Refer to each section of the ADEM QAPP for guidance as this Contractor QAPP is prepared.
4. The purpose of this QAPP is to give an overall view of the quality system of the contractor. Site-specific information will be included in the site-specific Study Plan and should be noted as such if not included in this QAPP. If there are items that will be consistent, regardless of the specific project, it can be included in this QAPP and referenced in the site-specific Study Plan. This will prevent repetition and help increase efficiency.
5. For help with the parts of the QAPP call The ADEM UST Corrective Action Section Program Manager. For help with specific UST issues contact your ADEM Project Manager.
6. You are responsible for everything in this QAPP, as well as the site-specific Study Plan you produce for each project.

A1. Title & Approval

LTF Contractor Quality Assurance Program Plan (QAPP) for the Underground Storage Tank LTF Program In Alabama

Prepared by: Contractor Information

Date Prepared:

Prepared by (Signature and Printed Name)	Date
Approved by (Contractor Approved by Signature and Title)	Date
ADEM Project Manager	Date
ADEM Program Manager	Date

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A2. Table of Contents

A PROJECT MANAGEMENT

A3. Distribution List and Project Organization

The distribution and project organization list is a list of individuals that may either directly participate in the project or oversee a project. The personnel assigned to these roles must be identified in this QAPP. Anyone possibly performing essential functions in projects [including contract laboratory(ies)] should be listed below and their duties outlined. Those listed below must have access to the ADEM QAPP as well as any updates/revisions.

Table 1. List of Assigned Roles

Name	*Role*	*Organization and Address*	*Telephone Number*	*Email Address*

A3.1 Roles and Responsibilities

List the responsibilities for the roles in Table 1.

A4. Training and Certification

Provide educational and training information on personnel utilized in the LTF site work. Licensed professionals (e.g., PE, PG, well driller, surveyor) listed in Table 1 must provide applicable license information (type, number, expiration date). Explain how training is maintained, documented, and tracked.

A5. Documentation and Records

A5.1 Field, Laboratory, and Data Handling Records

Detail the filing procedure and data handling that will be used for maintaining project-related documents, including all documents including plans, reports, photos, copies of property access agreements, copies of field notes, field sampling forms, waste handling and disposal manifests, completed chain-of-custody forms, and laboratory data reports.

B DATA GENERATION AND ACQUISITION

B1. Sampling Process Design

B1.1 Sample Matrices and Types

If procedures other than the ones specified in the ADEM QAPP will be used to sample the typical media listed in the ADEM QAPP, include them in this section for each type of media.

B1.2 Locational Data Collection

If procedures other than the ones specified in the ADEM QAPP will be used to obtain the locational data, include them in this section.

B2. Sampling Methods Requirements

B2.1 Sample Collection, Preparation and Decontamination Procedures

If sample collection, sample preparation, or decontamination methods other than the ones specified in the ADEM QAPP will be used, include them in this section.

B2.2 Measurement of Field Water Quality Parameters

If field water quality measurements are obtained using methods other than the ones specified in the ADEM QAPP, include them in this section.

B2.3 Support Facilities and Equipment for Sampling Methods

B2.3.1 Contractor Laboratory

List the contract laboratories that may be used for a project.

B2.3.2 Field Equipment

If equipment preparation methods other than the ones specified in the ADEM QAPP will be used, include them in this section.

B3. Sample Handling & Custody

If sample handling procedures other than the ones specified in the ADEM QAPP will be used, include them in this section.

B3.1 Chain of Custody

Provide chain-of-custody procedures that will be used.

B3.2 Sample Transport

Provide the packaging and transporting procedures that will be used for samples.

B3.3 Laboratory Sample Check-In

Provide laboratory sample check-in procedures.

B4. Analytical Methods

B4.1 Purpose/Background

If a private laboratory is used, then the methods must be equivalent to those listed in the ADEM QAPP and must be stated as such in this section.

List the contract laboratory staff responsible for taking corrective actions regarding errors or discrepancies in laboratory generated data.

B5. Quality Control Requirements

B5.1 Field Procedures

B5.1.1 *Field QC Samples*

Include a statement that all field QC samples will be collected as specified in the ADEM QAPP and how this will be tracked and ensured.

B5.1.2 *Field Corrective Action*

Explain how field corrective actions will be handled and documented.

B5.2 Laboratory Procedures

B5.2.1 *Laboratory QC Samples*

Include references to the appropriate laboratory quality document that includes the method-specific requirements for the type of QC samples, their frequency, and acceptance criteria. This must also be included in the Appendices.

B5.2.2 *Laboratory Corrective Action*

Include the contract laboratory's corrective action procedures. You may reference their quality document(s).

B6. Instrument/Equipment Calibration and Frequency

B6.1 Field Equipment

A complete list of in-situ testing instruments/field equipment and the associated calibration frequencies **must** be included. Procedures for calibration and quality control checks for each instrument **must** also be included. This can also be included as an appendix.

B6.2 Laboratory Instruments

Include a listing of all laboratory equipment and the standard equipment performance and maintenance schedule. Procedures for calibration and quality control checks, details on the calibration standards, and documentation requirements for calibration records must be included.

B7. Inspection/Acceptance of Supplies and Consumables

B7.1 Critical Supplies and Consumables

Include a list of general field and laboratory supplies, such as those found in the ADEM QAPP appendices.

B7.2 Establishing Acceptance Criteria

Provide procedures for verification of the quality of the deionized water used in the field blanks and contracted laboratories.

B8. Data Management

B8.1 Data Management Process

Include the over-all QAPP-specific data management process including data archival procedures for both the contractor and the potential labs.

B8.1.1 Contractor Data Recording

Include descriptions and copies of all field forms and laboratory-specific chain-of-custody forms that may be used.

B8.2 Data Validation

Outline the process for validation of the data by the laboratory and the project staff.

B8.3 Data Entry QC

Describe the efforts used to ensure data accuracy, including peer-review by experienced staff.

C ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

C1.1 Number, Frequency, Types, and Documentation of Assessments

C1.1.1 Sampling Staff/Field Assessments

Include details on any additional assessments conducted on or by the sampling staff in addition to the surveillance and peer-review listed in the ADEM QAPP.

C1.1.2 Laboratory Assessments

List the assessment activities conducted to ensure the accuracy of the data generated.

C2. Reports to Management

C2.1 Project Status Report

List/detail the information that will be included in the monthly project status reports and address the use of the status report template.

C2.2 Monitoring/Investigation Report

List/detail the information that will be included in the monitoring/investigation report(s).

C2.3 ADEM Project Manager Notification

Acknowledge the requirement of the 24-hour notification to the ADEM Project Manager regarding site access issues, quality assurance problems, and laboratory issues. Indicate the title of the person will be responsible for the notification and possible corrective actions.

D DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

D1.1 Laboratory Data Qualifiers

Provide a list of data qualifier flags and definitions for each contract laboratory.

D2. Verification and Validation Methods

D2.1 Laboratory Data Verification and Validation

Provide information on laboratory verification and validation methods for each laboratory to be utilized.

D2.2 Final Data Verification

Describe how the verification checklist (ADEM QAPP Appendix X) for the monitoring/ investigations reports will be utilized.

E REFERENCES

Include appropriate references.

F CHANGE TRACKING FORM

Revision # Rev. Date: (Mm/Dd/Yy)	Section or Table Affected	Description of Modifications

APPENDIX C: SITE-SPECIFIC STUDY PLAN TEMPLATE

Note to Contractors and those using this site-specific Study Plan Template:

1. Once the form is completed, DELETE THESE INSTRUCTIONS
2. Instructions for filling in this template are in red. **Anything in red should be deleted out of the template when finalized.**
3. Refer to each section of the ADEM QAPP for guidance as this site-specific Study Plan is prepared.
4. The purpose of this Study Plan is to give detailed information for each site. Items already described in the Contractor QAPP may be referenced but anything not already included in that QAPP must be included in this document.
5. For help with the parts of the site-specific Study Plan call The ADEM UST Corrective Action Section Program Manager. For help with specific UST issues contact your Project Manager.

A1. Title & Approval

Site-Specific Study Plan
for the
Underground Storage Tank LTF Program
In Alabama

Name of Project/Site including the site identification number.

Site Location (Address, City)

Prepared by: Contractor Information

Date Prepared:

Prepared by (Signature AND Printed Name)	Date
Approved by (Contractor Approved by Signature and Title)	Date
Program Manager	Date
Project Manager	Date

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A2. Table of Contents

List of Appendices

List of Tables

List of Figures

A PROJECT MANAGEMENT

An Alabama Registered Professional Engineer or Alabama Licensed Professional Geologist must sign the site-specific Study Plan. The printed name, signature, and sign/seal as required by the licensing entities must be included. The following statement must be included with the signature.

"I certify under penalty of law that this site-specific Study Plan and all plans, specifications, and technical data submitted within were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiring of the person or persons who directly gathered the enclosed information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information."

A3. Distribution List and Project Organization

The distribution and project organization list is a list of individuals either directly participating in the project or overseeing the project. List each person assigned to a role for this project. Those listed below must have access to the ADEM QAPP and the Contractor QAPP, as well as any updates/revisions.

Table 1. List of Assigned Roles

Name	*Role*	*Organization and Address*	*Telephone Number*	*Email Address*

A3.1 Roles and Responsibilities

List the responsibilities for the roles in Table 1.

Figure 1. Organizational Chart

Include an organization chart specific to this project.

A4. Problem Definition/Background

Discuss the background (as much as is known) of the site and appropriate historical information, and why this site is being monitored, assessed, or remediated.

A5. Project/Task Description

A5.1 Description of Work to be Performed

Summarize what is known about the work to be done. Include details on the type of field measurements that will be performed.

A5.2 Geographical Locations

Include a map showing property boundaries and the location of the USTs and possible receptors (both on the property and off-site). Also include descriptions and maps indicating the proposed sampling points, borings, and any groundwater monitoring/recovery wells.

A5.3 Work Schedule

Include work schedules including the proposed field activity start and completion dates, report submittal dates, and any resource constraints.

A6. Training and Certification

Provide educational and training information on personnel utilized in the LTF project activities (including report reviews). Licensed professionals (e.g., PE, PG, well driller, surveyor) listed in Table 1 must provide applicable license information (type, number, expiration date). Explain how training is maintained, documented, and tracked.

A7. Documentation and Records

This section requires a list of the records pertinent to the project and produced during the project by the Contractor, Laboratories, and Subcontractors.

Table 2. Record Identification

Record	Produced By	Hardcopy/Electronic	Storage Location	Archival

B DATA GENERATION AND ACQUISITION

B1. Sampling Process Design

B1.1 Sample Information

Detail the proposed location, number, frequency, and type of samples to be collected. Also include the COPCs/COCs that will be sampled. If procedures other than the ones specified in the ADEM QAPP will be used to sample the typical media listed in the ADEM QAPP, include them in this section for each type of media. If Soil Gas Vapor samples will be collected, the procedures must be included.

B1.2 Project Activities Schedule

Include the proposed sampling schedule.

B1.3 Locational Data Collection

Include details regarding the locational data collection for the project. If procedures other than the ones specified in the ADEM QAPP will be used to obtain the locational data, include them in this section.

B2. Sampling Methods Requirements

B2.1 Sample Collection, Preparation and Decontamination Procedures

If sample collection, sample preparation, or decontamination methods other than the ones specified in the ADEM QAPP will be used, include them in this section.

B2.2 Measurement of Field Water Quality Parameters

If field water quality measurements are obtained using methods other than the ones specified in the ADEM QAPP, include them in this section. If equipment preparation methods other than the ones specified in the ADEM QAPP will be used, include them in this section. Include the precision for water quality field measurements.

B2.3 Support Facilities and Equipment for Sampling Methods

B2.3.1 Laboratory

List the laboratory(ies) that will be used for the project. Also include a list of laboratory equipment. This may be included as an appendix.

B2.3.2 Field Equipment

Include details, including make and model for each piece of equipment to be used to collect samples. If equipment preparation methods other than the ones specified in the ADEM QAPP will be used, include them in this section.

B3. Sample Handling & Custody

If sample handling procedures other than the ones specified in the ADEM QAPP will be used, include them in this section.

B3.1 Sample and Data Record Identification

Include procedures that ensure that the field identification of sampling points, media types, and sample types are uniquely identified.

B3.2 Chain of Custody

Provide chain-of-custody procedures that will be used.

B3.3 Sample Transport

Provide the packaging and transporting procedures that will be used for samples.

B3.4 Laboratory Sample Check-In

Provide laboratory sample check-in procedures.

B4. Analytical Methods

B4.1 Purpose/Background

If a non-ADEM laboratory is used, then the methods must be equivalent to those listed in the ADEM QAPP and must be stated as such in this section.

List the contract laboratory staff responsible for taking corrective actions regarding errors or discrepancies in laboratory generated data.

B4.2 Analytical Methods

List the constituents, analytical methods, and method detection limits (MDLs) for all project parameters. Include the contract laboratory turnaround time.

B4.3 Sample Disposal

Describe the sample disposal and legal sample handling procedures used by each contract laboratory.

B5. Quality Control Requirements

B5.1 Field Procedures

B5.1.1 *Field QC Samples*

Include a statement that all field QC samples will be collected as specified in the ADEM QAPP and how this will be tracked and ensured.

B5.1.2 *Field Corrective Action*

Explain how field corrective actions will be handled and documented.

B5.2 Laboratory Procedures

B5.2.1 *Laboratory QC Samples*

Include references to the appropriate laboratory quality document that includes the method-specific requirements for the type of QC samples, their frequency, and acceptance criteria. This must also be included in the appendices.

B5.2.2 *Laboratory Corrective Action*

Include the contract laboratory's corrective action procedures. You may reference their quality document(s).

B6. Instrument/Equipment Testing, Inspection, and Maintenance

B6.1 Field Equipment/Instruments

Discuss how maintenance of field equipment is recorded and how the documentation is maintained.

B6.2 Laboratory Equipment/Instruments

Discuss how maintenance of laboratory equipment is recorded and how the documentation is maintained.

B7. Instrument/Equipment Calibration and Frequency

B7.1 Field Equipment

Include the field instruments and equipment requiring calibration and the corresponding frequencies. Also include how the results are documented.

B7.2 Laboratory Instruments

Include a listing of all laboratory equipment and the standard equipment performance and maintenance schedule. Procedures for calibration and quality control checks, details on the calibration standards, and documentation requirements for calibration records must be included.

B8. Inspection/Acceptance of Supplies and Consumables

B8.1 Critical Supplies and Consumables

List the field and laboratory supplies that will be used for the project.

B8.2 Establishing Acceptance Criteria

If procedures for establishing acceptance criteria differ from the ADEM QAPP, provide details.

B9. Data Acquisition Requirements for Non-direct Measurements

List the data source and provide a reason for use of any non-direct measurements.

B10. Data Management

B10.1 Data Management Process

Include site-specific modifications to the data management scheme described in the Contractor QAPP.

B10.2 Data Recording

Include descriptions and copies of all field forms and laboratory-specific chain-of-custody forms that will be used. The forms may be included in an Appendix. If field forms are not used, include

details on the method used to record the required minimum data elements. If information other than what is listed as a required minimum data element will be pertinent to the project, describe the type of information and its importance.

B10.3 Data Validation

Outline the process for validation of the data by the laboratory and the project staff.

B10.4 Data Entry QC

Describe the efforts used to ensure data accuracy, including peer-review by experienced staff.

C ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

C1.1 Number, Frequency, Types, and Documentation of Assessments

C1.1.1 Sampling Staff/Field Assessments

Include details on any additional assessments conducted on or by the sampling staff in addition to the surveillance and peer-review listed in the ADEM QAPP.

C1.1.2 Laboratory Assessments

List the assessment activities conducted to ensure the accuracy of the data generated.

C2. Reports to Management

List/detail the information that will be included in the monitoring/investigation report.

D DATA VALIDATION AND USABILITY

D1. Data Review, Verification, and Validation

Provide a list of data qualifier flags and definitions for each laboratory used.

D2. Verification and Validation Methods

D2.1 Laboratory Data Verification and Validation

Provide information on laboratory verification and validation methods.

D2.2 Sampling Staff Data Verification

Describe how the verification checklist for the monitoring/investigation reports will be completed and who will conduct the verification.

E SIGNATURE PAGE

Include a signature page signed by all parties involved in the project that they have received the most recent version of the ADEM QAPP and the site-specific Study Plan. Include the signatures of the Alabama Licensed Professional Geologist and/or Alabama Registered Professional Engineer, as appropriate. All participants conducting field data collection must sign this page. The signature page must include a printed full name, signature, and initials (as used for initialing corrections).

F REFERENCES

Include appropriate references.

G CHANGE TRACKING FORM

Revision # Rev. Date: (Mm/Dd/Yy)	Section or Table Affected	Description of Modifications

APPENDIX D: MONITORING/INVESTIGATION REPORT TEMPLATE

Note to Contractors and those using this monitoring/investigation report template:

1. Once the report template is completed, DELETE THIS SECTION
2. Instructions for filling in this template are in red. **Anything in red should be deleted out of the template when finalized.**
3. Refer to each section of the ADEM QAPP, the LTF Contractor QAPP, and the approved site-specific Study Plan for guidance as this monitoring/investigation report is prepared.
4. The purpose of this report is to give detailed information for each site. The report must address the requirements of the ADEM QAPP, approved LTF Contractor QAPP, and site-specific Study Plan as appropriate.
5. For help with completing parts of the report or specific UST issues, call the ADEM Project Manager or ADEM Program Manager.

A1.*Title & Approval*

Monitoring/Investigation Report

(Enter in the specific name of the report for the scope of work performed)

for the

Underground Storage Tank LTF Program in Alabama

Name of Project/Site including the site identification number.

Site Location (Address, City)

Prepared by: Contractor Information

Date Prepared:

Prepared by (Print Name)

Prepared by (Signature) Date

Approved by (Signature) Place senior management title here Date

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A2. *Table of Contents*

List of Tables

Include the list of applicable tables in similar format as shown below.

List of Figures

Include the list of applicable figures in similar format as shown below.

List of Appendices

Include the list of applicable appendices in similar format as shown below.

Appendix A: Site Classification Checklist

Appendix B: Site Survey

Appendix C: Tax Map

Appendix D: Forms and Records

Appendix E: Laboratory Analytical Reports

Appendix F: Soil Boring/Field Screening Logs

Appendix G: Well Completion Logs

Appendix H: Aquifer Evaluation Information

Appendix I: LTF Contractor Waste Handling/Disposal Manifests and Receipts and ADEM Solid Waste Disposal Approval Letter

Appendix J: Fate and Transport Modeling Information

Appendix K: Access Agreements

Appendix L: Photographs

Appendix M: MEME Vendor Report, Disposal Manifest, and ADEM Air Division Approval Letter

Appendix N: Completed Verification Checklist

A INTRODUCTION

An Alabama Registered Professional Engineer or Alabama Licensed Professional Geologist must sign all reports. The printed name, signature, and sign/seal as required by the licensing entities must be included in the report. The following statement must be included with the signature.

"I certify under penalty of law that this report, and all specifications, and technical data submitted within were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiring of the person or persons who directly gathered the enclosed information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information."

A3. *Distribution List and Project Organization*

The distribution and project organization list contains information on individuals who directly participated in the project or oversaw the project. List each person's role who participated in this project. This includes LTF Contractor staff, laboratory contact, and drilling personnel, as well as others who actually participated in the project.

List of Roles

Name	*Role*	*Organization and Address*	*Telephone Number*	*Email Address*

A3.1 Roles and Responsibilities

If the responsibilities associated with the roles are different than those listed in the contractor QAPP and/or site-specific Study Plan, include details here. If the organizational structure associated with this scope of work performed under the associated site-specific Study Plan has changed, include an updated organizational chart.

A4. *Problem Definition/Background*

Discuss the background (as much as is known) of the site and appropriate historical information. Discuss why this site is being monitored, assessed, or remediated.

A. Background

1. UST Site Name, Facility I.D. Number, UST Release Incident Number, LTF site number, LTF site address, and LTF site phone number
2. UST Owner and Operator's name, address, and phone number
3. Name, address, and telephone number of the site property owner
4. Name, address, and telephone number of the adjacent property owner(s)
5. Site history including tank information (number, size, and contents of all current and former USTs), date release reported to ADEM, estimated quantity of release, cause of release (if known), source of the release, and status of any other releases at the facility. If the facility is no longer a petroleum marketing facility, please provide the current facility name and use. If the facility is currently not in use, please list the current use as vacant.

B. Site Activity History

Provide a listing of previously performed site activities such as tank closures, investigations performed, monitoring events, remediation, etc. Include the contractor name that performed the activity and the date of the activities performed and/or report submitted.

C. Site Classification List

Discuss the justification for the classification assigned to the site. Include the most current version of the UST Site Classification Checklist. (Appendix A)

A5. *Project/Task Description*

A5.1 Description of Work Performed

Provide an executive summary of the work efforts performed under the approved site-specific Study Plan.

Details of the site activities will be included as listed in Section B of this template.

A5.2 Geographical Description

Provide a description of the site and the surrounding area. Include the latitude and longitude of the site. (Refer to the appropriate maps/figures discussed later in the document)

A5.3 Work Schedule

If there were work schedule deviations from the contractor QAPP and/or site-specific Study Plan, explain here. Include discussion on any missing or incomplete data. List any resource constraints encountered. Include the dates of field work performed, including the start and completion dates, and report submittal dates.

A6. *Training and Certification*

Provide educational and training information on personnel utilized in the LTF site work if different than included in the site-specific Study Plan.

Licensed professionals (e.g., PE, PG, well driller, surveyor) participating in project activities must provide applicable license information (profession, license number, expiration date).

B DATA GENERATION AND ACQUISITION

Provide a concise introduction into what data were collected and what activities were performed during this scope of work.

A detailed discussion of data collection should be provided for the items listed below in B1 – B10. A discussion and interpretation of the data collection activities and site activities will be provided in B11.

B1. *Sampling Process*

B1.1 Sample Information

Detail the location, number, frequency, and type of samples collected. Also include the COPCs/COCs that were sampled.

B1.2 Project Activities Schedule

Include the dates of the actual data collection activities.

B1.3 Locational Data Collection

Include details regarding the locational data collection for the project. Describe the procedures utilized to obtain the locational data.

B2. *Data Collection Methods*

B2.1 Sample Collection, Preparation and Decontamination Procedures

Describe the sample collection, sample preparation, and any decontamination methods used.

A. Soil Data Collection and Field Screening Methodology
   1. Describe how the soil sample(s) was collected and preserved.
   2. Describe how the field screening was conducted.
   3. Describe the drilling method and rig utilized

B. Groundwater Data Collection Methodology
   1. Describe the groundwater sampling methodology and preservation methods.
   2. Describe groundwater measurement (temperature, pH, dissolved oxygen, specific conductance, etc.) methods.
   3. Describe the purging methodology.

C. Water Well Data Collection Methodology
   Water wells include public and private drinking water wells, irrigation wells, agricultural wells, or industrial wells.
   1. Describe the water well sampling methodology and preservation methods.
   2. Describe the purging methodology.

D. Surface Water Data Collection Methodology
   1. Include the surface sampling methodology and preservation methods.
   2. Describe the sampling containers used.

B2.2 Field Measurements

Describe the methods used for the field water quality measurements conducted. Include the precision for water quality field measurements if they differ from those listed in the site-specific Study Plan.

Describe the methods used to determine the total depth of wells and depth to groundwater.

B2.3 Support Facilities and Equipment

B2.3.1 Laboratory

List the contract laboratory(ies) that were used for the project. If the laboratory has any applicable certifications, include a list here or reference the analytical reports if the certifications are listed.

B2.3.2 Field Equipment

Provide details, including make and model for each piece of equipment used to collect samples and conduct field measurements. If equipment preparation methods other than the ones specified in the ADEM QAPP, LTF Contractor QAPP, or approved site-specific Study Plan were used, include them in this section.

B3. *Sample Handling & Custody*

Provide information on the sample handling and chain-of-custody procedures utilized. Include the completed chain-of-custody forms in Appendix D.

B3.1 Sample Transport

Provide the packaging and transporting procedures that were used for samples.

B4. *Analytical Methods*

B4.1 Purpose/Background

If a private laboratory was used, then the methods must be equivalent to those listed in the ADEM QAPP, LTF Contractor QAPP, or approved site-specific Study Plan, and must be stated as such in this section.

B4.2 Analytical Methods

List the constituents, analytical methods, and method detection limits (MDLs) for all project parameters. Analytical lab reports must be included in Appendix E.

B5. *Quality Control Requirements*

B5.1 Field Procedures

B5.1.1 *Field QC Samples*

Include a statement that all field QC samples were collected as specified in the ADEM QAPP, LTF Contractor QAPP, or approved site-specific Study Plan. Include a discussion of the QC results and implications.

B5.1.2 *Field Corrective Action*

Describe any field corrective actions taken. Explain how the corrective actions were handled and documented.

B5.2 Laboratory Procedures

B5.2.1 *Laboratory Corrective Action*

Describe any laboratory corrective actions taken. Explain how the corrective actions were handled and documented.

B6. *Instrument/Equipment Testing, Inspection, and Maintenance*

B6.1 Field Equipment/Instruments

Include a discussion of any maintenance performed on field equipment.

B7. *Instrument/Equipment Calibration and Frequency*

B7.1 Field Equipment

Include a discussion on the field instrument and equipment calibration. Include records of the calibrations in Appendix D.

B8. *Inspection/Acceptance of Supplies and Consumables*

B8.1 Supplies and Consumables

List the field supplies and consumables that were used for the project.

B8.2 Establishing Acceptance Criteria

If procedures for establishing acceptance criteria differ from the ADEM QAPP, LTF Contractor QAPP, or approved site-specific Study Plan, provide the details.

B9. *Data Acquisition Requirements for Non-direct Measurements*

List the data source and provide a reason for use of any non-direct measurements.

B10. *Data Management*

B10.1 Data Management Process

Include site-specific modifications to the data management scheme described in the Contractor QAPP.

B10.2 Data Recording

Include the completed field forms and/or site notes in Appendix D. Include any observations of site conditions that may have introduced variability.

B10.3 Data Entry QC

Describe the efforts used to ensure data accuracy, including peer-review by experienced staff. The names of the individuals that conducted the peer review must be included.

B11. *Discussion of Site Activities*

Provide a discussion of the following applicable information in the report. This section is for the discussion of the data collected and its interpretation. Reference the applicable table(s) from Section B13 in the discussions. Provide the required data elements as listed in Section B10 of the ADEM QAPP.

A. Regional and Site Geology and Hydrogeology
   1. Discuss the regional and site geology and hydrogeology.

B. Receptor Survey & Site Data

   Include reference to appropriate maps in the following discussion of the site features in the following sections.
   1. Significant site features: Discuss the location, status, and history of past and current petroleum storage tank systems and building structures.
   2. Determine land use: Within a 500-foot radius of the site, identify the following: schools, hospitals, basements, day-care centers, nursing homes, and businesses. Also identify surface-water bodies, parks, recreational areas, wildlife sanctuaries, wetlands, and agricultural areas.
   3. Utility Survey: Identify the location and depth of all subsurface utilities and other subsurface pathways, which may serve as preferential conduits for migration of the petroleum. Identify the flow direction of the material (water, sewage, etc) within the utility line.
   4. Water Well Inventory: Locate all public water-supply wells within a 1-mile radius of the site and all private wells and well water use within a 1,000-foot radius. Information sources include the ADEM Water Supply Branch, the USGA, the Alabama Geological Survey, water-system operators and interviews of local residents. A representative survey must be made and may require door-to-door interviews of businesses and residents. Identify existing potable and non-potable wells. The current use and status of all located wells should be noted. The ownership of the well(s) should be determined with owner name and address provided.

C. Soil Data and Field Screening
   1. Provide the soil boring and field screening date(s).
   2. Describe the soil type and field screening results.
   3. Discuss the soil analytical data.
   4. Discuss the soil physical parameter data.
   5. Provide the latitude/longitude of soil boring locations.
   6. Include the soil boring logs and field screening logs in Appendix F.
   7. Describe the soil cuttings handling, storage, and disposal practices.

D. Monitoring Well Information
1. Provide the monitoring well installation, development date(s).
2. Describe the well development procedure.
3. Provide justification for monitoring well locations.
4. Provide the latitude/longitude of monitoring well locations.
5. Describe the drilling method and rig utilized.
6. Include well completion logs in Appendix G.
7. Discuss the well specifications (depth, casing diameters, screen intervals, etc).

E. Groundwater Depths and Flow Direction
1. Describe the depths to groundwater measured in all wells.
2. Discuss current and historical depths to water and groundwater elevations, and total depths of wells.
3. Refer to the appropriate map showing the groundwater flow direction.
4. Discuss the flow direction and groundwater gradient.

F. Groundwater Data
1. Include sampling dates and field measurement dates.
2. Discuss purged water volume and groundwater measurements (to verify purging is complete), current and historical analytical data, and field measurement results.
3. Describe the purged water handling, storage, and disposal practices.

G. Water Well Data
1. Include sampling dates.
2. Discuss the volume of water purged or time elapsed.
3. Provide the latitude/longitude of water well locations.
4. Discuss the current and historical analytical data.

H. Surface Water Data
1. Include sampling dates.
2. Discuss the sampling locations and rationale for selection.
3. Provide the latitude/longitude of sampling locations.
4. Include a description of the surface water body to include name, water body type, approximate max depth and/or dimensions (refer to applicable figure).
5. Discuss the analytical data.

I. Free Product Removal Information
1. Discuss observations of free product at site to include visual appearance, product type, weathering state, color, etc.
2. Discuss the location and thickness of free product observed.
3. Refer to the appropriate figure that includes observed locations of free product at site.
4. Describe the procedures utilized to remove free product.
5. Describe the free product handling, storage, and disposal practices.

J. Mobile Enhanced Multiphase Extraction (MEME) Information

1. A brief description of the completed work scope and any relevant descriptions pertaining to the data tables.
2. Include the vendors report in Appendix M which should include:
    i. total volume of water recovered (gallons).
    ii. total volume of free phase product recovered in equivalent gallons.
    iii. total mass of petroleum removed as vapor.
    iv. a table summarizing the airflow (in CFPM) and volatile concentrations collected from the stack of the truck through the duration of the event. The table should also document which well(s) were being recovered from during that time interval.
    v. scaled base map depicting the location of the extraction wells and the surrounding wells equipped with magnehelic gauges.
    vi. a table summarizing the magnehelic gauge measurements from all applicable wells on periodic intervals.
3. Discuss the free product thickness in each well before and after the recovery event.
4. Include a copy of the ADEM Air Division approval letter in Appendix M.
5. Discuss the disposal of the recovered free phase petroleum and groundwater. A copy of the disposal manifest from the receiving facility that clearly designates the quantity received must be included as Appendix M in the report.

