

**Jefferson Proving Ground
South of the Firing Line
Quality Control Plan
Volume III**

September 1992

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ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
CNES	Chem-Nuclear Environmental Services
COC	Chain-of-Custody
CRL	Certified Reporting Limit
DOT	Department of Transportation
DQOs	Data Quality Objectives
EPA	Environmental Protection Agency
ID	identification
JPG	Jefferson Proving Ground
NCP	National Contingency Plan
NEPA	National Environmental Policy Act
OSHA	Occupational Health and Safety Administration
PID	photoionization detector
QA/QC	quality assurance/quality control
QAP	Quality Assurance Program
QCP	Quality Control Plan
RI/FS	Remedial Investigation/Feasibility Studies
SARA	Superfund Amendments and Reauthorization Act
semi-VOCs	semi-Volatile Organic Compounds
TPH	total petroleum hydrocarbons
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
UTM	Universal Transverse Mercator
UXO	unexploded ordnance
VOCs	Volatile Organic Compounds

1.0 INTRODUCTION

This Quality Control Plan (QCP) is specific to the work to be performed under the Remedial Investigation/Feasibility Studies (RI/FS) at Jefferson Proving Ground (JPG), Madison, Indiana, in support of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA).

The purpose of this QCP is to provide a summary of the detailed and specific procedures and practices to be used for the RI/FS at JPG that will result in the production of data of known and acceptable quality in accordance with USATHAMA Quality Assurance Program (QAP) requirements and the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, the National Contingency Plan (NCP), and the National Environmental Policy Act (NEPA).

In addition, this plan describes the organizational structure and responsibilities of personnel in the Quality Assurance and Quality Control (QA/QC) program for conducting the RI/FS at JPG.

Many of the specific requirements are also covered in tables and specific sections of the Sampling Design Plan (Volume II), which accompanies this plan (Volume III). When possible, those sections will be referenced when they apply to the specific QA/QC elements of this plan.

To accomplish the various subtasks identified in the Technical Plan (Volume I), Sampling Design Plan (Volume II), and the Health and Safety Plan (Volume IV), a readiness review will be performed prior to the start of each activity where data are to be collected to assess the availability of adequate procedures, equipment, and properly trained, qualified, and certified personnel. These review requirements will assure that identified quality is achieved during the collection, processing, analyzing, and reporting of data. Evaluations of administrative and technical systems approved for the project will be performed during the project activities, and the systems will be modified when necessary to meet regulatory, project-management, and USATHAMA requirements. These modifications will be made only with the approval of the appropriate USATHAMA representative.

This QCP establishes the basis for the overall QA/QC program to be used at JPG. Site-specific variances to this plan may be required during the execution of the proposed tasks. Any changes to the QCP would require the approval of the Quality Assurance (QA) Coordinator, Project Director, and appropriate USATHAMA and JPG personnel.

2.0 SITE BACKGROUND

This section provides a summary of the background information presented in the Technical Plan (Volume I), which describes the location, geologic and hydrologic setting, installation history, and previous investigations.

2.1 Location

Jefferson Proving Ground occupies 55,265 acres of land along U.S. Highway 421 north of Madison, Indiana (see Figure 1). The facility is located in portions of three counties (Ripley, Jennings, and Jefferson Counties). The installation is approximately 18 miles long (north-south) and 5 miles wide (east-west). Figure 2 shows the location of buildings, roads, and sites to be characterized south of the firing line at JPG.

2.2 Geologic and Hydrologic Setting

Jefferson Proving Ground lies on the western limb of a plunging anticline known as the Cincinnati Arch. It also lies within the Till Plains Section of the Central Lowlands Province. In general, the geology at JPG is characterized by glacial till overlying Ordovician and Silurian bedrock consisting of limestones and dolomites interbedded with shales.

Unconsolidated materials consist of loess over glacial till, which are typically 25 to 35 feet thick (range from 0 to 50 feet). These deposits are generally not present in and near stream valleys. Soils at JPG have been derived from the glacial parent materials. These soils are strongly weathered, leached, and acidic. The majority of the soils at JPG are clay and silt loams with low permeability.

The soils and glacial till deposits are underlain by Ordovician, Silurian, and Devonian carbonate units. These include the Muscatatuck Group (Devonian); Louisville Limestone, Salamonie Dolomite, and Brassfield Limestone (Silurian); and Maquoketa Group, Trenton and Black River Limestones and Knox Dolomite (Ordovician).

Groundwater at JPG is primarily stored in Silurian and Devonian limestone aquifers. The Brassfield Limestone is the principal aquifer underlying JPG. The limestone aquifers are confined by the overlying fine-grained glacial materials. Wells in the area of JPG range in depth from 50 to 250 feet, and yields range from 10 to 100 gallons per minute (USGS, 1985). Groundwater from the limestone aquifers is generally hard with potentially high sulfur contents. Little information exists for groundwater flow within the JPG facility. Previous monitoring wells were installed for sampling of contaminants, and little aquifer characteristic data have been obtained. However, it is anticipated that groundwater flow rates through the limestone aquifers are low to moderate.

Six major streams cross JPG in a northeast to southwest direction. These are Otter Creek, Graham Creek, Little Graham Creek, Big Creek, Middle Fork Creek, and Harberts Creek. Surface water bodies in addition to the six creeks include two lakes, Old Timbers Lake and Krueger Lake, both of which have been stocked previously with a variety of fish. Also present are several ponds and impoundments.

2.3 Installation History

JPG was established in 1941 as a Class II military installation assigned to the Ordnance Department, Army Services Forces, with the mission of production acceptance and specification testing of all types of ordnance. These included propellants, projectiles,

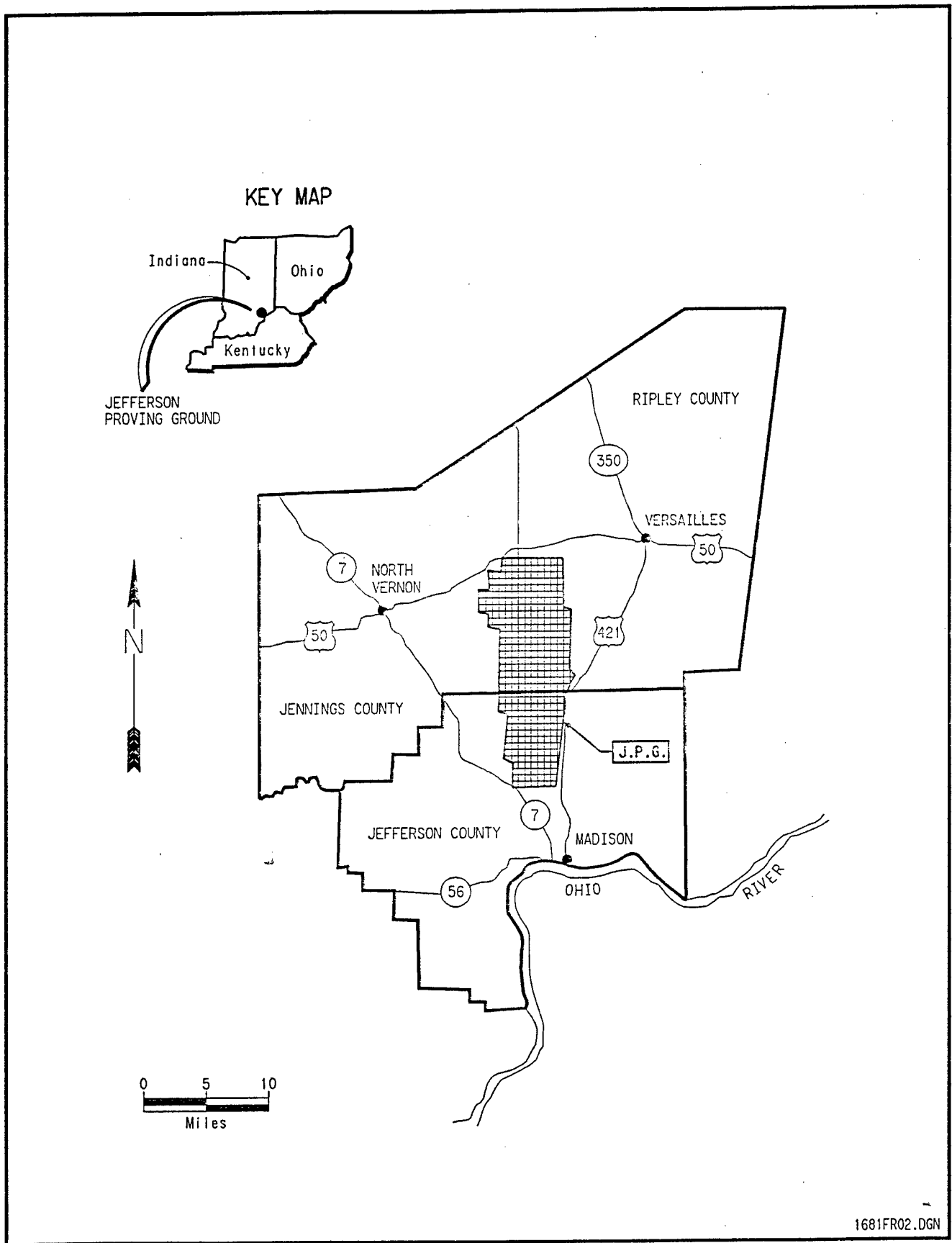


Figure 1. Location Map of Jefferson Proving Ground, Indiana

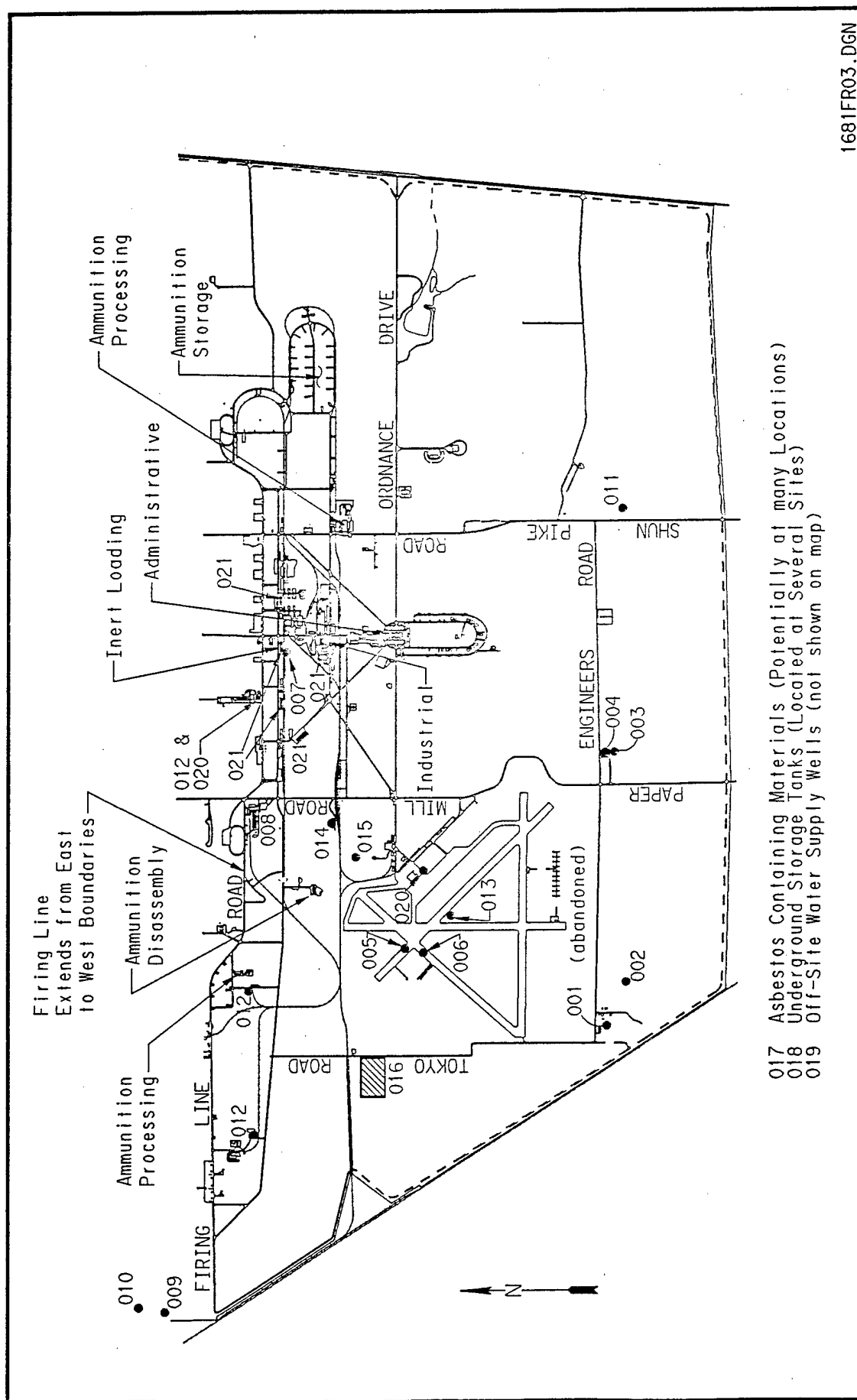


Figure 2. Location Map of RI/FS Sites South of the Firing Line, Jefferson Proving Ground, Indiana

cartridges, mortars, grenades, fuses, primers, boosters, rockets, tank ammunition, mines, and weapon components. Peak production periods at JPG corresponded to times of national conflict such as World War II, the Korean War, and the Vietnam War. Since the 1970s, JPG has experienced a steady decline in production and, in 1988, the installation was identified for closure by the Defense Secretary's Commission on Base Closure and Realignment.

The installation consists of industrial buildings, workshops, and test facilities, as well as administrative buildings and personnel housing in the area south of the firing line. This line consists of 268 gun positions, which run east-west across the southern portion of JPG. Areas north of the line consist mainly of impact areas with safety fans.

2.4 Previous Investigations

Several investigations were conducted at JPG covering a variety of environmental concerns. These reports included the following:

- Environmental Impact Assessment (O'Neill, 1978)
- Installation Assessment (USATHAMA, 1980)
- Update of Initial Assessment (Environmental Science and Engineering, 1988)
- RCRA Part B Permit for Open Burning/Open Detonation (U.S. Army Corps of Engineers, 1988)
- Draft RI Technical Report (Environmental Science and Engineering, 1989)
- Enhanced Preliminary Assessment (Ebasco, 1990a)
- Master Environmental Plan (Ebasco, 1990b)
- Environmental Audit (USEPA, 1990)

Although the above investigations have resulted in the identification of numerous potentially hazardous waste sites, little work has been performed to characterize the nature and extent of contamination at JPG. Additional studies will be required to allow JPG to satisfy federal, state, and local environmental laws and regulations and to provide USATHAMA with sufficient data to make informed decisions on remedial-action alternatives required to complete the base-closure process.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

An example of a typical organization structure of an RI/FS team for JPG is shown in Figure 3, showing the reporting structure of the various key project personnel.