B12. *Data Collection Results & Discussion*

Include a discussion on the following as applicable. Reference the applicable table(s) from Section B13 in the discussions.

1. Monitoring and Investigation results – include a discussion and interpretation of all monitoring and/or investigation results and a comparison of those results to screening levels and/or site specific target levels (SSTLs) as appropriate.

2. Aquifer evaluation results – include a discussion of the aquifer evaluation and results.

3. Fate & transport results – include a discussion of the fate & transport parameters utilized in the models. All assumptions should be clearly identified. Discuss the modeling results.

4. Recommendations - include recommendations for further action (ARBCA evaluation, monitoring, investigation, active remediation, intrinsic remediation, etc.) as warranted by the risk receptors and concentrations detected.

B13. *Tables*

Include the applicable tables as listed below.

1. Soil and Field Screening Data - Soil field screening and analytical data for the site must be included in tabular form as Table 1. Soil borings must be designated with a unique number and be consistent with the identifiers on the chain-of-custody forms. Include screening levels and/or SSTLs as appropriate.

2. Potentiometric Data - Potentiometric data for the site must be included in tabular form for this and all previous sampling events as Table 2. This includes top of casing elevations, screened intervals, well diameter, depth to water, depth to product, and groundwater elevation for each well.

3. Water Analytical Data - Water analytical data for the site must be included in tabular form as Table 3 and must include current and historical data. Monitoring wells must be designated with a unique number and be consistent with the identifiers on the on the chain-of-custody forms. Water wells must be clearly designated. Surface water sampling locations should be designated with a unique identifier and be consistent with the identifiers on the on the chain-of-custody forms. Include groundwater measurements (temperature, pH, dissolved oxygen, specific conductance, free product thickness, etc.). The table may be separated by type (ex: groundwater, surface water, field measurements) and labeled as 3a, 3b, 3c, etc. Include screening levels and/or SSTLs as appropriate.

4. Purge Water Table – The quantity of water purged from each well, the date and time of purging, confirmatory field measurements, name of staff who purged the well, and the methodology utilized must be included in tabular form as Table 4.

5. Free Product Table – The thickness of free product measured before free product removal and after including the dates and times of measurements must be included for each well in tabular form as Table 5.

6. Aquifer Characteristics – Hydraulic conductivity, seepage velocity, porosity, fractional organic carbon, etc. must be summarized in tabular form as Table 6.

7. Site Conceptual Model - Identify the data necessary to characterize the migration potential along the pathway and to quantify the potential impact. Label this as Table 7.

B14. ***Figures***

Include the applicable figures listed below.

1. Topographic Map- Include a copy of the relevant portion of a USGS topographic map showing the site location and the locations of all water wells and other potential receptors within the specified footage of the site. The figure must be captioned with the facility name and address, UST Release Incident number, LTF number, date, and bar scale. The map must include a north arrow. Label as Figure 1.

2. Satellite Photo – Include a copy of a satellite photo showing the site location and the locations of all water wells and other potential receptors within the specified footage of the site. The figure must be captioned with the facility name and

address, UST Release Incident number, LTF number, date, and bar scale. The map must include a north arrow. Label as Figure 2.

3. Site Base Map #1 - The first site base map, labeled as Figure 3, should be accurately scaled, but does not need to be surveyed (unless otherwise specified). The map should include the following:
    i. Legend including the facility name and address, UST Release Incident number, LTF and a bar scale.
    ii. North arrow.
    iii. Location of property lines.
    iv. Streets or highways (indicate names and numbers).
    v. Location of buildings.
    vi. Paved areas on or adjacent to site.
    vii. Location of all present and former above ground and underground storage tanks and approved lines, pumps, and dispensers.
    viii. Underground and aboveground utilities on or adjacent to site (sewer, water, telephone, gas, electric, etc.).
    ix. Location of any potential receptors.

4. Site Base Map #2 - The second site base map, labeled as Figure 4, should be scaled as in Figure 3, but does not need to be surveyed (unless otherwise specified). The map should include the following:
    i. Legend including the facility name and address, UST Release Incident number, LTF and a bar scale.
    ii. North arrow.
    iii. Location of property lines.
    iv. Streets or highways (indicate names and numbers).
    v. Location of buildings.
    vi. Paved areas on or adjacent to site.
    vii. Location of all present and former above ground and underground storage tanks and approved lines, pumps, and dispensers.
    viii. Location of any potential receptors.
    ix. Previous soil sampling locations.
    x. Boring/Monitoring well location.

5. Land-Use Map – The land-use map must show the surrounding land-use within a 500 ft radius of the site labeled as Figure 5. The land-use should be residential, commercial, agricultural, industrial, parks, etc.

6. COC Site Maps - The COC site maps must show the known and estimated horizontal extent of COCs in the soil and groundwater. The presence, including thickness, of free-product must be noted on the maps as appropriate. Analytical values for the COCs must be indicated at each sampling point. A separate map should be used for each medium and designated parameter including benzene, lead, lead scavengers, MTBE, total BTEX, PAHs, naphthalene, or others requested by ADEM. Label the separate maps as Figure 6a, Figure 6b, etc.

7. Site Potentiometric Map - The map must indicate the water level elevations for each monitoring well and show the direction of groundwater flow for the surficial aquifer. Label as Figure 7. Additional groundwater flow maps may be included on a site specific basis.

8. Geologic Cross-Sections - Include two cross-sections showing the lithology and stratigraphy of the site, groundwater table, and the known and estimated vertical extent of COCs in the soil and groundwater. The cross-sections should intersect at a 90-degree angle if possible. One cross-section should include the source area and go down-gradient through as many wells as practicable with the highest concentrations. If a subsequent assessment is conducted to define the extent of COCs, the cross-sections must be updated to include the additional wells and updated with the most recent sampling results. Screened intervals must be included for each well included in the cross-section. Label as Figure 8.

C ASSESSMENT AND OVERSIGHT

C1. Assessments and Response Actions

C1.1 Number, Frequency, Types, and Documentation of Assessments

C1.1.1 Sampling Staff/Field Assessments

Include details on any additional assessments conducted on or by the sampling staff in addition to the surveillance and peer-review listed in the LTF Contractor QAPP or approved site-specific Study Plan.

Include a discussion of any ADEM oversight that was performed during data collection and the comments that were provided by ADEM.

D DATA USABILITY AND VERIFICATION

D1. Data Usability

Include a discussion of the usability of any qualified data.

D2. Data Verification

Describe how the verification checklist for this report was completed and who conducted the verification. The verification checklist must be included in Appendix N.

E SIGNATURE PAGE

Include a signature page signed by all data collectors. This includes field data collection and data collection from non-direct sources. The signature page must include a printed full name, signature, and initials (as used for initialing corrections).

F REFERENCES

Include appropriate references.

APPENDICES

Include the appropriate appendices labeled below. Each appendix must have a cover page with the appendix title.

Appendix A: Site Classification Checklist

Appendix B: (When required by the Department) Site Survey prepared and certified by an Alabama Registered Professional Land Surveyor. The surveyed base map should be plotted to an accuracy of 1-foot and include the following:

i. Location of property lines, for the subject site and all affected adjacent properties
ii. Streets and highways (indicate names)
iii. Location of buildings
iv. Paved areas on or adjacent to site
v. Location of present and former above ground and underground storage tanks and approved lines, pumps, and dispensers.
vi. Underground utilities on or adjacent to the site (sewer, water, gas, telephone, electric, etc.)
vii. Location of any potential receptors
viii. Soil boring locations
ix. Monitoring well locations
x. Survey datum location
xi. Captioned with the facility name and address, UST Release Incident Number, LTF Number, date, and bar scale.
xii. North arrow

Appendix C: A copy of the relevant portion of the tax map depicting the location of the facility, all impacted properties, and all properties located adjacent to the impacted properties. The property owner names, contact addresses, and phone numbers as well as a list of monitoring wells installed on each parcel must be included.

Appendix D: Field forms and/or site notes, maintenance/calibration records, and completed chain-of-custody forms.

Appendix E: Laboratory Analytical Reports

Appendix F: Soil Boring/Field Screening Logs

Appendix G: Well Completion Logs

Appendix H: Aquifer evaluation (ex. Slug tests, pumping test) summary forms, data, graphs, equations.

Appendix I: LTF Contractor waste handling/disposal manifests and receipts and ADEM Solid Waste Disposal approval letter

Appendix J: If requested by the ADEM UST Program, all fate and transport modeling assumptions, data input to each model, and all generated output data.

Appendix K: Copies of any access agreements obtained by the contractor to complete the required work.

Appendix L: Representative photos of the site work performed.

Appendix M: MEME vendor report, disposal manifest, and ADEM Air Division approval letter.

Appendix N: Completed verification checklist.

APPENDIX E: REFERENCE LIST OF APPLICABLE STANDARDS

Appendix E – Reference List of Applicable Standards

ADEM UST regulations: ADMIN Code R335-6-15

ADEM. 2008 (as amended). Alabama Underground Storage Tank Release Investigation and Corrective Action Guidance Manual

ADEM. 2001 (as amended). ARBCA: Alabama Risk-Based Corrective Action for Underground Storage Tanks Guidance Manual

ADEM 2005 (as amended) September revised. Alabama Environmental Investigation and Remediation Guidance (AEIRG).

APPENDIX F: CONTAMINANTS OF POTENTIAL CONCERN

Appendix F -- CHEMICALS OF POTENTIAL CONCERN

CHEMICAL		Gasoline	Diesel/ Light Fuel Oils	Kerosene-type Jet Fuel	Kerosene	Heavy Fuel Oils	Waste/ Used Oil	Analytical Methods*	
ORGANICS								**Groundwater**	**Soil**
Benzene	ca/nc	X	X	X	X	NC	X	8021, 8260[1], 8260B	8021, 8260, 8260B
Toluene	nc	X	X	X	X	NC	X	8021, 8260[1], 8260B	8021, 8260[1], 8260B
Ethylbenzene	ca/nc	X	X	X	X	NC	X	8021, 8260[1], 8260B	8021, 8260[1], 8260B
Xylenes (mixed)	nc	X	X	X	X	NC	X	8021, 8260[1], 8260B	8021, 8260[1], 8260B
Methyl-tert-Butyl-Ether	ca/nc	X	NC	NC	NC	NC	NC	8260, 8260B	8260, 8260B
tert-Butyl alcohol	nc	X**	NC	NC	NC	NC	X	8260B, 8015D	8260B, 8015D
Dibromoethane,1,2 EDB	ca/nc	X*	NC	NC	NC	NC	X	502.2, 504.1, 8011, 8260B	8021B , 8260B
Dichloroethane,1,2 EDC	ca/nc	X*	NC	NC	NC	NC	X	502.2,524.2,8260B,8021B	8260B,8021B
Ethanol	nc	X**	NC	NC	NC	NC	X	8260B, 8015D	8260B, 8015D
Anthracene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Benzo(a)anthracene	ca	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Benzo(a)pyrene	ca	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Benzo(b)fluoranthene	ca	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Benzo(k)fluoranthene	ca	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Benzo(g,h,i)perylene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Chrysene	ca	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Fluoranthene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Fluorene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Naphthalene	ca/nc	X	X	X	X	X	X	8310, 8270 , 8270C	8310, 8270, 8270C
Phenanthrene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C
Pyrene	nc	NC	X	X	X	X	X	8310[2], 8270, 8270C	8310[2], 8270, 8270C

Appendix F -- CHEMICALS OF POTENTIAL CONCERN

CHEMICAL		Gasoline	Diesel/ Light Fuel Oils	Kerosene-type Jet Fuel	Kerosene	Heavy Fuel Oils	Waste/ Used Oil	Analytical Methods*
METALS								**Soil and Groundwater**
Arsenic	ca/nc	NC	NC	NC	NC	NC	X	200.8, 200.9, 206.2, 206.3, 206.4, 6020, 7000, 7062
Barium	nc	NC	NC	NC	NC	NC	X	200.7, 200.8, 208.1, 208.2, 6010, 6020, 7000, 7080
Cadmium	ca/nc	NC	NC	NC	NC	NC	X	200.8, 200.9, 213.2, 6010, 6020, 7000, 7130, 7131
Chromium (VI)	ca/nc	NC	NC	NC	NC	NC	X	218.4, 218.5, 3500CrB (water only), 7195[5], 7197[5], 7198
Lead	nc	X*	NC	NC	NC	NC	X	200.8, 200.9, 239.2, 6020, 7421
Zinc	nc	NC	NC	NC	NC	NC	X	200.7, 200.8, 289.1, 289.2, 6010, 6020, 7000, 7950, 7951

*The methods chosen for analyses must achieve Method Detection Limits lower than the screening values.

X: Chemical of Potential Concern ; X** A gasoline chemical of potential concern when directed by the Department

NC: Not a Chemical of Potential Concern;

X* Chemical of Potential Concern for leaded gasoline and aviation gas release

1 For 8260B and 8021B, use extraction Method 5035 for soil, promulgated June 1997.

2 For 8310, must use High Performance Liquid Chromatography (HPLC) version.

5 7195, 7197 use a new digestion, 3060, promulgated June 1997

nc Non-carcinogenic toxicological parameter(s) are available.

ca Carcinogenic toxicological parameter(s) are available.

APPENDIX H: UST SITE CLASSIFICATION CHECKLIST

ADEM GROUNDWATER BRANCH

UST SITE CLASSIFICATION SYSTEM

CHECKLIST

Please read all of the following statements and mark either yes or no if the statement applies to your site. If you have conducted a Preliminary or Secondary Investigation, all questions should be answered. Closure site assessment reports may not provide you with all the necessary information, but answer the statements with the knowledge obtained during the closure site assessment.