3.1 Program Manager

The Program Manager has overall responsibility for coordination and performance of all tasks performed under the RI/FS at JPG. The Program Manager is responsible for appointing only properly trained and qualified personnel to perform the tasks at JPG. Responsibilities also include the review of work plans, schedules, costs, and technical performance under the USATHAMA contract. He has the authority to redirect resources as

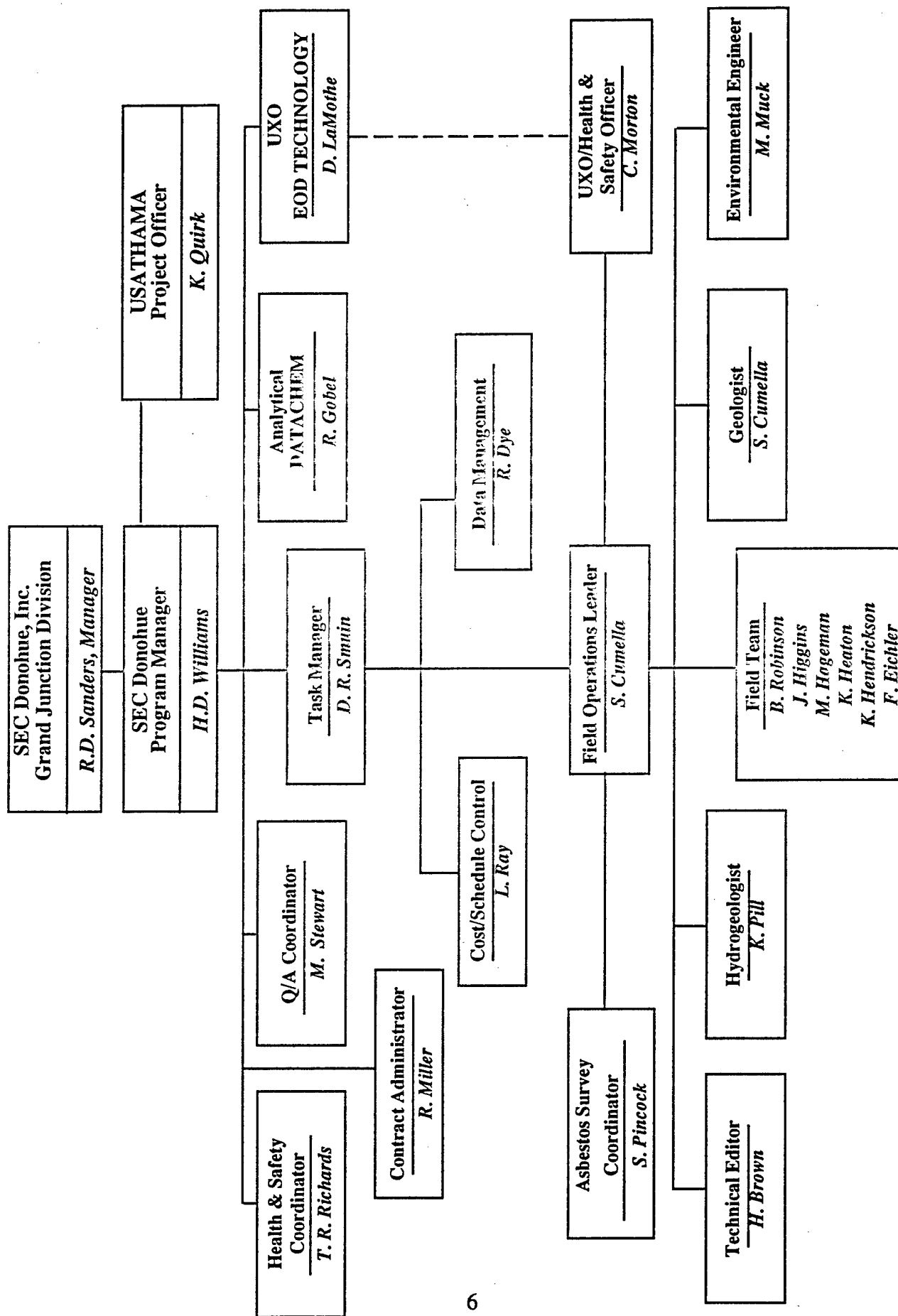


Figure 3: Jefferson Proving Ground-South RI/FS Task Organization

necessary to achieve the contractual obligations, as well as to meet quality-assurance objectives. This includes the authority to select/dismiss contractor staff, terminate major subcontractors, approve or disapprove budgets and schedules, stop work, and communicate with USATHAMA as necessary to evaluate progress and to ensure resolution of any problem.

3.2 Task Manager

The Task Manager for each task under the RI/FS at JPG will be the principle representative to USATHAMA and JPG during all field operations and is responsible to the Project Director for all task activities. The Project Manager directs the technical efforts and manages personnel and budget resources to attain the task objectives. Specific duties include supervising and developing technical deliverables while keeping the Project Director fully informed of schedule status, personnel needs, scope changes, subcontractor performance, technical difficulties, and performance to budget. The Project Manager obtains technical assistance and resources from the Field Team Leader and other technical personnel assigned to each disciplinary area. The Project Manager is also responsible for implementing the project quality program established by the project QA Coordinator. He has the authority to allocate work assignments, budgets, and schedules to relevant elements of the team with emphasis on maintaining quality.

3.3 Quality Assurance Coordinator

The QA Coordinator, who reports directly to Corporate management to provide the necessary independence and high-level management involvement, serves as the coordinator of QA/QC activities performed at JPG by Chem-Nuclear Environmental Services (CNES). The QA Coordinator is responsible for supervising development of QA project plans and conducting random audits to verify that quality-related procedures are being followed and objectives are being met. The QA Manager aids the Task Manager in identifying and developing solutions to quality problems and verifies that non-conforming items are corrected. The QA Coordinator is also responsible for resolving quality issues at the appropriate program or project level or for elevating issues within the corporate organization to achieve resolution.

The QA Coordinator will ensure that appropriate sampling, field testing, and field analysis procedures are being followed and that correct QA/QC checks are being made by performing on-site surveillance or audits as required. Any deficiencies will be reported to the Task Manager or other management personnel as required. He will also ensure that the proper Standard Operating Procedures, training records, and personnel qualification documentation is current and available at the work site.

The QA Coordinator will also be responsible for monitoring and documenting the quality of all data reported to USATHAMA by the subcontracted laboratory. This will be accomplished through the review and/or audit of laboratory data packages.

3.4 Field Operations Leader

The Field Operations Leader is responsible for coordinating the entire field program and to provide on-site leadership in the collection of all samples for laboratory analysis and in the field measurement and analysis tasks at JPG. He also provides supervision of all subcontractors associated with the JPG field program. The Field Operations Leader reports directly to the Task Manager. The Field Operations Leader will ensure that proper procedures are being followed and will provide support to the QA Coordinator in the review and audit of field activities with emphasis on QA/QC. He has the authority to enforce the established procedures; any observed problems or deficiencies will be reported to the QA Coordinator and the Task Manager.

3.5 Health and Safety Coordinator

Although not specifically charged with responsibility for providing QA/QC support, the site Health and Safety Coordinator will ensure that all of the work is performed in a safe manner and in compliance with all applicable health and safety rules, regulations, and standards. Detailed procedures for managing the Health and Safety Program at JPG are included in the site-specific Health and Safety Plan (Volume IV) that accompanies this plan. The Health and Safety Coordinator will participate in field audits and surveillance to ensure that all procedures are being followed and complied with by field personnel. The Health and Safety Coordinator reports directly to the Program Manager, but also has the responsibility of reporting any accidents or incidents concerning health and safety to USATHAMA, the contractor's corporate management, and regulatory agencies (i.e., Occupational Health and Safety Administration [OSHA]) as required.

3.6 Technical Personnel

The technical and support staff used on each work task for the RI/FS at JPG will be selected on the basis of having the appropriate training and experience for the task(s) for which they are assigned. Depending on the scope and size of each task, the makeup of the project team may vary from one or two individuals to a full, multi-disciplined effort involving several individuals. The personnel assigned to each task will report to the Field Operations Leader and Task Manager for all matters relating to project performance. Copies of training records and qualifications of each team member will be maintained by the Task Manager.

Typically, the field technical team will consist of:

- Geophysicists
- Geologist
- Hydrologist
- Sampling Technicians
- Unexploded Ordnance (UXO) Technicians (2)
- Health Physics Technician
- Land Surveyor
- Subcontract Drilling Crew

The field team members have the responsibility of following all established procedures and documenting the results in a complete and accurate manner. The team members are responsible for maintaining records of any QA/QC measurements or samples collected. They also have the responsibility for reporting any unusual events or conditions that may affect data quality to the appropriate management personnel. Special attention will be given by all team members to ensuring that all USATHAMA procedures and requirements are followed and met. A method for the documentation of any corrective actions taken while performing fieldwork will be employed (see Section 15.0 of this plan).