SITE NAME: _____
SITE ADDRESS: _____
_____

FACILITY I.D. NO.: _____
UST INCIDENT NO.: _____

OWNER NAME: _____
OWNER ADDRESS: _____

NAME & ADDRESS OF PERSON
COMPLETING THIS FORM: _____
_____
_____

CLASSIFICATION	***DESCRIPTION***	***YES***	***NO***
CLASS A	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
A.1	Vapor concentrations at or approaching explosive levels that could cause health effects, are present in a residence or building.	☐	☐
A.2	Vapor concentrations at or approaching explosive levels are present in subsurface utility system(s), but no buildings or residences are impacted.	☐	☐
CLASS B	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
B.1	An active public water supply well, public water supply line, or public surface water intake is impacted or immediately threatened.	☐	☐
B.2	An active domestic water supply well, domestic water supply line or domestic surface water intake is impacted or immediately threatened.	☐	☐
B.3	The release is located within a designated Wellhead Protection Area I.	☐	☐
CLASS C	IMMEDIATE THREAT TO HUMAN HEALTH, HUMAN SAFETY OR SENSITIVE ENVIRONMENTAL RECEPTOR		
C.1	Ambient vapor/particulate concentrations exceed concentrations of concern from an acute exposure, or safety viewpoint.	☐	☐
C.2	Free product is present on the groundwater, at ground surface, on surface water bodies, in utilities other than water supply lines, or in surface water runoff.	☐	☐

CLASSIFICATION	***DESCRIPTION***	***YES***	***NO***

CLASS D	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
D.1	There is a potential for explosive levels, or concentrations of vapors that could cause acute effects, to accumulate in a residence or other building.	☐	☐
D.2	A non-potable water supply well is impacted or immediately threatened.	☐	☐
D.3	Shallow contaminated surface soils are open to public access, and dwellings, parks, playgrounds, day care centers, schools or similar use facilities are within 500 feet of those soils.	☐	☐
CLASS E	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
E.1	A sensitive habitat or sensitive resources (sport fish, economically important species, threatened and endangered species, etc.) are impacted and affected.	☐	☐
CLASS F	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
F.1	Groundwater is impacted and a public well is located within 1 mile of the site.	☐	☐
F.2	Groundwater is impacted and a domestic well is located within 1,000 feet of the site.	☐	☐
F.3	Contaminated soils and/or groundwater are located within designated Wellhead Protection Areas (Areas II or III).	☐	☐
CLASS G	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
G.1	Contaminated soils and/or groundwater are located within areas vulnerable to contamination from surface sources.	☐	☐
GLASS H	SHORT TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
H.1	Impacted surface water, stormwater or groundwater discharges within 500 feet of a surface water body used for human drinking water, whole body water-contact sports, or habitat to a protected or listed endangered plant and animal species.	☐	☐
CLASS I	LONG TERM THREAT TO HUMAN HEALTH, SAFETY, OR SENSITIVE ENVIRONMENTAL RECEPTORS		
I.1.	Site has contaminated soils and/or groundwater but does not meet any of the above mentioned criteria.	☐	☐

ADDITIONAL COMMENTS:

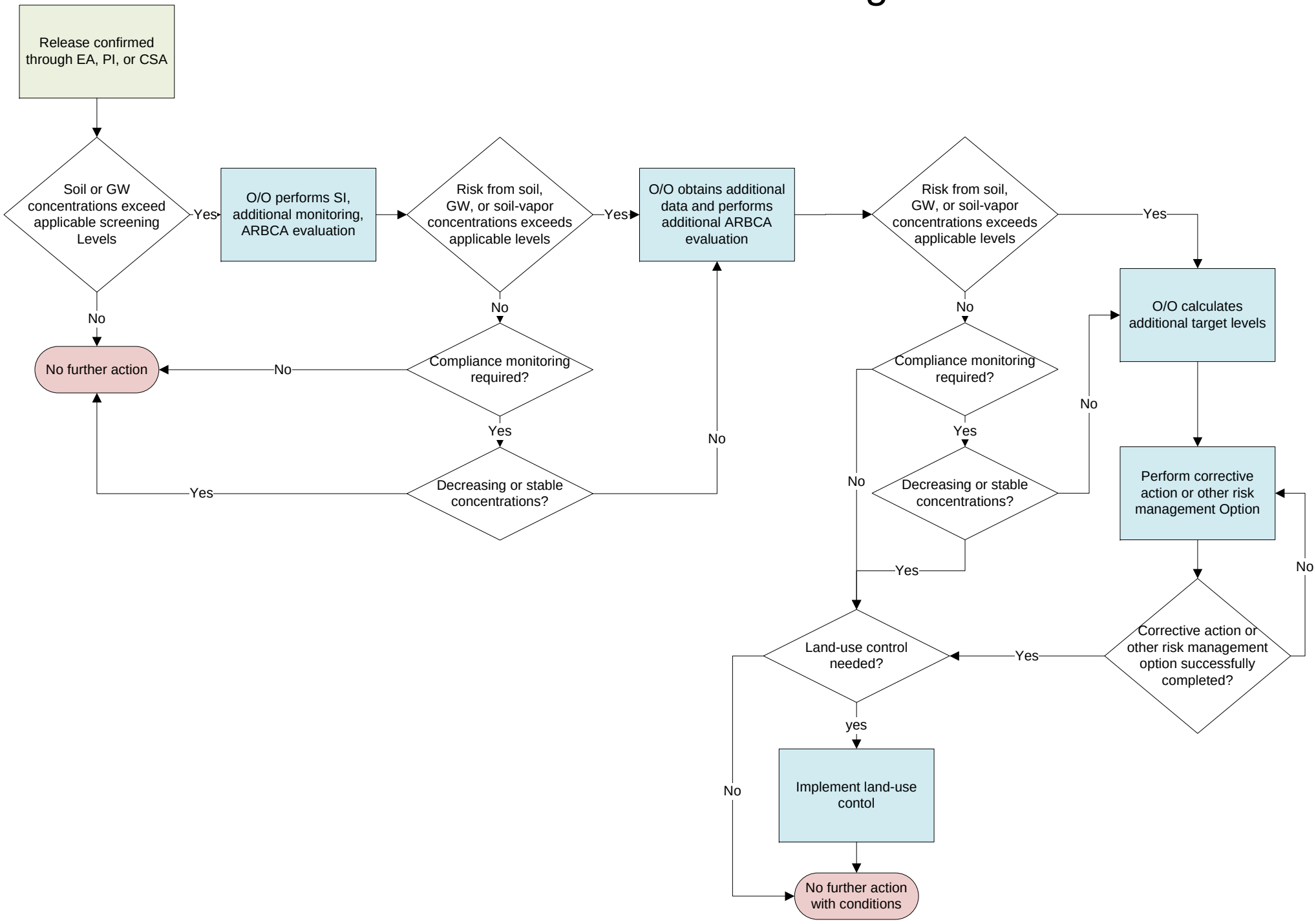
Complete the classification evaluation questions listed above. Upon completion, determine the highest rank of the site (A.1 is the highest rank) based on the statements answered with a yes.

Enter the determined classification ranking:	

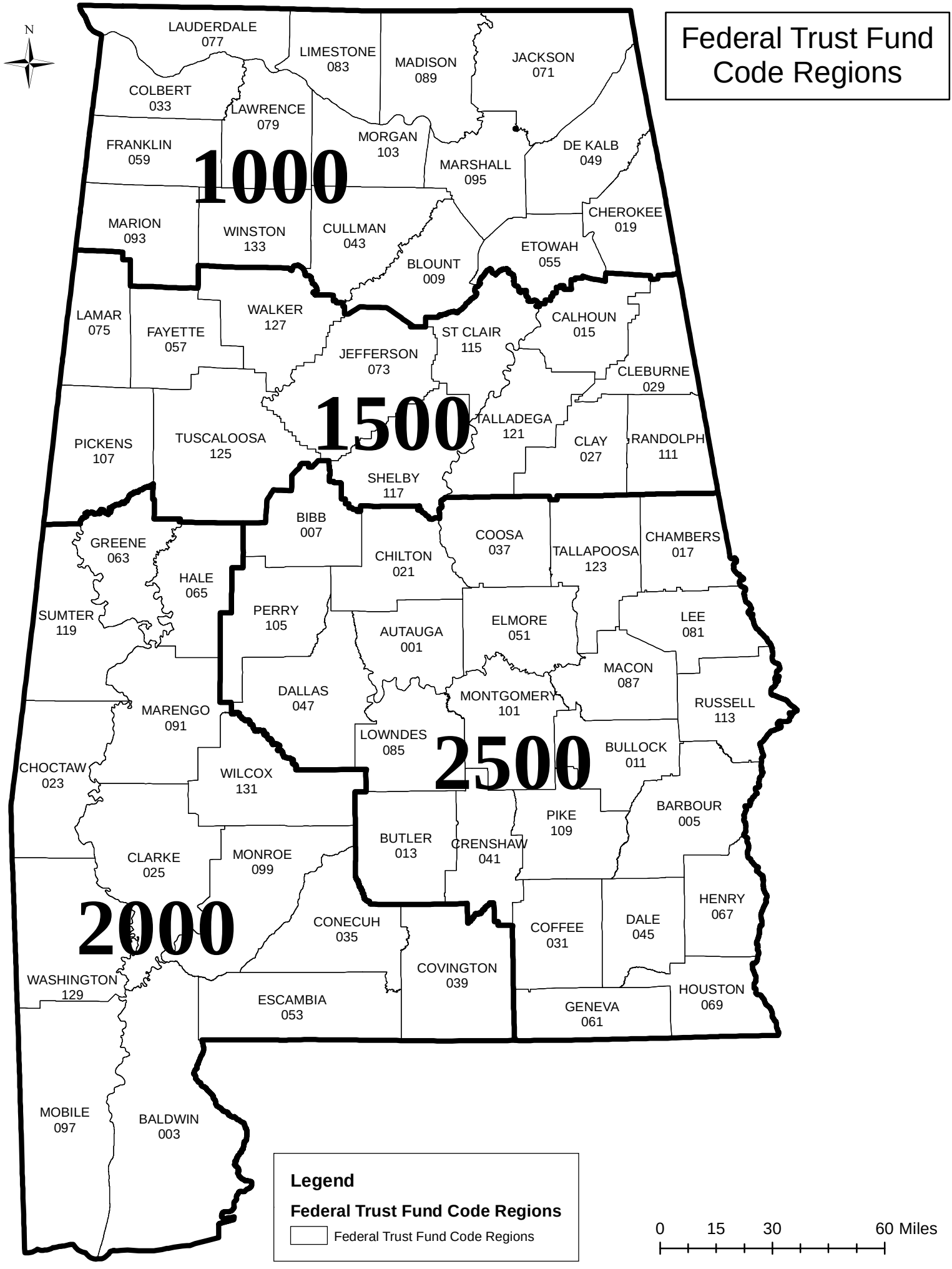
ADEM GROUNDWATER BRANCH
SITE CLASSIFICATION CHECKLIST
(5/8/95)

APPENDIX I: GENERAL UST DECISION MAKING FLOW CHART

Generalized UST Decision Making Flow Chart



APPENDIX J: MAP OF LTF CODE REGIONS


Federal Trust Fund Code Regions
N
LAUDERDALE 077
LIMESTONE 083
MADISON 089
JACKSON 071
COLBERT 033
LAWRENCE 079
FRANKLIN 059
MORGAN 103
MARSHALL 095
DE KALB 049
1000
MARION 093
WINSTON 133
CULLMAN 043
CHEROKEE 019
ETOWAH 055
BLOUNT 009
LAMAR 075
FAYETTE 057
WALKER 127
CALHOUN 015
ST CLAIR 115
JEFFERSON 073
CLEBURNE 029
1500
TALLADEGA 121
PICKENS 107
TUSCALOOSA 125
CLAY 027
RANDOLPH 111
SHELBY 117
BIBB 007
GREENE 063
COOSA 037
CHILTON 021
TALLAPOOSA 123
CHAMBERS 017
HALE 065
SUMTER 119
PERRY 105
ELMORE 051
LEE 081
AUTAUGA 001
MACON 087
DALLAS 047
MONTGOMERY 101
RUSSELL 113
MARENGO 091
LOWNDES 085
2500
BULLOCK 011
CHOCTAW 023
WILCOX 131
PIKE 109
BARBOUR 005
BUTLER 013
CRENSHAW 041
CLARKE 025
MONROE 099
2000
HENRY 067
CONECUH 035
COFFEE 031
DALE 045
COVINGTON 039
WASHINGTON 129
HOUSTON 069
ESCAMBIA 053
GENEVA 061
MOBILE 097
BALDWIN 003
Legend
Federal Trust Fund Code Regions
Federal Trust Fund Code Regions
0 15 30 60 Miles

APPENDIX K: FIELD EQUIPMENT CALIBRATION & MAINTENANCE SCHEDULE

Appendix K: Field Equipment Performance and Maintenance Schedule

Each Use	As Needed	Quarterly, semiannually or annually
Turbidimeter		
Hach 2100P Turbidimeter		
1. Check batteries 2. Check, clean, and coat cells 3. Read secondary standards before each day's run	1. Clean instrument 2. Replace batteries 3. Replace cells 4. Replace lamp	1. Calibrate with Stabl-Cal Standards 2. Re-establish acceptable range for secondary standards
Hach 2100Q Turbidimeter		
1. Verify calibration before each day's run 2. Checkand clean sample cells	1. Replace batteries 2. Replace cells	1. Calibrate with primary standards
DataLogger		
Hydrolab Surveyor 4a		
1. Recharge battery 2. Check barometer reading 3. Create data file 4. Download file	1. Replace battery 2. Replace internal battery 3. Delete old files	1. Calibrate barometer
Mutliprobe DataSonde		
Hydrolab MiniSonde 5		
1. Calibrate DO 2. Check Temperature 3. Calibrate Conductivity 4. Calibrate pH 5. Calibrate Depth	1. Clean instrument 2. Clean probes 3. Replace pH electrolyte 4. Replace pH Teflon junction 5. Request repair if malfunctioning 6. Replace batteries	1. Replace LDO cap

Appendix K: Field Equipment Performance and Maintenance Schedule

Each Use	As Needed	Quarterly, semiannually or annually
Hydrolab Datasonde 4a		
1. Calibrate DO	1. Clean instrument	1. Replace DO membrane
2. Check Temperature	2. Clean probes	2. Replace DO electrolyte
3. Calibrate Conductivity	3. Replace pH electrolyte	
4. Calibrate pH	4. Replace pH Teflon junction	
5. Calibrate Depth	5. Request repair if malfunctioning	
6. Check stirrer	6. Delete old files	
7. Create data file	7. Replace batteries	
8. Download file		
Camera		
1. Check memory card	1. Replace batteries	
2. Check batteries	2. Wipe lens and LCD as needed with soft cloth	
	3. If moisture condensation occurs, turn off camera and wait approximately one hour	
Thermometers		
1. Inspect glass facing	1. Re-calibrate as needed	1. Quarterly calibration checks
2. Calibrated along with sondes	2. Replace when broken	
Water Level Indicator		
1. Check batteries	1. Replace batteries	
GPS		
DeLorme PN-20		
1. Check batteries	1. Replace batteries	
Garmin eTrex Vista HC		
1. Check batteries	1. Replace batteries	

APPENDIX L: FIELD EQUIPMENT AND IN-SITU TESTING INSTRUMENTS LIST

APPENDIX L. ADEM Field Equipment List

Meter Type	Meter Manufacturer Model Type/Number
Nephelometric Turbidimeter	Hach 2100P
	Hach 2100Q
DataLogger	HydroLab Surveryor4a
Multiprobe DataSonde	Hydrolab Minisonde5
	Hydrolab Datasonde4a
Balance, Portable	Adam ST
Water Level Indicator	Slope Indicator 51690015
Camera	Olympus Stylus 780
	Kodak DC200 Plus, DX 3900
	Nikon Coolpix 2000, L18
	Sony DSC-H7
Thermometers	Taylor, Fisher Scientific, Ertco
GPS	DeLorme PN-20
	Garmin eTrex Vista HC

APPENDIX M: FIELD EQUIPMENT ACCURACY AND PRECISION

Appendix Table M: Field Instrument Accuracy and Precision *

Field Equipment Meter	Reportable Accuracy Value	Acceptable Precision Value
pH Meter/Probe	0.1 s.u.	± 0.1 s.u.
Conductivity Meter/Probe (<1000umhos)	10umhos@25°C	± 10%
Conductivity Meter/Probe (≥1000umhos)	100umhos@25°C	± 10%
Dissolved Oxygen Meter/Probe	0.1 mg/L	± 0.2 mg/L
Thermometer (Dial/Probe)	1°C	± 1°C
Turbidity Meter (1.0-10.0 NTU)	0.1 NTU	± 0.1 NTU
Turbidity Meter (10-40 NTU)	1 NTU	± 1 NTU
Turbidity Meter (40-100 NTU)	5 NTU	± 5 NTU
Turbidity Meter (100-400 NTU)	10 NTU	± 10 NTU
Turbidity Meter (400-1000 NTU)	50 NTU	± 50 NTU
Turbidity Meter (≥1000 NTU)	100 NTU	± 100 NTU
Balance (200g)	0.01g	± 0.02g
Balance (250g)	0.01g	± 0.1g
Balance (600g)	0.01g	± 0.1g
Balance (1500g)	0.01g	± 0.2g
Balance (2000g)	1g	± 1g
Balance (5000g)	1g	± 1g
Water Level Indicator	0.01ft	n/a
GPS	<1 m	± 1 ft

* Per instrument manufacturer

APPENDIX N: LIST OF CONSUMABLES

Appendix N: Consumable List

Item Description	Category	Program use description
1" x 10' PVC riser and well screens	Field	well material
10 mL disposable syringes	Field	VOC soil sampling syringe
250 mL plastic bottles (HDPE)	Field	Sampling Bottles
4 oz soil jars	Field	Sampling Bottles
48" soil liners (DT21)	Field	Geoprobe soil sample liners
aluminum foil	Field	aluminum foil
amber 1 liter bottles	Field	Sampling Bottles
amber 40 mL vials with septum lid	Field	Sampling Bottles
bentonite (Hole Plug 3/8")	Field	boring backfill material
bonded polyethylene tubing for GEOTECH pneumatic bladder pumps	Field	small diameter pneumatic pump tubing
compressed gas cylinder (nitrogen) for pneumatic bladder pump controller and Geoprobe hammer gas charge	Equipment	big nitrogen cylinder
deionized/Analyte-free water (Lab)	Field	DI water/Final decon rinse
disposable bailers	Field	Bailers
disposable blue nitrile gloves (x-large)	Field	nitrile gloves

Appendix N: Consumable List

Item Description	Category	Program use description
disposable ear plugs	Field	ear plugs
HAPSITE HSS clear 40 mL vial with septum lid	Field	Sampling Bottles
HAPSITE internal standards gas canisters	Equipment	HAPSITE internal standards
HAPSITE nitrogen carrier gas canisters and extended life cylinder	Equipment	HAPSITE nitrogen carrier gas
inner and outer polyethylene tubing for Geoprobe mechanical bladder pumps	Field	mechanical bladder pump tubing
Isopropyl alcohol (99.9%)	Field	Alcohol rinse
LABELING TAPE WHITE 25MMX55M/RL	General	tape large roll white
Luminox	Field	Decon liquid soap (no isopropyl alcohol rinse required)
Luquinox	Field	Decon liquid soap (isopropyl alcohol rinse required)
paper towels	Field	paper towels
perservatives (HCl, Nitric acid, and NaOH pellets)	Reagent	perservatives
plastic garbage bags	Field	garbage bags
polyethylene sheeting	Field	polyethylene sheeting
Portland cement	Field	Portland cement

Appendix N: Consumable List

Item Description	Category	Program use description
replacement bladders and checkballs for mechanical bladder pumps	Equipment	bladders and checkballs for mechanical bladder pumps
replacement bladders and checkballs for pneumatic bladder pumps	Equipment	bladders and checkballs for pneumatic bladder pumps

APPENDIX P: CONTAINERS, VOLUMES, & PRESERVATIVES BY PARAMETER/METHOD

Containers, Preservation Techniques, Holding Times, and Minimum Sample Volumes for Common Parameters

(Applicable Approved Media-Type/s)[4] are Listed)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Inorganic Field Tests (Water)				
Dissolved Oxygen-Winkler	Glass Bottle & Top	Fix on-site/Store in Dark	8 hrs	
Dissolved Oxygen-Probe	P or G	none required	Analyze immediately	
pH	P or G	none required	Analyze immediately	
Total Residual Chlorine	P or G	none required	Analyze immediately	
Temperature	P or G	none required	Analyze immediately	
Bacterial Tests (SW/WW/GW)				
Fecal Coliform	Sterile 250 mL[3] Polypropylene	Cool, <10°C	8 hrs	240 mL
Fecal Coliform-DST	Sterile 120 mL[3] Plastic	Cool, <10°C	8 hrs	100 mL
Enterococcus (Mobile)	Sterile 250 mL[3] Polypropylene	Cool, <10°C	8 hrs	240 mL
Ecoli	Sterile 120 mL[3] Plastic	Cool, <10°C	8 hrs	100 mL
Inorganic/Misc Tests (SW/WW/GW)	(minimum container size for these tests is a near full 1/4 Gallon Jug)			
Acidity, Total	P or G	Cool, ≤6°C	14 days	100 mL
Alkalinity, Total	P or G	Cool, ≤6°C	14 days	250 mL
Carbon, Total Organic (TOC)	125 mL Amber Glass with Teflon® Lined Septum	Cool, ≤6°C, H_3PO_4 (Phosphoric Acid) to pH <2	28 days	125 mL or 250 mL** (**Collect one 250 mL sample [or 2 x 125 mL] per run for Lab QC.)
Carbon, Dissolved Organic (DOC)	125 mL Amber Glass with Teflon® Lined Septum	Field Filtered; Cool, ≤6°C, H_3PO_4 (Phosphoric Acid) to pH <2	28 days	125 mL or 250 mL** (**Collect one 250 mL sample [or 2 x 125 mL] per run for Lab QC.)
CBOD-5day; BOD-5day	P or G	Cool, ≤6°C	48 hrs	1 L
CBOD-Ultimate; BOD-U	P or G	Cool, ≤6°C	48 hrs	8 L - MGY / 4 L MOB & BHM
Chemical Oxygen Demand (COD)	P or G	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	250 mL
Chloride/Bromide/Fluoride	P or G	None required	28 days	100 mL
Chlorophyll a (collect in ½ gal Plastic Jug)	Glass Fiber Filter / Plastic Petri Dish wrapped in Aluminum foil stored in plastic Zip bag, or Black Plastic Centrifuge Tube	Filter 250-1000 mL on site; Store filter Cool, ≤6°C	21 days at -20°C	Glass Fiber Filter
Color	P or G	Cool, ≤6°C	48 hrs	100 mL
Color, ADMI	P or G	Cool, ≤6°C	48 hrs	500

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Conductivity	P or G	Cool, ≤6°C	28 days	200 mL
Cyanide, Available	P or G	Cool, ≤6°C, Ascorbic acid (if chlorinated), NaOH to pH>12	14 days	2 L
Cyanides, Total	P or G	Cool, ≤6°C, Ascorbic acid (if chlorinated), NaOH to pH>12	14 days	2 L
Oil & Grease	1L Glass; Teflon® lined Screw Cap	Cool, ≤6°C; HCl to pH<2	28 days	1L or 2 x 1L** (**Collect one sample per run in duplicate [2 x 1L] for Lab QC.)
Phenolics, Total Recoverable	Amber Glass	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	1L
Solids, Total Dissolved (TDS)	P or G	Cool, ≤6°C	7 days	1 L (If TSS & TDS only 1 L Needed)
Solids, Total Suspended (TSS)	P or G	Cool, ≤6°C	7 days	1 L
Sulfate	P or G	Cool, ≤6°C	28 days	100 mL
Sulfide, Total	P	Cool, ≤6°C Zinc Acetate + NaOH to pH >9	7 days	500 mL MGY
Turbidity	P or G	Cool, ≤6°C	48 hrs	100 mL (250 mL MOB)
Nutrients (SW/WW/GW)	(The minimum container size for these tests is a near full ¼ Gallon Jug)			
Ammonia Nitrogen (NH3-N)	P or G	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	100 mL
Nitrate-Nitrite Nitrogen (NO3+NO2-N)	P or G	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	100 mL
Nitrite-Nitrogen (NO2-N)	P or G	Cool, ≤6°C	48hrs	100 mL
Nitrate-Nitrogen (NO3-N)	P or G	Cool, ≤6°C	48hrs	100 mL

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
2 – Teflon® is a registered trademark of DuPont Corp. Any similar PTFE product is suitable.
3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
4 – Media Types:
Water – General Water Sample; WW – Waste Water (NPDES), SW – Surface Water (Unless part of a "source-water" study; GW – Ground Water unless part of a "source-water" or "potable water" study; DW – Drinking Water or Potable Water. Method cited in 40CFR 141 / EPA Drinking Water Certification Manual; Waste – appropriate for RCRA/CERCLA analysis; SED– Sediment Samples; Note: Only EPA-approved methods will be used for the matrix of concern
5 – Holding Time - Stated in days unless marked otherwise. A holding time of "Analyze immediately", indicates that the sample is to be analyzed within 15 minutes (40 CFR 136 Table II).
6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Total Kjeldahl Nitrogen (TKN)	P or G	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	100 mL
Total Organic Nitrogen (TON)	Calculated using NH3 & TKN results. Provide 100 mL to conduct both of these analyses			
Total Phosphorus (Total-P)	P or G	Cool, ≤6°C, H_2SO_4 to pH <2	28 days	100 mL
Dissolved Reactive Phosphorus (DRP) (Ortho Phosphate)	PS or G 125 mL	Field Filtered within 15 minutes of Collection, Cool, ≤6°C	48hrs	100 mL
Metals (SW/WW/GW)				
Total Hardness (only)	P or G	HNO_3 to pH <2	180 days 6 Months	100 mL (MGY-30mL)
Total Metals (incl. Hardness)	P or G	HNO_3 to pH <2	180 days 6 Months (except Hg: 28 days)	250 mL (MGY-200mL) (if including Mercury collect 375mL)
Dissolved Metals	P or G	Filter Immediately on site; HNO_3 to pH <2	180 days 6 Months (except Hg: 28 days)	250 mL (MGY-200mL) (if including Mercury collect 375mL)
Mercury (Hg)	P or G	HNO_3 to pH <2	28 days	125 mL (When no other metals are collected)
Hexavalent Chromium (Cr^{+6})	P or G	Cool, ≤6°C	24 hrs	250 mL

Note:

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7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Organics (SW /GW/Liquid Wastes-Not NPDES)				
Atrazine by Immunoassay	60 mL Plastic Screw Cap	Cool, ≤6°C	14 days	5 mL
Pesticides by SW8081A *Organochlorine Pesticides*	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Pesticides by SW8141A *Organophosphorus Compounds*	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Chlorinated Herbicides SM6640B	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
PCBs by SW8082	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
SW8260B (Volatile)	40 mL Amber Glass; Teflon® Septum Screw Cap	Cool, ≤6°C; HCl to pH<2	14 days	3 x 40 mL or 4 x 40 mL** (**Collect one extra bottle per run [40mL] for Lab QC)
SW8270C (Semi-Volatile)	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
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3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
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7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Metals/Cyanides (Sediments/Soils)				
Metals (Sed/Soils)	4 oz. Sediment Jar	Cool, ≤6°C	180 days 6 Months	5 grams (10 grams, if incl. Hg)
TCLP (Sed/Soils)	125 ml or larger Sediment jar	Cool, ≤6°C	180 days 6 Months	125 grams
Cyanide (Sed/Soils)	4 oz. Sediment Jar	Cool, ≤6°C	14 days	30 grams
Organics (Sediments/Soils)				
Chlorinated Herbicides in soil	Contact Central Lab Manager			
PCBs in soil - SW8082	4oz. Wide-mouth Glass Jar with PTFE Septum Lid	Cool, ≤6°C	14 Days	30 grams
Pesticides, Organochlorine in soil - SW8081A	4oz. Wide-mouth Glass Jar with PTFE Septum Lid	Cool, ≤6°C	14 Days	30 grams
Pesticides, Organophosphorus in soil - SW8141A	4oz. Wide-mouth Glass Jar with PTFE Septum Lid	Cool, ≤6°C	14 Days	30 grams
Semi-Volatiles in soil - SW8270C	4oz. Wide-mouth Glass Jar with PTFE Septum Lid	Cool, ≤6°C	14 Days	30 grams
Volatiles in soil – High Level SW8260B *(Lab Container Prep Req'd)*	4-40 mL VOA vials (3 preserved, 1 not preserved)	5 mL Methanol Cool, ≤6°C	14 Days	5 grams
Volatiles in soil – Low Level SW8260B *(Lab Container Prep Req'd)*	4-40 mL VOA vials (3 preserved, 1 not preserved)	1 g Sodium bisulfate 5mL Org.-Free Water Cool, ≤6°C	14 Days	5 grams

Note:

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6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Organics (WW-NPDES)				
Herbicides *Chlorinated Herbicides* *SM6640B*	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Pesticides *Organochlorine Pesticides* *EPA 608*	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Pesticides *Organophosphorus Compounds* *EPA 622*	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Semi-Volatiles EPA 625	1 Liter Amber Glass; Teflon® lined Screw Cap	Cool, ≤6°C	7 Days (Extract: 40 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
Volatiles SM 6200B	40 mL Amber Glass; Teflon® Septum Screw Cap	Cool, ≤6°C; HCl to pH<2	14 days	3 x 40 mL or 4 x 40 mL** (**Collect one extra bottle per run [40mL] for Lab QC)

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
2 – Teflon® is a registered trademark of DuPont Corp. Any similar PTFE product is suitable.
3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
4 – Media Types:
Water – General Water Sample; WW – Waste Water (NPDES), SW – Surface Water (Unless part of a "source-water" study; GW – Ground Water unless part of a "source-water" or "potable water" study; DW – Drinking Water or Potable Water. Method cited in 40CFR 141 / EPA Drinking Water Certification Manual; Waste – appropriate for RCRA/CERCLA analysis; SED– Sediment Samples; Note: Only EPA-approved methods will be used for the matrix of concern
5 – Holding Time - Stated in days unless marked otherwise. A holding time of "Analyze immediately", indicates that the sample is to be analyzed within 15 minutes (40 CFR 136 Table II).
6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
Approved Drinking Water Methods (DW) *(See EPA Manual for the Certification of Laboratories Analyzing Drinking Water - Table IV-6)*				
Chloride	P or G	None required	28 days	100 mL
Total Alkalinity	P or G	Cool, 4°C	14 days	250 mL
TDS	P or G	Cool, 4°C	7 days	1 L (If TSS & TDS only 1 L Needed)
Conductivity	P or G	Cool, 4°C	28 days	200 mL
Nitrate Nitrogen (chlorinated-DW)	P or G	Cool, 4°C	14 days	100 mL
Nitrate Nitrogen (NON-chlorinated-DW)	P or G	Cool, 4°C	48 hrs	100 mL
Nitrite-Nitrogen (NO2-N)	P or G	Cool, ≤6°C	48hrs	100 mL
Total Metals	P or G	HNO_3 to pH <2	180 days 6 Months (except Hg: 28 days)	250 mL (if including Mercury collect 375mL)
Mercury (Hg)	P or G	HNO_3 to pH <2	28 days	125 mL (When no other metals are collected)
Dissolved Reactive Phosphorus (DRP) (Ortho Phosphate)	P or G 125 mL	Field Filtered, Cool, 4°C	48 hrs	100 mL
Fluoride	P	None required	28 days	100 mL
Color	P or G	Cool, 4°C	48 hours	100 mL
Foaming Agents /Surfactants (MBAS)	P or G	Cool, 4°C	48 hours	500 mL
Cyanide	P or G	Cool, 4°C, Ascorbic acid (if chlorinated), NaOH to pH>12	14 days	1L
Sulfate	P or G	Cool, 4°C	28 days	100 mL