3.7 Laboratory QA Manager

The subcontracted laboratory will establish a Laboratory QA Manager, who will be responsible for the monitoring and reporting of all QA/QC activities performed by the laboratory in support of the RI/FS at JPG. This person will work closely with the contractor QA Coordinator and will report any problems or findings to that coordinator. The Laboratory QA Manager will conduct periodic reviews of daily instrument calibrations, site-specific QC samples analyzed, analytical data packages, and routine laboratory records (i.e., chemist bench work sheets, original chromatographs, hand calculations, etc.). The Laboratory QA Manager will also assist the contractor QA Coordinator and USATHAMA with laboratory audits including verification of proper USATHAMA certification, review of Standard Operating Procedures, inspection of calibration records, and review of data packages. The Laboratory QA Manager will provide weekly or monthly reports to the contractor with results of QA/QC activities relating to the JPG project.

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT OF DATA

4.1 Data Quality

To determine whether the requirements for data quality at JPG as defined in the Data Quality Objectives (DQOs) for the project have been met, an understanding of the parameters used to determine data quality is necessary. This section is designed to provide definitions to be used in determining data quality for data collected under the RI/FS at JPG. These apply to both field measurements and analysis and laboratory analysis.

Acceptance criteria for laboratory analysis are found specifically in the USATHAMA Quality Assurance Program Plan (PAM 11-41, Rev 0). These criteria are an integral part of the USATHAMA laboratory certification program and data management program (IRDMIS). All data must pass through a rigorous QA/QC program prior to being accepted by USATHAMA. Laboratories certified by USATHAMA have also passed rigorous QA/QC requirements for each analysis for which they are certified.

Acceptance criteria for field data are somewhat less defined. For field measurements, evidence of instrument calibrations and operational checks to known standards are most often the best indication of data quality. For other data, adherence to standard procedures may be all that is required to achieve the desired quality.

4.2 Data Accuracy and Precision

Accuracy is the nearness of a measurement or the mean (\bar{x}) of a set of measurements to the true value (t), usually expressed as the difference between the two values ($\bar{x}-t$), or the difference as a percentage of the reference or true value ($100(\bar{x}-t)/t$), and is sometimes expressed as a ratio (\bar{x}/t). Accuracy is the measure of the bias in a system. Analysis of spiked and blank-sample data will be performed by the laboratory to provide a measure of the bias of each test method. Accuracy limits for each parameter in each sampling matrix are stated as percent recoveries or spiked analytes and are part of the certification records maintained by each USATHAMA-certified laboratory. The subcontract laboratory will be required to provide the accuracy limits established for each method to the contractor prior to the start of work to allow proper independent monitoring of laboratory performance.

Precision is the agreement between a set of replicate measurements without assumption or knowledge of the true value. Repetitive measurements of analytical samples will be made by use of replicate samples to judge the precision of each measurement process.

4.3 Data Completeness

Completeness is a measure of the amount of valid data expressed as a percentage obtained from a measurements system and are compared with the amount of valid data expected under normal conditions. Field and analytical data are specified at a minimum of 90 percent completeness, which satisfies the requirements of USATHAMA and Environmental Protection Agency (EPA) Contract Laboratory Program (CLP). No data requirements have been set at 100 percent recovery for the JPG RI/FS.

4.4 Data Representativeness

Representativeness is the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Representativeness for JPG will be accomplished by the extensive monitoring of field activities and sampling. For example, evaluation of subsurface soil contamination will involve the review of previous subsurface lithologic data and contaminant data by the contractor geologist to determine the proper sampling and analysis approach for each individual site to ensure that the data collected are representative of the site-specific subsurface environment. Field measurements will also be made so that the results are as representative of the media and conditions being measured as possible. Protocols for sample collection and handling presented in the Sampling Design Plan (Volume II) were developed to ensure that the samples collected are representative of the media sampled. Records will be kept to document that these protocols were followed during the sample-collection portion of the project.

4.5 Data Comparability

Comparability is the confidence with which one data set can be compared to another. Comparability may be ensured by using approved sampling plans, standardized analytical methods, and identical units for reportable data. All data in a particular data set will be obtained by the same methods.

The comparability of the analytical results will be based upon acquisition of data through only USATHAMA-certified analytical techniques using a certified laboratory and experienced chemists. The quality control procedures required by USATHAMA will be followed to provide analytical results of known quality.

Field comparability involves the use of standard operating procedures such that the measurements taken on the samples collected will be comparable. Rinsate samples from sampling equipment are also a way to ensure data comparability by documenting that the equipment did not introduce outside contaminants to the sample. Data will be grouped and evaluated according to similar sampling methods, sampling media, sampling interval, and laboratory analytical methods.

4.6 Quality Assurance Objectives

QA objectives for the RI/FS at JPG were determined based on the data-quality objectives (DQOs) described in Section 5.0 of the Technical Plan (Volume I). DQOs were determined on the basis of the intended uses of the data to be collected. DQOs were prepared for the collection of representative soil gas, soil, water quality, and hydrologic (i.e., hydraulic conductivity) data.

4.6.1 Data-Quality Objectives for Field Investigation Activities

DQOs are qualitative and quantitative statements that specify the quality of data required to support decisions during RI and FS activities. DQOs initially identified during review of previous investigations and through on-site visits and installation record review are incorporated in the project-planning documents. These documents provide implementable objectives that ensure that the data collected during RI work tasks are of adequate quality for their intended uses. The DQOs describe objectives of various sampling efforts performed during the RI and provide rationale for the selection of sampling locations, sampling techniques, number of samples, and analytical parameters.

The following sections briefly summarize the general DQOs for each RI activity and the analytical procedures required to meet each DQO. Site-specific DQOs are presented in Section 5.0 of the Technical Plan (Volume I) and are summarized in Section 3.0 of the Sampling Design Plan (Volume II).

Soil-Gas Sampling and Analysis. Soil-gas samples collected at JPG will be used only as a reconnaissance tool. The objective of these samples is to delineate specific areas of volatile organic compound (VOC) contamination in soil gas and to identify concentrations that indicate VOC sources require additional investigation by soil or groundwater sampling.

Soil Sampling and Analysis. The collection of soil samples for chemical analysis, physical analysis, and lithologic description will be performed as part of the RI. The objectives of surface and subsurface soil sampling are to provide data on the site lithology, determine the physical properties of each lithologic unit, determine the presence or absence of chemical contaminants in the soil, and provide an indication of the distribution of the contaminants. Sediments at JPG will be collected using the same method employed for surface soils. These samples are to be taken to determine if contaminants have entered the surface-water pathway, resulting in potential risk to human health or the environment due to off-site migration.

Soil samples (and sediments) will be analyzed for VOCs using USATHAMA-approved method LM-16; semi-VOCs using method LM-15; metals using method JS-15, SD-24 (lead), JB-03 (mercury), and JC-06 (silver); explosives using method LW-26; cyanide using method KY-02; and herbicides using method LW-29. Total petroleum hydrocarbons (TPH) will be analyzed by EPA Method 418.1. Concentrations will generally be reported in $\mu\text{g}/\text{kg}$. Certified reporting limits will be subcontractor specific for each certified method, but will be within the required range specified by USATHAMA.

Groundwater Sampling. Groundwater samples will be collected from new and existing wells if results of other field-investigation activities (i.e., soil borings) indicate that a release of contaminants to the groundwater pathway may have occurred. The samples will also provide background and site-specific water-quality data to characterize overall JPG water quality. Proper selection of monitoring-well location is critical to aid in determining:

- Areal extent of contaminants in groundwater
- Definition and tracking of contaminants exceeding regulatory standards
- Monitoring of basic groundwater quality
- Baseline hydrologic data for new monitoring wells
- Confirmation of previous results

Analytical parameters selected for groundwater samples will vary according to the suspected contaminants from previous water sampling or subsurface-soil sampling. Samples will be analyzed for VOCs using USATHAMA method UM-17; semi-VOCs using USATHAMA method UM-16; metals using USATHAMA methods SS-16, SD-16 (lead), SB-03 (mercury), SD-24 (silver); explosives using USATHAMA method UW-20; cyanide using USATHAMA method TY-12; and anions using USATHAMA method TT-08. Certified reporting limits will vary with each subcontract laboratory, but will be within the certified range established by USATHAMA.

Surface-Water Sampling. Surface-water samples will be collected below the Yellow Sulfur Disposal Site if surface water is present at the time of sediment sampling. These samples are designed to provide evidence as to whether the Yellow Sulfur Disposal Site has released potentially hazardous chemicals to the surface-water environment.