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
2 – Teflon® is a registered trademark of DuPont Corp. Any similar PTFE product is suitable.
3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
4 – Media Types:
Water – General Water Sample; WW – Waste Water (NPDES), SW – Surface Water (Unless part of a "source-water" study; GW – Ground Water unless part of a "source-water" or "potable water" study; DW – Drinking Water or Potable Water. Method cited in 40CFR 141 / EPA Drinking Water Certification Manual; Waste – appropriate for RCRA/CERCLA analysis; SED– Sediment Samples; Note: Only EPA-approved methods will be used for the matrix of concern
5 – Holding Time - Stated in days unless marked otherwise. A holding time of "Analyze immediately", indicates that the sample is to be analyzed within 15 minutes (40 CFR 136 Table II).
6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
504.1 EDB /DBCP	Glass with Teflon® Lined Septum	Sodium Thiosulfate (if Chlorinated) Cool, 4°C	14 days (Extract: 4C, 24 hours)	125 mL
508 Chlorinated Pesticides	Glass with Teflon® Lined Cap	Sodium Thiosulfate (if Chlorinated) Cool, 4°C, Dark	7 days (see method for exceptions) (Extract: 14 days)	1 L or 4 x 1L** (**Collect one sample per run in quadruplicate for Lab QC. All other samples can be collected in duplicate to allow a re-analysis.)
515.3 Chlorinated Acids	Amber glass with Teflon® lined cap	Sodium Thiosulfate (if Chlorinated Cool, 4°C, Dark	14 days (Extract: ≤4°C, dark 14 days)	125 mL
524.2 Purgeable Organics	Glass with Teflon® Lined Septum	Ascorbic Acid or Sodium Thiosulfate (if Chlorinated) HCl to pH<2, Cool 4°C	14 days	2 x 40 mL
524.2 THMs	Glass with Teflon® Lined Septum	Ascorbic Acid or Sodium Thiosulfate (if Chlorinated) HCl to pH<2, Cool 4°C	14 days	2 x 40 mL
525.2 Organics	Amber Glass with Teflon® lined cap	Sodium Sulfite (if Chlorinated), Dark, Cool, 4°C HCl to pH<2	14 days (see method for exceptions) (Extract: ≤4C 30 days)	1 L or 3 x 1 L** (**Collect one sample per run in triplicate for Lab QC.)
531.1 N-Methyl Carbamates	Glass with Teflon® Lined Septum	Sodium Thiosulfate (if Chlorinated), Monochloroacetic acid to pH<3, Cool, 4°C	28 days	60 mL
547 Glyphosate	Glass with Teflon® Lined Septum	Sodium Thiosulfate (if Chlorinated) Cool, 4° C	14 days (18 mo. frozen)	60 mL

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
2 – Teflon® is a registered trademark of DuPont Corp. Any similar PTFE product is suitable.
3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
4 – Media Types:
Water – General Water Sample; WW – Waste Water (NPDES), SW – Surface Water (Unless part of a "source-water" study; GW – Ground Water unless part of a "source-water" or "potable water" study; DW – Drinking Water or Potable Water. Method cited in 40CFR 141 / EPA Drinking Water Certification Manual; Waste – appropriate for RCRA/CERCLA analysis; SED– Sediment Samples; Note: Only EPA-approved methods will be used for the matrix of concern
5 – Holding Time - Stated in days unless marked otherwise. A holding time of "Analyze immediately", indicates that the sample is to be analyzed within 15 minutes (40 CFR 136 Table II).
6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

Parameter Name[6]	*Container*[1, 2] p=polyethylene; PS=polystyrene, g=glass	*Preservation*[7]	*Max Holding Time*[5]	*Volume/Weight Required*
548.1 Endothall	Amber Glass with Teflon® Lined Septum	Sodium Thiosulfate If Chlorinated) (HCl to pH 1.5-2 if high biological activity) Cool, 4°C, Dark	7 days (Extract: ≤6C 14 days)	≥ 250 mL
549.2 Diquat & Paraquat	High Density Amber Plastic or Silanized Amber Glass	Sodium Thiosulfate (if Chlorinated), (H_2SO_4 to pH<2 if biologically active) Cool, 4°C, Dark	7 days (Extract: 21 days)	1 L
552.2 Haloacetic Acids	Amber Glass with Teflon® Lined cap	Ammonium chloride (If Chlorinated) Cool, 4°C, Dark	14 days (Extract: ≤6°C, dark 7 days ≤-10°C 14 days	125 mL
Radiation Samples				
Gross Alpha/Gross Beta	P or G	HCl to pH <2	180 days 6 Months	2 L
Radium 226/228	P or G	HCl to pH <2	180 days 6 Months	2 L
Uranium	P or G	HCl to pH <2	180 days 6 Months	2 L
Tritium	G	None	180 days 6 Months	2 L
Iodine-131	P or G	None	8 days	2 L
Cesium 134	P or G	HCl to pH <2	180 days 6 Months	2 L

Note:

1 – Follow ADEM Sample Collection SOPs for specific container pre-cleaning procedures and/or certifications required (ADEM Intranet SOP #s: 2061-2067, 2069, 2100, 2150, 2175, 2350).
2 – Teflon® is a registered trademark of DuPont Corp. Any similar PTFE product is suitable.
3 – Pre-cleaned by lab personnel using laboratory-grade cleaning procedures and autoclaved prior to use or sterile disposable container.
4 – Media Types:
Water – General Water Sample; WW – Waste Water (NPDES), SW – Surface Water (Unless part of a "source-water" study; GW – Ground Water unless part of a "source-water" or "potable water" study; DW – Drinking Water or Potable Water. Method cited in 40CFR 141 / EPA Drinking Water Certification Manual; Waste – appropriate for RCRA/CERCLA analysis; SED– Sediment Samples; Note: Only EPA-approved methods will be used for the matrix of concern
5 – Holding Time - Stated in days unless marked otherwise. A holding time of "Analyze immediately", indicates that the sample is to be analyzed within 15 minutes (40 CFR 136 Table II).
6 – The approved edition, year, or version of the analytical testing methods are provided in the applicable ADEM analytical standard operating procedures
** The collected triplicate or quadruplicate set of samples is needed for the lab to run the required "laboratory QC" spikes and internal duplicate samples. The collection of duplicate samples for these organic analyses allows the lab to re-run a sample to verify a result. Each bottle collected allows the lab one chance to analyze the sample. Critical samples should always be collected in duplicate.

7 – Preserve (temperature and/or chemical) each grab sample within 15 minutes of collection (40CFR 136.3 Table II)

APPENDIX Q: LABORATORY EQUIPMENT CALIBRATION AND MAINTENANCE SCHEDULE

APPENDIX Q. LAB EQUIPMENT PERFORMANCE AND MAINTENANCE SCHEDULE

Each Use	As Needed	Quarterly, Semiannually, or Annually

BIRMINGHAM LAB

A. Agilent ICP-MS 7700

Each Use	As Needed	Quarterly, Semiannually, or Annually
1. Check pump tubing	1. Change tubing	1. Schedule preventive maintenance
2. turn recirculating chiller on	2. Clean torch and sample introduction system	2. Clean cooling system
3. turn plasma on	3. Clean filters	3. Replace argon filter
4. Calibrate instrument	4. Change oil	
5. Run performance standards		

B. Perkin Elmer Analyst 600 Atomic Absorption Spectrometer

Each Use	As Needed	Quarterly, Semiannually, or Annually
1. Clean area	1. Replace graphite tubes	1. Schedule preventative maintenance
2. Fill rinse bottles	2. Replace contact cylinders	2. Replace air filters
3. Check autosampler tubing	3. Clean furnace windows	3. Oil pump
4. Check water level in cooling system	4. Replace fume extractor	
5. Optimize lamp energy	5. Replace sample capillary	
6. Calibrate instrument	6. Empty waste container	
7. Run performance standard	7. Change air filter	
8. Check fume extraction unit		
9. Check furnace windows are clean		
10. Check gas pressure		
11. Run standards, blanks, samples, and QC		

C. Perkin Elmer Optima 3300 DV-ICP

Each Use	As Needed	Quarterly, Semiannually, or Annually
1. Change pump tubing	1. Replace argon	1. Schedule preventive maintenance
2. Check torch alignment	2. Clean torch and sample introduction system	2. Clean cooling system
3. Check nebulizer	3. Clean filters	3. Replace argon filter
4. Optimize source	4. Replace O-rings	
5. Calibrate instrument		
6. Run performance standards		

APPENDIX Q. LAB EQUIPMENT PERFORMANCE AND MAINTENANCE SCHEDULE

Each Use	As Needed	Quarterly, Semiannually, or Annually
	MOBILE LAB	
A. Agilent ICP-MS		
1. Check argon supply	1. Inspect sampling cone and skimmer cone	1. Schedule preventative maintenance
2. Check wast containers	2. check foreline pump	2. Clean/replace spray chamber
3. Check peri pump tubing	3. Perform nebulizer test	3. Clean/ replace torch
4. Check rise bottle	4. Inspect shield contact	4. Inspect argon gas filter
4. Check enternal std	5. Check cooling water	5. Change oil in forline pumps
5. Tune instrument	6. Check extraction /omega lens	
6. Calibrate instrument	7. Change pump tubing	
7. Run performance standards		
B. Hach DR 5000 Spectrophotometer		
1. Clean after each use	1. Replace lamps as needed	1. N/A
C. Leeman Labs PS 1000 ICP		
1. Change pump tubing	1. Replace argon	1. Schedule preventive maintenance
2. Check torch alignment	2. Clean torch and sample introduction system	2. Clean cooling system
3. Check nebulizer	3. Clean filters	3. Replace argon filter
4. Optimize source	4. Replace O-rings	
5. Calibrate instrument	5. Change pump tubing	
6. Run performance standards		

APPENDIX Q. LAB EQUIPMENT PERFORMANCE AND MAINTENANCE SCHEDULE

Each Use	As Needed	Quarterly, Semiannually, or Annually
	MONTGOMERY LAB	
A. Agilent 5973 GC/MS		
1. Calibrate ion abundance 2. Check all instrument parameters 3. Run performance standard 4. Check DFTPP or BFB, CCC, and SPCC	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Change gas cylinders, septa, and columns 4. Clean ion source 5. Clean injection port 6. Replace filament and multiplier	1. Schedule preventive maintenance visit(s) 2. Check air filter 3. Check pump and vacuum oil
B. Agilent 6890 Gas Chromatograph with Dual ECD Detectors, Dual Autosamplers and Data Station		
1. Check all instrument parameters 2. Run standards, blanks, samples, and QC	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Change gas cylinders, septa, and columns 4. Clean injection port	1. Perform leak test on Ni-63 detectors semiannually
C. Agilent 7700 Series ICP/MS		
1. Check pump tubing for wear 2. Check flow in tubing 3. Check argon 4. Run performance checks 5. Tune instrument 6. Make calibration standards 7. Calibrate instrument	1. Replace argon 2. Clean torch 3. Change pump tubing 4. Clean cones 5. Change oil 6. Make tuning solutions, rinse ,internal standard 7. Empty waste bottle	1. Schedule preventative maintenance 2. Clean cooling system
D. Agilent 7890A Gas Chromatograph (FID, ECD) with Data Station		
1. Check all instrument parameters 2. Run standards, blanks, samples, and QC	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Change gas cylinders, septa, and columns 4. Clean injection port 5. Perform routine maintenance on FID and NPD detectors	1. Perform leak test on Ni-63 detectors semiannually

APPENDIX Q. LAB EQUIPMENT PERFORMANCE AND MAINTENANCE SCHEDULE

Each Use	As Needed	Quarterly, Semiannually, or Annually
E. Agilent 7890A Gas Chromatograph with Dual ECD Detectors, Dual Autosamplers and Data Station		
1. Check all instrument parameters 2. Run standards, blanks, samples, and QC	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Change gas cylinders, septa, and columns 4. Clean injection port	1. Perform leak test on Ni-63 detectors semiannually
F. Hach DR5000		
1. Check all instrument parameters 2. Run standards, blanks, samples, references, duplicates, and spikes 3. Clean optical cells	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Perform routine maintenance 4. Replace lamps and bulbs	1. N/A
G. Hewlett Packard 5972 GC/MS		
1. Calibrate ion abundance 2. Check all instrument parameters 3. Run performance standard 4. Check BFB, CCC, and SPCC	1. Dust and clean instrument 2. Request repair if malfunctioning 3. Change gas cylinders, septa, and columns 4. Clean ion source 5. Clean injection port 6. Replace filament and multiplier 7. Clean injection port 8. Replace filament and multiplier	1. Schedule preventive maintenance visit(s) 2. Check air filter 3. Check pump and vacuum oil
H. Leeman Labs Profile ICP		
1. Change pump tubing 2. Check torch alignment 3. Check nebulizer 4. Optimize source 5. Calibrate instrument 6. Run performance standards	1. Replace argon 2. Clean torch and sample introduction system 3. Clean filters 4. Replace O-rings	1. Schedule preventive maintenance visit(s) 2. Clean cooling system 3. Replace argon filter

APPENDIX Q. LAB EQUIPMENT PERFORMANCE AND MAINTENANCE SCHEDULE

Each Use	As Needed	Quarterly, Semiannually, or Annually

I. Perkin Elmer Analyst 600 Atomic Absorption Spectrometer

Each Use	As Needed	Quarterly, Semiannually, or Annually
1. Clean area	1. Replace graphite tubes	1. Schedule preventative maintenance
2. Fill rinse bottles	2. Replace contact cylinders	2. Replace air filters
3. Check autosampler tubing	3. Clean furnace windows	3. Oil pump
4. Check water level in cooling system	4. Replace fume extractor	
5. Optimize lamp energy	5. Replace sample capillary	
6. Calibrate instrument	6. Empty waste container	
7. Run performance standard	7. Change air filter	
8. Check fume extraction unit		
9. Check furnace windows are clean		
10. Check gas pressure		
11. Run standards, blanks, samples, and QC		

J. Perkin Elmer Model 4100ZL Zeeman Atomic Absorption Spectrometer

Each Use	As Needed	Quarterly, Semiannually, or Annually
1. Clean area	1. Replace graphite tubes	1. Schedule preventive maintenance visit(s)
2. Fill rinse bottles	2. Replace contact cylinders	2. Replace air filters
3. Check autosampler tubing	3. Clean furnace windows	3. Oil pump
4. Check water level in cooling system	4. Replace fume extractor	
5. Optimize lamp energy	5. Replace sample capillary	
6. Calibrate instrument	6. Empty waste container	
7. Run performance standard	7. Change air filter	
8. Check fume extraction unit		
9. Check furnace windows are clean		
10. Check gas pressure		
11. Run standards, blanks, samples, and QC		

APPENDIX R: LIST OF CHEMICALS

Appendix R: Consumable Reagents List for the ADEM Field Operations Division

Chemical Name	Chemical Information	Storage	Grade
0.5% Starch Sol'n	aqueous sol'n	Refrigerator	Laboratory/ACS Certified
90% Reagent Grade Alcohol	aqueous sol'n	Flammable Storage Container	Laboratory/ACS Certified
95% Ethyl Alcohol	aqueous sol'n	Refrigerator	Laboratory/ACS Certified
Acetate	n/a	Exhaust Hood	Laboratory/ACS Certified
Acetone	aqueous sol'n	Chemical Cabinet	Laboratory/ACS Certified
Aldex (concentrate)	neutralizes Formaldyhyde	Exhaust Hood	Laboratory/ACS Certified
Alkaline Iodide Azide	AIA	Cool, Dry Place	Laboratory/ACS Certified
AMCO-NTU Standards	Turbidity Std Sol'n	Cool, Dry Place	Laboratory/ACS Certified
Ammonium Chloride	NH_4Cl	Chemical Cabinet	Laboratory/ACS Certified
Ammonium Hydroxide (in hood)	NH_4OH	Exhaust Hood	Laboratory/ACS Certified
Amyl Alcohol	$CH_3(CH_2)_3CH_2OH$	Chemical Cabinet	Laboratory/ACS Certified
Bacto Agar	n/a	Cool, Dry Place	Laboratory/ACS Certified
Bacto-Crystal Violet (microbio. Culture media)	n/a	Cool, Dry Place	Laboratory/ACS Certified
Boric Acid	H_3BO_3	Chemical Cabinet	Laboratory/ACS Certified
Bromothymol Blue	Sodium salt	Cool, Dry Place	Laboratory/ACS Certified
Calcium Carbonate	$CaC0_3$	Chemical Cabinet	Laboratory/ACS Certified
Calcium Chloride	$CaCl_2$-$2H_20$	Chemical Cabinet	Laboratory/ACS Certified
Calcium Chloride	$CaCl_2$ Drying Desiccant	Chemical Cabinet	Laboratory/ACS Certified
Calcium Sulfate	$CaSO_4$	Chemical Cabinet	Laboratory/ACS Certified
Carbon TetraChloride	CCl_4	Cool, Dry Place	Laboratory/ACS Certified
Cello-Seal	grease	Chemical Cabinet	Laboratory/ACS Certified
CMC-10	Slide Prep Reagent	Cool, Dry Place	Laboratory/ACS Certified
Cobalt Chloride	$CoCl_2$-$6H_20$	Chemical Cabinet	Laboratory/ACS Certified
Cotton Blue	n/a	Cool, Dry Place	Laboratory/ACS Certified
Coulter Clenz	Sol'n of Proteolytic Enzyme	Cool, Dry Place	Laboratory/ACS Certified
Cupric Chloride	$CuCl_2$-$2H_20$	Chemical Cabinet	Laboratory/ACS Certified
d-Biotin (vitamin H)	$C_{10}H_{16}N_2O_3S$	Refrigerator	Laboratory/ACS Certified
DeNatured ETOH	unmarked Conc.--assuming 100%	Chemical Cabinet	Laboratory/ACS Certified
Disodium Ethylenediamine Tetraacetate	EDTA ($Na_2C_{10}H_{14}O_8N_2$-$2H_20$)	Chemical Cabinet	Laboratory/ACS Certified
EC Medium	n/a	Chemical Cabinet	Laboratory/ACS Certified
Eriochrome Black T	water-soluble Indicator	Chemical Cabinet	Laboratory/ACS Certified
Ferric Chloride	$FeCl_3$-$6H_20$	Chemical Cabinet	Laboratory/ACS Certified
Fluorescent Dye Tablets	n/a	Cool, Dry Place	Laboratory/ACS Certified
Fluorescin Indicator	$C_{20}HNa_2O_5$	Cool, Dry Place	Laboratory/ACS Certified
Formaldyhyde (in hood)	37% sol'n	Exhaust Hood	Laboratory/ACS Certified
Hexanes		Chemical Cabinet	Laboratory/ACS Certified
HydroChloric Acid	HCl	Exhaust Hood	Laboratory/ACS Certified
HydroChloric Acid (in acid cabinet)	HCl	Chemical Cabinet	Laboratory/ACS Certified
Hypochlorite (bleach)	100% stock	Cool, Dry Place	Laboratory/ACS Certified
Hypochlorite (bleach)	100%	Cool, Dry Place	Laboratory/ACS Certified
IntraAcid Rhodamine	n/a	Cool, Dry Place	Laboratory/ACS Certified
Iodine-Free Sodium Chloride	NaCl (table salt)	Cool, Dry Place	Laboratory/ACS Certified
IsoTon	Salt Sol'n (Coulter Counter Sol'n)	Cool, Dry Place	Laboratory/ACS Certified
L-Ascorbic Acid	$CH_2OHCHOHCHCOH$:$COHCOO$	Chemical Cabinet	Laboratory/ACS Certified
Lauryl Tryptose Broth	n/a	Chemical Cabinet	Laboratory/ACS Certified
Lite Soda Ash	Na_2CO_3	Cool, Dry Place	Laboratory/ACS Certified
Magnesium Chloride	$MgCl_2$-$6H_20$	Chemical Cabinet	Laboratory/ACS Certified
Magnesium Sulfate Heptahydrate	$MgSO_4$-$7H_20$	Chemical Cabinet	Laboratory/ACS Certified
Manganese Chloride	$MnCl_2$-$4H_20$	Chemical Cabinet	Laboratory/ACS Certified
Manganous Sulfate	$MnSO_4$	Chemical Cabinet	Laboratory/ACS Certified
Manganous Sulfate	$MnSO_4$	Cool, Dry Place	Laboratory/ACS Certified
Methyl Red (Sodium Salt)	water-soluble Indicator	Chemical Cabinet	Laboratory/ACS Certified
mFC Broth Base	n/a	Chemical Cabinet	Laboratory/ACS Certified
Nitric Acid (in acid cabinet)	HNO_3	Acid Cabinet	Laboratory/ACS Certified
Otolith Preservation (Glycerin:RGA mix)	2:1 ratio Glycerol:RGA	Exhaust Hood	Laboratory/ACS Certified
PerMount	Slide Prep Reagent	Chemical Cabinet	Laboratory/ACS Certified

Appendix R: Consumable Reagents List for the ADEM Field Operations Division

Chemical Name	Chemical Information	Storage	Grade
Pesticide Grade 2-Propanol		Flammable Storage Container	Pesticide Grade
pH Buffers	4.00, 7.00, 10.01	Cool, Dry Place	Laboratory/ACS Certified
Phenolphthalin	$HOCOC_6H_4CH(C_6H_4\text{-}4\text{-}OH)_2$	Flammable Storage Container	Laboratory/ACS Certified
Potassium Bilodate	$KH(IO_3)_2$	Chemical Cabinet	Laboratory/ACS Certified
Potassium Bilodate	0.0375N $KH(IO_3)_2$	Cool, Dry Place	Laboratory/ACS Certified
Potassium Chloride	KCl	Chemical Cabinet	Laboratory/ACS Certified
Potassium Chloride saturated w/ AgI	pH Electrode sol'n	Chemical Cabinet	Laboratory/ACS Certified
Potassium Chloride Sol'n	74.56g/L	Cool, Dry Place	Laboratory/ACS Certified
Potassium Iodide	KI	Chemical Cabinet	Laboratory/ACS Certified
Potassium Iodide	KI	Chemical Cabinet	Laboratory/ACS Certified
Potassium Permanganate	$KMnO_4$	Chemical Cabinet	Laboratory/ACS Certified
Potassium Phosphate Dibasic	K_2HPO_4	Chemical Cabinet	Laboratory/ACS Certified
Potassium Phosphate Monobasic	KH_2PO_4	Chemical Cabinet	Laboratory/ACS Certified
Reagent Grade Alcohol (RGA)	aqueous sol'n	Flammable Storage Container	Laboratory/ACS Certified
Rhodanine	$C_3H_3NOS_2$	Cool, Dry Place	Laboratory/ACS Certified
Rosalic Acid (pwdr)	n/a	Chemical Cabinet	Laboratory/ACS Certified
Safranin O (microbio. Culture media)	n/a	Cool, Dry Place	Laboratory/ACS Certified
Salicylic Acid	$HC_7H_50_3$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Azide	NaN_3	Chemical Cabinet	Laboratory/ACS Certified
Sodium Bicarbonate	$NaHCO_3$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Borate	$Na_2B_40_7\text{-}10H_20$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Carbonate	Na_2C0_3	Chemical Cabinet	Laboratory/ACS Certified
Sodium Chloride	NaCl	Chemical Cabinet	Laboratory/ACS Certified
Sodium Hydroxide	NaOH	Chemical Cabinet	Laboratory/ACS Certified
Sodium Hydroxide	NaOH	Chemical Cabinet	Laboratory/ACS Certified
Sodium Iodide	NaI	Chemical Cabinet	Laboratory/ACS Certified
Sodium Molybdate	$NaMoO_4\text{-}2H_20$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Nitrate	$NaNO_3$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Thiosulfate (solid)	$Na_2S_2O_3\text{-}5H_20$	Chemical Cabinet	Laboratory/ACS Certified
Sodium Thiosulfate (working titrant)	0.0375N $Na_2S_2O_3\text{-}5H_20$	Chemical Cabinet	Laboratory/ACS Certified
StabalCal (stablized Formazin)	<0.1, 20, 100, & 800 NTUs	Exhaust Hood	Laboratory/ACS Certified
Starch Soluble	$C_6H_{10}O_5$	Chemical Cabinet	Laboratory/ACS Certified
Sulfuric Acid (in acid cabinet)	H_2SO_4	Acid Cabinet	Laboratory/ACS Certified
Thiamine	$C_{12}H_{17}ClN_4OS\text{-}HCl$	Chemical Cabinet	Laboratory/ACS Certified
Tryptone Glucose Extract Agar	n/a	Chemical Cabinet	Laboratory/ACS Certified
Vitamin B_{12}	n/a	Refrigerator	Laboratory/ACS Certified
Zinc Acetate	$Zn(C_2H_3O_2)_2\text{-}2H_2O$ (in sol'n)	Chemical Cabinet	Laboratory/ACS Certified
Zinc Acetate	$Zn(C_2H_3O_2)_2\text{-}2H_2O$	Chemical Cabinet	Laboratory/ACS Certified
Zinc Chloride	$ZnCl_2$	Chemical Cabinet	Laboratory/ACS Certified

All chemical reagents are obtained through the ADEM FOD Procurement Officer. Storage, Handling, and Disposal of any other aforementioned chemical reagents follows MSDS guidelines set forth for each specific chemical reagent.

APPENDIX S: ADEM UST CORRECTIVE ACTION SECTION SITE INSPECTION LOG

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

UNDERGROUND STORAGE TANK SITE INSPECTION LOG
UST CORRECTIVE ACTION SECTION

SITE INFORMATION:

DATE OF INSPECTION:		Time of Arrival at Site:	
		Time of Departure From Site:	

SITE NAME:	
SITE ADDRESS:	
CITY/COUNTY:	
FACILITY I.D. NUMBER:	
UST INCIDENT NUMBER:	

PURPOSE OF SITE INSPECTION: *(Check all that apply)*

GPS LOCATION:	☐	SITE STATUS/DETERMINE COMPLETION OF SCOPE OF WORK:	☐
SAMPLING:	☐	COMPLAINT:	☐
EMERGENCY RESPONSE:	☐	OTHER: *(Describe)*	☐

SUMMARY OF INSPECTION FINDINGS: *(Attach additional pages and maps as needed)*

Residential Property adjacent to release site? (Circle One) YES NO

Residential Property located within 300 ft of release site? (Circle One) YES NO

SIGNATURES:

Signature of ADEM Representative:	Signature of Site Representative:

APPENDIX T: ON-SITE SAMPLE COLLECTION AUDIT CHECKLIST

LTF ON-SITE SAMPLE COLLECTION AUDIT CHECKLIST

LTF Contractor Company:

Date/Location:

Observation: Time Start: **Time Completed:**

	Project Preparation			
1	Were all sampling equipment, forms, and sample containers properly prepared and available?	Y	N	N/A
2	Was acid stored properly?	Y	N	N/A
3	Were sample containers packaged to avoid contamination during travel?	Y	N	N/A
	Field Parameter Integrity			
4	Was all equipment calibrated using SOP or manufacturer's specification?	Y	N	N/A
5	Were calibration results documented adequately in a meter calibration logbook/database?	Y	N	N/A
6	Were calibration standards used within their expiration date(s)?	Y	N	N/A
7	Were field parameter readings taken at the proper location?	Y	N	N/A
8	Were the readings recorded after they had stabilized?	Y	N	N/A
9	Were all probes properly stored between wells?	Y	N	N/A
	Water Level Measurements			
10	Was measuring device properly cleaned before use?	Y	N	N/A
11	Was a point of reference for measurement used in each well?	Y	N	N/A
12	Was the cord/string attached to device cleaned before use?	Y	N	N/A
13	Was depth to groundwater and total depth of well measured?	Y	N	N/A
	Sample Integrity			
14	Were samples collected from the proposed locations?	Y	N	N/A
15	Was the integrity of the sampling containers maintained?	Y	N	N/A
	General Surface Water Sampling/Sample Handling			
16	Were samples collected in the proper location?	Y	N	N/A
17	Was the sampling container positioned properly during collection?	Y	N	N/A
18	Were the surface water samples collected properly?	Y	N	N/A
19	Was each water sample labeled properly?	Y	N	N/A
20	Were proper containers utilized?	Y	N	N/A
21	Were samples properly preserved for appropriate analysis?	Y	N	N/A
22	Were samples properly iced to allow for cooling to or below 4℃?	Y	N	N/A
23	Was sample custody properly maintained?	Y	N	N/A
	Monitoring Well Purging			
24	Was each monitoring well property purged?	Y	N	N/A
25	Was purge information properly recorded in a logbook/form?	Y	N	N/A

	General Groundwater Sampling/Sample Handling			
26	Were groundwater sample locations collected in the proper order?	Y	N	N/A
27	Were the groundwater samples collected properly?	Y	N	N/A
28	Was each water sample labeled properly?	Y	N	N/A
29	Were proper containers utilized?	Y	N	N/A
30	Were the groundwater samples collected in the proper order?	Y	N	N/A
31	Were samples properly preserved for appropriate analysis?	Y	N	N/A
32	Were samples properly iced to allow for cooling to or below 4℃?	Y	N	N/A
33	Was sample custody properly maintained?	Y	N	N/A
	Soil Borings			
34	Were borings installed in the proposed locations?	Y	N	N/A
35	Were borings installed using an acceptable drilling method ?	Y	N	N/A
36	Was boring log information properly recorded in a logbook/form?	Y	N	N/A
	General Soil Sampling/Sample Handling			
37	Were the soil samples collected properly?	Y	N	N/A
38	Was each soil sample labeled properly?	Y	N	N/A
39	Were proper containers utilized?	Y	N	N/A
40	Were soil samples collected in the proper order?	Y	N	N/A
41	Were samples properly preserved for appropriate analysis?	Y	N	N/A
42	Were samples properly iced to allow for cooling to or below 4℃?	Y	N	N/A
43	Was sample custody properly maintained?	Y	N	N/A
	Waste Management			
44	Was purge water managed properly?	Y	N	N/A
45	Were soil cuttings/stockpiles/containerized materials managed properly?	Y	N	N/A
46	Were samples from the soil cuttings/stockpiles/containerized materials collected properly?	Y	N	N/A
47	Were consumable materials used on-site disposed of properly?	Y	N	N/A
	Field Documentation			
48	Was the paperwork completed?	Y	N	N/A
49	Were corrections completed using QAPP specifications?	Y	N	N/A
50	Were all times listed on the field form/logbook?	Y	N	N/A
51	Were all collectors documented on the field form/logbook?	Y	N	N/A
52	Was the COC complete and accurate?	Y	N	N/A
	Quality Control Measures			
53	Was the replicate sample collected using procedures documented in the SOP or QAPP?	Y	N	N/A
54	Was the trip blank created using procedures documented in the SOP or QAPP?	Y	N	N/A
55	Was the field blank collected using procedures documented in the SOP or QAPP?	Y	N	N/A

Findings/Comments

LTF Contractor
Signature:_____Date_____

LTF Contractor
Printed Name: _____

ADEM Program
Auditor Signature: _____Date_____

ADEM Program
Auditor Printed Name: _____

APPENDIX V: PROJECT STATUS REPORT TEMPLATE

Note to Contractors and those using this Monthly Project Status Report Template:

1. Once the report template is completed, DELETE THESE INSTRUCTIONS
2. Instructions for filling in this template are in red. **Anything in red should be deleted out of the template when finalized.**
3. Refer to the ADEM QAPP (especially section C2) for guidance as this monthly report is prepared.
4. The purpose of this monthly report is to provide information to ADEM on the activities recently performed during the previous month, work scheduled/planned to be performed, and to include any brief recommendations on future work activities.
5. For help with completing this monthly report, please contact the ADEM Project Manager or ADEM Program Manager.
6. A monthly report is to be provided for each site which has received a work order during the current 2-year contract period. A cover letter should be submitted identifying the report submittal with the individual reports attached.
7. The status report should be limited to 1-2 pages with additional photos or maps as appropriate.
8. Reports are due to ADEM by the 7th day of the following month.
9. Each report for each site should be signed by the LTF project manager and Senior Management representative.