Geophysical Surveys. Geophysical surveys will be conducted at JPG as a reconnaissance tool for identifying and delineating former trenches, pits, and landfills used for the burning and disposal of potentially hazardous materials. These surveys will provide data to guide the location of soil borings and groundwater-monitoring wells as well as provide information to

be used for determining potential safety hazards. Data obtained using these techniques will be collected using only properly calibrated instruments and qualified geophysicists and technicians.

Other Data Collection. Numerous other field measurements may be taken during the RI at JPG. These measurements will be made following established operating procedures and will be properly calibrated on a daily basis or as required by manufacturer specifications. An example of routine measurements would be the use of a photoionization detector (PID) for the scanning of materials for VOC contamination. These instruments will be calibrated daily using a standard calibration gas with a known concentration.

5.0 SAMPLING PROCEDURES

Sampling procedures used at JPG will be selected on the basis of proper technique for the medium/matrix to be sampled and the analytes of interest. These procedures will cover not only sample collection, but also proper containers, preservatives, handling, storage, chemical interactions, etc. Unless proper procedures are followed throughout the entire process from collection to analysis, the quality of the resulting data cannot be ensured.

The procedures described in this section are designed to provide representative samples and measurements of the sampled matrices at JPG. Environmental measurements and samples cover a wide range of media, including surface and subsurface soils, sediments, surface water, and groundwater. In addition, geophysical, soil-gas, and unexploded-ordnance surveys will be required. Step-by-step procedures can be found in Appendix A of the Sampling Design Plan (Volume II). The following section mainly describes the QA/QC requirements to be met using the procedures described in Appendix A.

5.1 General Sample Collection Requirements

5.1.1 Sample Containers

To ensure the integrity of the collected samples, steps must be taken to minimize the potential for contamination of containers prior to sample collection. This requirement will be fulfilled by the laboratory purchasing pre-cleaned sample containers from a supplier who certifies the cleanliness of the containers. These containers will be kept in their shipping containers until time of collection in a "clean" storage area. Each container will be inspected prior to use for signs of contamination, breakage, missing parts, etc. Suspect containers will be discarded.

The type of bottle or container is critical for some analytes. For example, samples for volatile organic compounds must be stored in amber glass to minimize the possible effect of exposure to direct sunlight. Table 1, taken from the USATHAMA QAP, shows the types of containers required for each type of analyte to be sampled. Sampling personnel will have a copy of these requirements in the field for reference during sampling to prevent the use of

Table 1. Containers, Preservation, Storage, and Holding Times^a

Parameter	Container ^b		Preservative ^{c,d}		Maximum Holding Time for all Matrices ^e
	Water	Soil	Water	Soil	
INORGANIC TESTS					
Acidity	P	G	Cool, 4°C	Cool, 4°C	14 days
Alkalinity	P	G	Cool, 4°C	Cool, 4°C	14 days
Ammonia	P	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Asbestos	P	G	Cool, 4°C	Cool, 4°C	48 hours ^f
Bicarbonate	P	G	None Required	None Required	Analyze Immediately
Biochemical Oxygen Demand (BOD) and Carbonaceous BOD	P	G	Cool, 4°C	Cool, 4°C	48 hours
Bromide	P	G	None Required	None Required	28 days
Carbonate	P	G	None Required	None Required	Analyze Immediately
Chemical Oxygen Demand (COD)	P	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Chloride	P	G	None Required	None Required	28 days
Chlorine, Total Residual	P	N/A	None Required	N/A	Analyze Immediately
Color	P	N/A	Cool, 4°C	N/A	48 hours
Cyanide, Total and Amenable to Chlorination	P	G	Cool, 4°C NaOH to pH >12 0.6 g Ascorbic Acid ^g	Cool, 4°C	14 days ^h
Dissolved Oxygen Probe	G Bottle and Top	N/A	None Required	N/A	Analyze Immediately
Winkler	G Bottle and Top	N/A	Fix On Site Store in Dark	N/A	8 hours
Fluoride	P	G	None Required	None Required	28 days
Hardness	P	N/A	HNO ₃ or H ₂ SO ₄ to pH<2	N/A	6 months
Hydrazine	P	G	If not analyzed immediately, collect under acid. Add 90 ml of sample to 10 ml HCl.	Cool, 4°C	7 days
Iodide	P	G	Cool, 4°C	Cool, 4°C	24 hours
Iodine	P	G	None Required	None Required	Analyze Immediately
Kjeldahl and Organic Nitrogen	P	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days

Table 1. Containers, Preservation, Storage, and Holding Times (continued)

Parameter	Container ^b		Preservative ^{c,d}		Maximum Holding Time for all Matrices ^e
	Water	Soil	Water	Soil	
Metals ⁱ					
Chromium VI	P	G	Cool, 4°C	Cool, 4°C	24 hours
Mercury	P	G	HNO ₃ to pH <2	Cool, 4°C	28 days
Others	P	G	HNO ₃ to pH <2	Cool, 4°C	6 months
Nitrate	P	G	Cool, 4°C	Cool, 4°C	48 hours
Nitrate plus Nitrite	P	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Nitrite	P	G	Cool, 4°C	Cool, 4°C	48 hours
Oil and Grease	G	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Orthophosphate	P	G	Filter Immediately Cool, 4°C	Cool, 4°C	48 hours
pH	P	G	None Required	None Required	Analyze Immediately
Phenols	G	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Phosphorous, Elemental	G	G	Cool, 4°C	Cool, 4°C	48 hours
Phosphorous, Total	P,G	G	Cool, 4°C H ₂ SO ₄ to pH <2	Cool, 4°C	28 days
Silica, Dissolved or Total	P	G	Cool, 4°C	Cool, 4°C	28 days
Residue					
Filterable	P	N/A	Cool, 4°C	N/A	7 days
Settleable	P	N/A	Cool, 4°C	N/A	48 hours
Nonfilterable (TSS)	P	N/A	Cool, 4°C	N/A	7 days
Total	P	N/A	Cool, 4°C	N/A	7 days
Volatile	P	N/A	Cool, 4°C	N/A	7 days
Specific Conductance	P	G	Cool, 4°C	Cool, 4°C	28 days
Sulfate	P	G	Cool, 4°C	Cool, 4°C	28 days
Sulfide	P	G	Cool, 4°C Add Zinc Acetate plus NaOH to pH >9	Cool, 4°C	7 days
Sulfite	P	G	None Required	None Required	Analyze Immediately
Surfactants	P	G	Cool, 4°C	Cool, 4°C	48 hours
Temperature	P	G	None Required	None Required	Analyze Immediately
Turbidity	P	N/A	Cool, 4°C	N/A	48 hours
ORGANIC TESTS ^j					
Acrolein and Acrylonitrile	S	S	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g Adjust pH to 4-5 ^k	Cool, 4°C	14 days ^k

Table 1. Containers, Preservation, Storage, and Holding Times (continued)

Parameter	Container ^b		Preservative ^{c,d}		Maximum Holding Time for all Matrices ^e
	Water	Soil	Water	Soil	
Benzidines ¹	G	G	Cool, 4°C ^m 0.008% Na ₂ S ₂ O ₃ ^g pH 2-7	Cool, 4°C	7 days until extraction 40 days after extraction
Chlorinated Hydrocarbons ¹	G	G	Cool, 4°C	Cool, 4°C	7 days until extraction 40 days after extraction
Haloethers ¹	G	G	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g	Cool, 4°C	7 days until extraction 40 days after extraction
Nitroaromatics and Isophorone ¹	G	G	Cool, 4°C Store in Dark	Cool, 4°C Store in Dark	7 days until extraction 40 days after extraction
Nitrosamines ^{1,o}	G	G	Cool, 4°C Store in Dark 0.008% Na ₂ S ₂ O ₃ ^g	Cool, 4°C Store in Dark	7 days until extraction 40 days after extraction
PCBs	G	G	Cool, 4°C	Cool, 4°C	7 days until extraction 40 days after extraction
Pesticides ¹	G	G	Cool, 4°C pH 5-9 ^p	Cool, 4°C	7 days until extraction 40 days after extraction
Phenols ¹	G	G	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g	Cool, 4°C	7 days until extraction 40 days after extraction
Phthalate Esters ¹	G	G	Cool, 4°C	Cool, 4°C	7 days until extraction 40 days after extraction
Polynuclear Aromatic Hydrocarbons ¹	G	G	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g Store in Dark	Cool, 4°C Store in Dark	7 days until extraction 40 days after extraction
Purgeable Aromatic Hydrocarbons	S	S	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g HCl to pH < 2 ^q	Cool, 4°C	14 days ^q
Purgeable Halocarbons	S	S	Cool, 4°C 0.008% Na ₂ S ₂ O ₃ ^g	Cool, 4°C	14 days
TCDD ¹	G	G	Cool, 4°C 0.008% Na ₂ SO ₃ ^g	Cool, 4°C	7 days until extraction 40 days after extraction
Total Organic Carbon	G	G	Cool, 4°C HCl or H ₂ SO ₄ to pH < 2	Cool, 4°C	28 days
Total Organic Halogen	G	G	Cool, 4°C 1 ml of 0.1 M sodium sulfite	Cool, 4°C	7 days

Analytes not listed should be preserved at 4°C and held not longer than 7 days.