Monthly Project Status Report
for the
Underground Storage Tank LTF Program
In Alabama

LTF Site Name: _____
LTF Site Number: _____
LTF Site Address, City, County: _____
_____
_____

Reporting Month: _____

Prepared by: Contractor Firm Information

Date Prepared:

Place LTF project manager title here Date

Place LTF Contractor senior management title here Date

Monthly Status Report for ADEM LTF Site

Site Number

Current Project Status:

Activities Conducted:

Describe activities conducted during the previous month at this site

Issues Addressed:

Describe issues that have arisen and the corrective action measures taken to correct deficiencies. Include sample handing that deviated from the requirements in the quality documents.

Waste Handling:

Describe any monitoring or investigative waste being maintained on the site and how that waste is secured

Planned Activities:

Describe the activities and their schedule which are planned over the upcoming months as part of the approved work order

Anticipated Changes:

Discuss any changes to the anticipated monitoring/investigation reporting date

APPENDIX X: CONTRACTOR VERIFICATION CHECKLIST

Contractor Verification Checklist

For each monitoring/investigation report submitted to the UST Corrective Action Section, the LTF Contractor will be required to verify that all data elements for the required scope of work have been provided. For items not required for the scope of work, the "N/A" box should be checked. For items required and not completed or provided, the "No" box should be checked and a thorough description of the reason must be provided in an attachment. For "Yes" responses, the "Yes" box should be checked. Provide the page number on which the information is located in the report in the "Report Page #" area.

Item #	Item	Yes	Report Page #	No	N/A
Cover Page					
1	Are the LTF Contractor Company's Name, Address, and telephone number provided?				
Section A					
2	Are the signatures, license numbers/seal provided, as required, for the PG and/or PE, as appropriate?				
3	Are the name, address, and telephone number of the well driller that installed borings/monitoring wells provided?				
4	Are the name, address, and telephone number of the laboratory(ies) performing analytical analyses provided?				
5	Are the names, roles, and contact information of personnel who performed various activities provided?				
6	Is the site name, address, Facility I.D. Number, UST Release Incident Number, and LTF Site Number provided?				
7	Is UST Owner/Operator name, address, and phone number provided?				
8	Are the current and adjacent property owners' names, addresses, and phone numbers provided?				
9	Is the site history provided?				
10	Is the site classification discussed?				
11	Is the site description included, along with the locational coordinates?				
12	Are explanations for any deviations from the site-specific Study Plan, including missing or incomplete data, provided?				
13	Are the qualifications of personnel who performed various activities provided?				
Section B					
14	Is the sample information detailed including COPCs/COCs?				
15	Are the data collection dates provided?				
16	Are the procedures for obtaining locational data provided?				
17	Is the soil sample collection method included?				
18	Is the soil sample preservation information included?				

Item #	Item	Yes	Report Page #	No	N/A
19	Is the field screening methodology and procedure detailed or referenced?				
20	Is the soil drilling method and rig information included?				
21	Is the groundwater sample collection method included?				
22	Is the groundwater sample preservation information included?				
23	Is the groundwater measurement procedures included?				
24	Is the groundwater purging methodology detailed?				
25	Is the water well sample collection method included?				
26	Is the water well sample preservation information included?				
27	Is the water well purging methodology detailed?				
28	Is the surface water sample collection method included?				
29	Is the surface water sample preservation information included?				
30	Are the surface water sampling containers described?				
31	Are the field measurement methods included?				
32	Are the methods used to determine total well depth and depth to groundwater included?				
33	Are the contract laboratories listed and are any applicable certifications included?				
34	Is field equipment information included?				
35	Are the sample handling and chain-of-custody procedures included?				
36	Are the sample transportation procedures included?				
37	Are the constituents, analytical methods, and MDLs included?				
38	Are the field QC samples discussed?				
39	Are field corrective actions discussed?				
40	Are lab corrective actions discussed?				
41	Is field equipment maintenance discussed?				
42	Is field equipment calibration discussed?				
43	Are the field supplies and consumables used included?				
44	Are non-direct measurements addressed?				
45	Are observations of site conditions that may introduce variability documented?				
46	Are the data entry QC efforts described, including thenames of individuals who conducted the peer-review of data tables?				

Item #	Item	Yes	Report Page #	No	N/A
47	Is the regional and site geology and hydrogeology described?				
48	Are the receptor survey results to include water wells, land use, and surface water bodies provided as required?				
49	Is the current use of the site and adjacent land described?				
50	Are the soil boring dates included?				
51	Are the field screening measurement dates included?				
52	Is the soil type described?				
53	Are the field screening results described?				
54	Are soil data discussed?				
55	Are the soil boring locational coordinates provided?				
56	Are the soil cuttings handling, storage, and disposal procedures provided?				
57	Are the monitoring well installation and development dates provided?				
58	Is the procedure of well development detailed?				
59	Is justification provided for the locations of the monitoring wells?				
60	Are the monitoring well locational coordinates provided?				
61	Is the monitoring well drilling method and rig information included?				
62	Are the well specifications discussed?				
63	Are the depths to groundwater for all wells discussed?				
64	Are current and historical depths discussed?				
65	Is the flow direction and groundwater gradient discussed?				
66	Are the groundwater sample collection and measurement dates included?				
67	Are groundwater analytical data, measurements, and purged water information discussed?				
68	Are purged water handling, storage, and disposal procedures provided?				
69	Are the water well sample collection dates included?				
70	Is the volume of purged water or elapsed time discussed?				
71	Are the water well locational coordinates provided?				
72	Are water well analytical data discussed?				
73	Are the surface water sample collection dates included?				

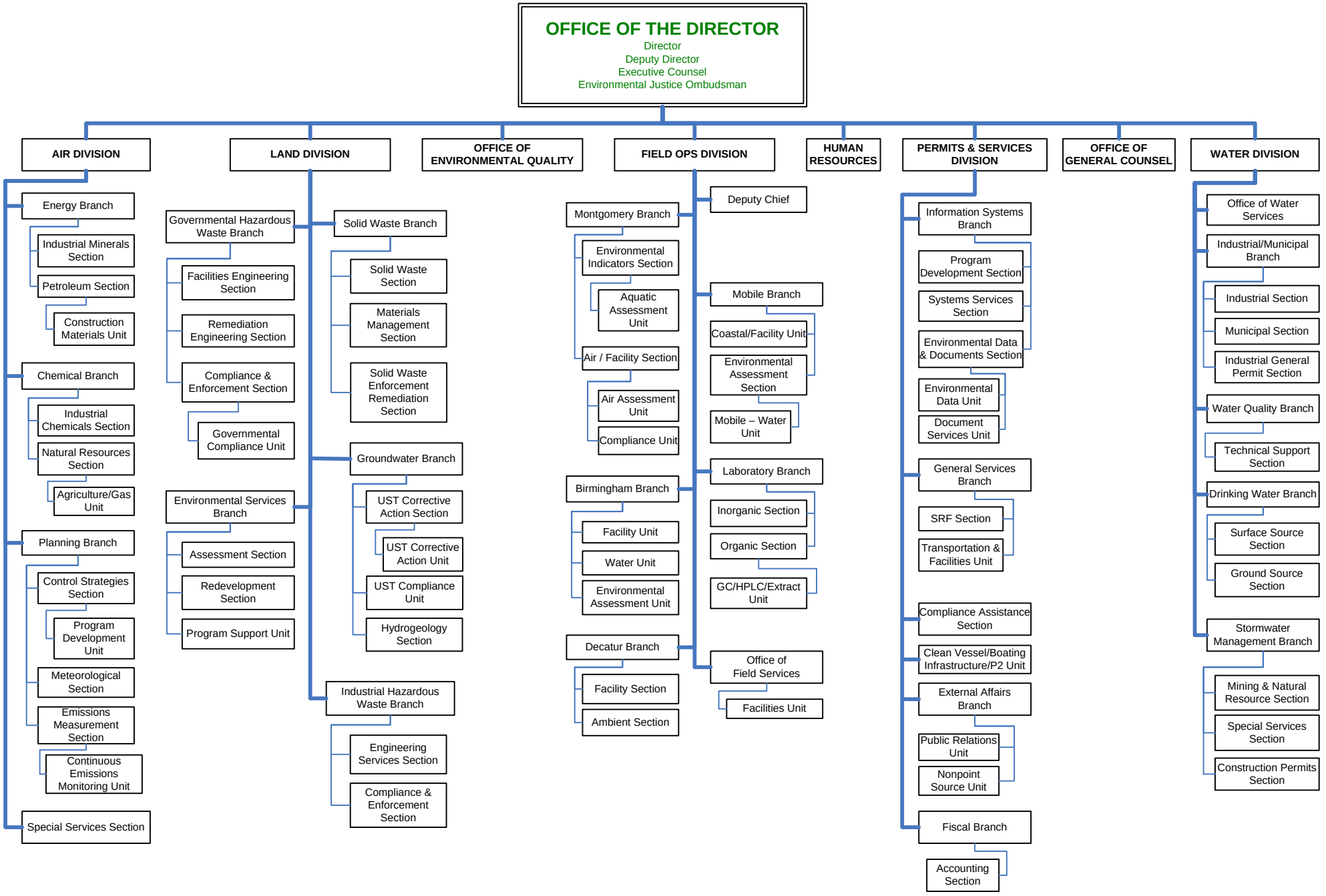
Item #	Item	Yes	Report Page #	No	N/A
74	Are the sampling locations, including locational coordinates and rationale, discussed?				
75	Is the surface water body described?				
76	Are the surface water analytical data discussed?				
77	Are the free product observations included?				
78	Is the free product location and thickness discussed?				
79	Are the free product removal procedures included?				
80	Are free product handling, storage, and disposal procedures provided?				
81	Is a brief description of the MEME event included?				
82	Is the free product thickness discussed for each well included in the MEME event?				
83	Are the disposal procedures included for the free product recovered during the MEME event?				
84	Is a discussion of the monitoring/investigation conducted and the results included?				
85	Is a discussion of the aquifer evaluation and results included?				
86	Is a discussion of the fate & transport models used included?				
87	Are recommendations for further action provided and explained?				
88	Is Table 1 (Soil and Field Screening Data) included with all required elements?				
89	Is Table 2 (Potentiometric Data) included with all required elements?				
90	Is Table 3 (Water Analytical Data) included with all required elements?				
91	Is Table 4 (Purge Water Table) included with all required elements?				
92	Is Table 5 (Free Product Table) included with all required elements?				
93	Is Table 6 (Aquifer Characteristics) included with all required elements?				
94	Is Table 7 (Site Conceptual Model) included with all required elements?				
95	Is Figure 1 (Topographic Map) included with all required elements?				
96	Is Figure 2 (Satellite Photo) included with all required elements?				

Item #	Item	Yes	Report Page #	No	N/A
97	Is Figure 3 (Site Base Map #1) included with all required elements?				
98	Is Figure 4 (Site Base Map #2) included with all required elements?				
99	Is Figure 5 (Land-Use Map) included with all required elements?				
100	Is Figure 6a, 6b, etc. (COC Site Maps) included with all required elements?				
101	Is Figure 7 (Site Potentiometric Map) included with all required elements?				
102	Is Figure 8 (Geologic Cross-Sections) included with all required elements?				
Section C					
103	Is information for contractor conducted assessments included?				
104	Is information for ADEM conducted assessments included?				
Section D					
105	Is a discussion of usability of qualified data included?				
106	Is the verification checklist completion described, along with the name of the individual(s) who completed the checklist?				
Section E					
107	Are the signatures, printed names, and initials provided for the data collectors?				
Section F					
108	Are the appropriate references provided?				
Section G					
109	Is the site classification checklist included?				
110	Is a site survey included with all required elements?				
111	Is a tax map included with all required elements?				
112	Are the completed field form/site notes (with all required data elements) included?				
113	Are the maintenance and calibration records included?				
114	Are the completed chain-of-custody forms included?				
115	Are the laboratory analytical reports included?				
116	Are the soil boring logs provided?				
117	Are the field screening logs provided?				
118	Are the well completion logs provided?				

Item #	Item	Yes	Report Page #	No	N/A
119	Are the aquifer evaluation summary forms, data, graphs, and equations included?				
120	Are the LTF Contractor waste handling/disposal manifests and receipts included?				
121	Is the ADEM Solid Waste Disposal approval letter provided?				
122	Are all fate and transport modeling assumptions, data input, and output data included?				
123	Are access agreements included?				
124	Are photographs included?				
125	Is the MEME vendor report included?				
126	Are the disposal manifests associated with the MEME event included?				
127	Is the ADEM Air Division approval letter included?				
128	Is the completed verification checklist included?				

APPENDIX Y: ADEM ORGANIZATIONAL CHART

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT



APPENDIX Z: LIST OF ADEM STANDARD OPERATING PROCEDURES

ADEM Field Sampling SOPs

SOP #	Title
2041	*In Situ* Surface Water Quality Field Measurements—Temperature
2042	*In Situ* Surface Water Quality Field Measurements—pH
2043	*In Situ* Surface Water Quality Field Measurements—Conductivity
2044	*In Situ* Surface Water Quality Field Measurements—Turbidity
2045	*In Situ* Surface Water Quality Field Measurements—Dissolved Oxygen
2047	*In-Situ* Surface Water Quality Field Measurements—By Datasonde
2061	General Surface Water Sample Collection
2065	Sediment Sample Collection
2066	Dissolved Metals Sample Collection and Processing
2067	Organic Sample Collection
2100	General Groundwater Sample Collection
2101	General Groundwater Temporary Monitoring Well Installation
2102	Well Abandonment Procedures
2150	General Soil Sample Collection

ADEM Laboratory SOPs – General

SOP #	Title
4901	Sample Receiving and LIMS Login
4902	Laboratory Sample Handling
4903	LIMS Result Validation
4904	LIMS Data Reporting
4905	Post Analysis Sample Handling
4910	Laboratory Data Qualification
4917	Waste Handling and Disposal
4918	Laboratory Personnel Training and Records
4924	LIMS Data Entry

ADEM Administrative SOPs

SOP #	Title
8023	Field Operations Division FileNet Procedures/Guidelines—Laboratory Information
8301	Preparation, Review, Approval, Distribution, and Archival of Standard Operating Procedures (SOP) Documents
8302	Preparation, Review, Approval, Distribution, and Archival of Quality Assurance Program/Project Plans (QAPPs)
8400	Global Positioning System

ADEM Quality Assurance SOPs

SOP #	Title
9020	Sample Submittal to Labs
9021	Field Quality Control: Measurements and Samples
9025	Field Equipment Cleaning and Storage Procedures
9040	Station, Sample Identification and Chain of Custody Procedures
9201	Documentation and Tracking of Laboratory Corrective Actions