^aPreservatives and holding times are from Federal Register, Vol. 49, No. 209, Friday, October 26, 1984 Page 43260 and Characterization of Hazardous Waste Sites: A Methods Manual -- Volume II, Sampling Methods Second Edition, EPA-600/4-84-076. Container requirements are consistent with these references.

^bp = Polyethylene

G = Amber Glass with Teflon-lined cap

S = Glass Vial with Teflon-lined septum cap

Table 1. Containers, Preservation, Storage, and Holding Times (concluded)

^cSample preservation should be performed immediately upon sample collection. For composite samples, each aliquot should be preserved at the time of collection. When use of an automatic sampler makes it impossible to preserve each aliquot, samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

^dWhen any sample is to be shipped by common carrier or sent through the U.S. Mail, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For the preservation requirements in this table, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation, has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric acid (HCl) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric acid (HNO₃) in water solutions at concentrations of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric acid (H₂SO₄) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.3 or less).

^eSamples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid.

Some samples may not be stable for the maximum time period given in the table. A laboratory is obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample integrity.

^fIf samples cannot be filtered within 48 hours, add 1 ml of a 2.71% solution of mercuric chloride to inhibit bacterial growth.

^gShould only be used in the presence of residual chlorine.

^hMaximum holding time is 24 hours when sulfide is present. Optionally, all samples may be tested with lead acetate paper before pH adjustment in order to determine if sulfide is present. If sulfide is present, it can be removed by addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

ⁱFor dissolved metals, filter immediately on site before adding preservative.

^jGuidance applies to samples to be analyzed by GC, LC, or GC/MS for specific compounds.

^kThe pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within three days of sampling.

^lWhen the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times must be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to 4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting pH to 6-9; samples preserved in this manner may be held for 7 days before extraction and 40 days after extraction. Exceptions to this optimal preservation and holding time procedure are noted in footnotes g, m, and n.

^mIf 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0 ± 0.2 to prevent rearrangement to benzidine.

ⁿExtracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

^oFor the analysis of diphenylnitrosamine, add 0.008% Na₂S₂O₃ and adjust pH to 7-10 with NaOH within 24 hours of sampling.

^pThe pH adjustment may be performed upon receipt at the laboratory and may be omitted if the samples are extracted within 72 hours of collection. For the analysis of aldrin, add 0.008% Na₂S₂O₃.

^qSample receiving no pH adjustment must be analyzed within 7 days of sampling.

the wrong container. Container size and sample volume requirements may vary according to equipment used, procedures, etc. The laboratory will provide the appropriate size of containers to meet their specific requirements for each analysis requested.

5.1.2 Sample Preservation, Handling, and Storage

Table 1 also provides the USATHAMA requirements for sample preservation and maximum holding times for each type of analyte at JPG. In addition to these requirements, collected water samples will be placed in containers that have been triple rinsed with the sample water prior to collection. All preservation will be done in the field, as opposed to doing it later in the laboratory. Filtering of the samples will also be completed at the time of sample collection as required. For acidified samples, the proper pH will be checked prior to sample packaging and shipping. Special care must be taken in the collection of samples for VOC analysis to prevent significant loss of volatiles. For soils, this requires immediate collection following removal from the ground and bottling in amber glass with zero headspace. For water samples, this requires immediate collection and zero headspace with no bubbles (trapped air).

After samples have been collected in the appropriate containers and have been properly preserved, labeled, and a custody seal placed over the lid, the samples will normally be placed immediately in a cooler with ice and stored at 4 °C until sample delivery to the laboratory. Maintenance of this temperature will be ensured by periodic checking of a thermometer placed in the cooler. For many analytes, holding times are critical. For this reason, shipments to the laboratory will be made on a daily basis using an overnight or priority-delivery service.

Bottles will be prepared for shipment by first placing the bottle in a ziploc-type bag, then in a foam shipping sock or bubble wrap. Also, vermiculite is usually placed in the container to absorb any potential leaks of sample material. Additional foam or bubble packs will be used, and the cooler lid will be sealed with reinforced strapping tape. Custody seals will be placed across the lid to ensure that sample custody was maintained during shipment from the field to the laboratory. The laboratory will document receipt of the sample in good condition by signing and dating the Chain-of-Custody (COC) form that accompanies the shipment.

5.1.3 Sample Labels and Records

Sample labels will be prepared at the time of sample collection. In some cases, the label will be pre-printed using a computerized-label system. However, at the time of sample collection, the following information must be recorded:

- Sampler's name
- Date and time of sample collection
- Sample site name
- Sample ID number
- Required analyses

In addition to the sample label, a sample-collection-log form or sample logbook will be used to document the sample location (i.e., sketch map), sample identification (ID) number at each location, physical description of the sample location, and any information pertinent to the quality of the sample (i.e., weather conditions, evidence of staining, field PID measurements, etc.).

For water samples, water quality measurements (i.e., pH, conductivity, and temperature) will also be documented (see Figure 4).

A COC form (Section 7.0), which documents the date and time of sampling, sample ID numbers, and name of sampler responsible for the custody of the sample prior to shipping, will also be completed at the time of sampling.

5.2 Sample Site Selection/Documentation

The rationale for each sampling location proposed for the RI at JPG is included in Section 4.0 of the Sampling Design Plan. Generally, the density of sample locations proposed for this phase of the RI are not sufficient to fully characterize the contamination at a specific site. Sample locations were selected to provide the best chance of detecting whether contamination is present or absent at a particular site. Sample location distribution is normally centered around a suspected source of contamination in all directions, since direction of contaminant migration is unknown at most JPG sites. Sample depths were selected on the basis of the location of the potential source of contamination. For example, contamination at burn areas is likely to be at the surface and near the surface while contamination at a former landfill is likely to be near and below the bottom of the former landfill. Groundwater samples are selected on the basis of either being downgradient of a particular site to assess the quality of groundwater leaving the site, or located upgradient to determine the quality of groundwater entering the site. Surface-water locations are selected on the same general principle as being either upstream or downstream of the potential source of contamination.

Proper location information for samples collected is important in evaluating of the sample results in relationship to other sample locations and potential contaminant sources. Sampling locations will be accurately located on a site base map with the location coordinates properly determined and entered in the map file of the IRDMIS data management system. These coordinates will be tied to established survey control points or permanent landmarks with known location coordinates. Sampling locations will be within a horizontal accuracy of +/- 1 foot. For monitoring wells, vertical accuracy will be within +/- 0.01 foot.

5.3 Field Documentation

The ability to assess and verify data quality is greatly dependent upon the proper documentation of all information pertinent or critical to assessing data quality. This includes the proper labeling of sample containers, the proper entry of field measurements, maintenance of accurate field notes in logbooks, proper documentation of sample custody, etc. The following describes the documentation requirements for field activities to be conducted at JPG.

DATE _____

WELL ID:

Figure 4. Example Water Quality Field Data Sheet (concluded)

5.3.1 *Field Logbooks, Records, and Forms*

Each sampling or measurement team will be issued a bound logbook with consecutively numbered pages to record the results of each day's activities. All entries will be made in indelible ink. Corrections will be made by crossing through the incorrect entry with a single line, adding the correct entry, and initialing and dating the correction. Each page of the logbook will be signed and dated by the person making the entries and will be reviewed by a person other than the person making the entry to ensure that the entries are legible, understandable, and accurate. The reviewer will initial and date each page at the time of review. All logbooks will be issued and controlled by the Project Manager or Field Operations Leader through the use of a Field Document Control Log (see Figure 5).

All data entry forms or sample data records will also be completed in indelible ink and will be submitted to the Project Manager or Field Operations Leader at the end of each day's activities. These records will be reviewed for completeness and accuracy and will then be placed in the on-site project file, which will be kept locked in the field-office trailer when not in use by authorized personnel. Corrections will be made in the same manner as described above. Transfer of data to the forms or records at the end of the day is not permitted. The forms must be completed at the time the work is performed.

Data obtained directly from instrument output (i.e., strip charts) will also be checked for accuracy and then placed in the project files with access limited to authorized personnel.

5.3.2 *Data Management*

A microcomputer will be maintained in the field-office trailer for the entry of field data from data entry forms or data records. This entry will be performed by a qualified data entry technician who has been trained in the USATHAMA IRDMIS system. An example of data that will be entered in the field are geotechnical data and location data. A modem will be installed for transfer of field-entered data to the contractor's office where access to the IRDMIS has been established. Hard copy printouts of all entered data will be obtained and reviewed by the QA Coordinator for completeness and accuracy of entry.

All other field-generated data will be maintained in the main project file until submittal to USATHAMA (in the case of boring logs and well installation diagrams, etc.) or until project completion and transfer to USATHAMA.

5.4 *Equipment Decontamination/Cross-Contamination Prevention*

Equipment and tools used to sample and test field materials will be decontaminated prior to use, between uses, and at the end of use to prevent cross-contamination of samples. Decontamination procedures are described in Section 5.0 of the Sampling Design Plan (Volume II) and are also described in the USATHAMA Geotechnical Requirements (Appendix B of the Sampling Design Plan). It should be noted that the use of detergents and solvents in the decontamination of equipment is prohibited under USATHAMA requirements.

[illegible]

Drilling equipment or other large equipment requiring decontamination will be decontaminated using high-pressure steam cleaning in an appropriately contained area (e.g., a lined decontamination pad). A steel brush or stiff-bristled brush will be used to remove the major solid materials. The equipment will then be steam cleaned until no visible materials are present.

Other smaller equipment and equipment easily damaged by steam cleaning will be decontaminated by use of a portable decontamination station consisting of a wash pan containing clean USATHAMA-approved source water, followed by a second pan of clean water rinse (i.e., approved water), and a third pan and sprayer containing distilled water for a final rinse. The equipment will then be allowed to air dry. Where allowable, the cleaned equipment will be placed in sealable plastic bags or will be wrapped in aluminum foil to prevent contamination between sampling events.

Some equipment, such as pH probes, will be decontaminated by a distilled-water rinse followed by blotting dry with a clean lint-free tissue or paper towel to avoid damage. Instruments such as PIDs will be cleaned according to manufacturer's recommendations for cleaning.

Laboratory-equipment-decontamination requirements will vary according to the specific instrument and analytical technique.

6.0 GEOTECHNICAL REQUIREMENTS

Quality assurance procedures are also necessary for the collection of geotechnical data, although the requirements are not as stringent as those required for sample collection and subsequent laboratory analysis. These requirements are contained in the USATHAMA Geotechnical Requirements (Appendix B of the Sampling Design Plan). The main QA requirements deal with the proper documentation of data to be entered into the IRDMIS system and with the verification of the proper use of materials that can affect the quality of other data (i.e., well-construction materials that can affect results of chemical analyses).

6.1 Lithologic Logging

Proper lithologic logging is important in the interpretation of chemical and geochemical data, especially in the determination of contaminant fate and transport determinations. Lithologic logs will be generated for soil boring or well boring that fully describes the materials encountered. Lithology will be classified using the Unified Soil Classification System. A boring log (see Figure 6) will be produced that also documents the depth and ID number of any samples collected, the number of blow counts in the case of split-barrel sampling, the total depth of the boring, when water was encountered (if applicable), and any other pertinent information that might affect the interpretation of chemical data quality. These logs will be completed by a qualified and properly trained geologist and will be provided in original form to USATHAMA according to the delivery schedule shown in Appendix B of the Sampling Design Plan (Volume II).



Bore Log

Project Site _____

Site ID _____ Auger Size _____

Date/Time Started _____ Date/Time Completed _____

Surface Elevation (optional) _____ Water Level (from Ground Surface) _____

Completion Depth _____ Drilling Co. _____ Driller _____

Drilling Type _____ Sample Type _____ No. of Samples _____

Geologist/Logger & Co. _____

Figure 6. Example Bore Log

BORING LOG GENERAL DATA

Project:			Boring:			Page: 1 of					
Driller & Company:											
Geologist/Logger & Company:						Signature:					
Date Boring Started:					Completed:						
Water Levels (From Ground Surface)						Drilling Rig:					
First Encountered:					Date:						
While Drilling:					Date:						
At Boring Completion:						Date:					
Drilling Shifts:											
Date	Time		Depth of Drilling Per Shift		Date	Time		Depth of Drilling Per Shift			
	Start	End	Start	End		Start	End	Start	End		
<u>Abbreviations:</u> <table style="width: 100%; border: none;"> <tr> <td style="border: none; width: 150px;"><u>Abbr</u></td> <td style="border: none;"><u>Meaning</u></td> </tr> </table>					<u>Abbr</u>	<u>Meaning</u>	<u>Location Sketch:</u> <div style="border: 1px solid black; height: 100px; width: 100%;"></div>				
<u>Abbr</u>	<u>Meaning</u>										

Figure 6. Example Bore Log (continued)

BORING LOG (cont'd)


Project:		Boring:		Page: of	
Depth/ Eval.	USCS Symbol/ Core Sketch	Soil/Rock Description	Sample No. & Depth	Blow Count & Recovery	Drilling Data
					

Figure 6. Example Bore Log (concluded)

6.2 Drilling Procedures

Quality assurance is maintained during drilling by restricting the use of materials that could adversely affect the quality of other data collected in association with the drilling activity. This includes, but is not limited to, prohibiting the use of items such as oil and grease lubricants and certain drilling-mud additives, and specifying requirements for other drilling materials (i.e., grout, bentonite, sand) that must be used. These requirements are designed to prevent contamination due to drilling activities and to provide standardization for all drilling activities.

6.3 Monitoring Well Installation

Quality assurance is maintained for monitoring-well installations through use of approved well-completion materials and by carefully following established procedures. The following requirements are all designed to ensure consistency and quality of installations:

- Only USATHAMA-approved water sources may be used (see Figure 7).
- Once begun, well installation must be completed without breaks.
- Only USATHAMA-approved materials are to be used in well installation (see Figures 8 and 9).
- Only PVC or stainless-steel screen, casing, and fittings will be used; these must conform to NSF Standard 14 or ASTM equivalent ratings.
- All materials must be clean and free of foreign matter when installed.
- Silt traps will not be because they could influence analytical results.
- Only threaded joints may be used, and no gaskets are to be used.
- Filter pack and bentonite must be approved by USATHAMA prior to use.
- Proper protective casing with a locking cap and padlock is required to ensure security.

Other technical requirements must also be met in the completion of monitoring wells. All of these requirements are designed to ensure that the completed installation will be capable of yielding quality data.

6.4 Land Surveying

Accurate locations for data points are important for the interpretation of the corresponding measurement or analytical data. These locations allow the use of computer modeling of contaminant distribution, fate, and transport. A land survey will be conducted for selected grid locations and soil borings and at all monitoring-well locations where a licensed surveyor determines map coordinates using a standard system such as State Planar or Universal Transverse Mercator (UTM). The survey will be completed prior to the start of work in the case of grid systems, and as soon as possible after completion of work in the case of monitoring wells.



WATER APPROVAL REQUEST

Army Installation for Intended Use:

1. Water Source:

Owner:

Address:

Telephone Number:

2. Water Tap Location:

Operator:

Address:

3. Type of Source:

Aquifer:

Well Depth:

Static Water Level From Ground Surface:

Date Measured:

4. Type of Treatment Prior to Tap:

5. Type Of Access:

6. Cost Per Gallon Charged by Owner/Operator:

7. Attach results and dates of chemical analyses for past two years. Include name(s) and address(s) of analytical laboratory(s).

8. Attach results and dates of duplicate chemical analyses for project analytes by the laboratory certified by, or in the process of being certified by, USATHAMA for those analytes.

Figure 7. Example Water Approval Request Form



SUBMITTED BY:

Company:

Person:

Telephone Number:

Date:

USATHAMA APPROVAL/DISAPPROVAL:

(check one)

Project Officer:

A D

Project Geologist/Date:

A D

Project Chemist/Date:

A D

Figure 7. Example Water Approval Request Form (concluded)

BENTONITE APPROVAL REQUEST

Army Installation for Intended Use:

1. Bentonite Brand Name:
2. Bentonite Manufacturer:
3. Manufacturer's Address and Telephone Number:
4. Product Description (from package label or attach brochure):
5. Intended Use:

SUBMITTED BY:

Company:

Person:

Telephone:

Date:

USATHAMA APPROVAL/DISAPPROVAL:

(check one)

Project Officer/Date:

A D

Project Geologist/Date:

A D

Figure 8. Example Bentonite Approval Request Form

SAND APPROVAL REQUEST

Army Installation for Intended Use: South Tooele Army Depot

1. Sand Provider Name:

2. Provider Source of Sand:

3. Has Sand Been Washed:

4. Product Description:

5. Intended Use:

SUBMITTED BY:

Company:

Person:

Telephone:

Date:

USATHAMA APPROVAL/DISAPPROVAL:

(check one)

Project Officer/Date:

A D

Project Geologist/Date:

A D

Figure 9. Example Sand Pack Approval Request Form

Horizontal map coordinates will be surveyed to within ± 1 foot and vertical elevation will be surveyed to within ± 0.01 foot. Survey data will include loop closure for survey accuracy. A plot will be made showing the location of all permanent and semi-permanent reference marks used for horizontal and vertical control. They will also be described in the surveyor's log by name, character, and physical location.

Other sample and grid locations will be determined by the use of a compass and measuring tape with points measured from an established survey control or previously surveyed location (i.e., from the nearest monitoring well). Proper location-coordinate data are needed for entry into the IRDMIS.

7.0 SAMPLE CUSTODY PROCEDURES

To maintain the integrity of the samples, it will be necessary to demonstrate that the samples were kept under custody from the time they were collected to the time they were analyzed. Field samples must be stored in environmentally or, when allowable, non-environmentally controlled and locked containers or buildings when they are out of the direct control of the responsible custodian of the sample. COC records will be used to list all sample possession transfers. The document will show that the sample was in constant custody between collection and analysis. An example COC is shown on Figure 10.

Labels used for samples taken in the field and placards for transportation will be in accordance with USATHAMA requirements and the U.S. Department of Transportation (DOT) Code of Federal Regulations Title 49 CFR 171-179 and U.S. Environmental Protection Agency (EPA) regulations Title 40 CFR 263. This will ensure that not only will the samples be properly packaged for safe shipment to the laboratory, but will conform to all applicable laws and regulations governing safety.

COC protocols to be followed by the sampling crew are:

- Documentation of the type and amount of reagents added to the samples (these become part of the sample and may require special handling, packaging, and shipping).
- Recording of sampling locations, sample bottle identification, and specific sample analytical requirements on the appropriate forms.
- Documentation of all required information on each sample container.
- Completion of the COC in the field and inclusion of the sample shipping container. The person relinquishing the samples must sign, date, and note the time of sample transfer when giving the sample shipment to the qualified carrier.

All COC records will be completed in triplicate or quadruplicate. The original plus one additional copy will accompany the sample shipment to the laboratory. One or two copies will be maintained in the project records. The original COC form will be placed by the laboratory in the completed data package for each sample lot or shipment. The second copy will be maintained in a laboratory project file.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments and equipment used to obtain data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the acceptable manufacturer's specifications. Calibration of laboratory equipment will be based on the Laboratory's Standard Operating Procedure for each instrument and on USATHAMA calibration requirements.

8.1 Laboratory Calibrations

Calibration of instruments and equipment will be performed at specified intervals (as specified by the manufacturer or, more frequently, as conditions dictate). Calibration standards used as reference materials will be traceable to the Technical Institute of Standards and Technology when possible. If standards are prepared by the laboratory, the standards will be prepared to bracket the certified range of the analytical method (i.e., one sample 10 percent less than the Certified Reporting Limit (CRL) and one 10 percent greater than the CRL). Detailed calibration procedures and frequencies are contained in the USATHAMA QAP. All laboratories that are certified by USATHAMA have met the requirements for having the proper calibration procedures in their system. Copies of all calibration records will be on file at the laboratory performing the work and will be available for inspection.

8.2 Field Instrument Calibrations

Each piece of field sampling or measuring equipment requiring calibration will be calibrated prior to each day's use and more frequently during the day as required. Calibrations will be performed according to manufacturer's recommendations and procedures. A calibration logbook will be kept for each instrument requiring daily calibration. Included information should be the instrument brand, model number, and identification number. Also included should be the type, concentration, and certification number (if available) of any standards used. A plot of calibration results will also be maintained. This plot will be used to determine if equipment contamination or failure is occurring. Early diagnosis of equipment problems is essential in maintaining quality data. Since specific equipment and model numbers will be available at the time field investigation activities are to begin, copies of the calibration procedures will be incorporated into the Sampling Design Plan at that time.

In general, the key to obtaining proper calibration of the instrument is to keep the instrument free from contamination through protective measures (i.e., covering with plastic) or through proper cleaning. Also, instruments are often sensitive to changes in temperature and humidity. If instruments are operated under adverse conditions (e.g., rain, below freezing temperatures), the conditions should be noted in both the calibration record and the field-measurement logs. Any instrument failing to pass a calibration will be rechecked, cleaned, or adjusted as necessary, and checked again until it passes the calibration. If the instrument continues to fail calibration, tag it with "Do Not Use" and return it to the manufacturer for repair. For any field effort, it is essential that backup equipment is available to avoid lengthy delays due to equipment failure.

All instruments used for the RI at JPG will have Standard Operating Procedures with the instrument, which include the detailed procedure for calibration of the instrument and operation of the instrument. These procedures will be available for inspection.

9.0 ANALYTICAL PROCEDURES

9.1 Analytical Parameters

On the basis of a review of previous investigation findings, installation historical records, and suspected contaminants based on each operation performed at JPG, a list of analytical parameters required for the RI was prepared as shown in Table 2. This list is presented in Section 7.0 of the Sampling Design Plan (Volume II).

Table 2. Analytical Parameters Required for the Remedial Investigation

Parameter	Method	Matrix
Volatile Organic Compounds	GC/MS ^a	Water/Soil
Semi-Volatile Organic Compounds	GC/MS	Water/Soil
TCLP Metals	ICP/SIM ^b	Water/Soil
Mercury	CVAA ^c	Water/Soil
Silver	AA ^d	Water/Soil
Lead	GFAA ^e	Water/Soil
Explosives	HPLC ^f	Water/Soil
Anions	IC ^g	Water
Herbicides	HPLC	Water/Soil
Total Petroleum Hydrocarbons	IS ^h	Water/Soil

^aGas Chromatography/Mass Spectrometry.

^bMultiple Element Inductively Coupled Argon Plasma Spectrometry.

^cCold Vapor Atomic Absorption Spectroscopy.

^dAtomic Absorption Spectroscopy.

^eGas Furnace Atomic Absorption Spectroscopy.

^fHigh Performance Liquid Chromatograph.

^gIon Chromatography.

^hInfrared Spectroscopy.

9.2 Laboratory Certification

Analyses will be performed only by a laboratory certified under the USATHAMA QA program. The QA Coordinator will review the laboratory's certification records prior to the start of work to confirm that the certifications are current and valid. For any analyses for which a USATHAMA certification does not exist, EPA CLP, or SW-846 methods will be used.

9.3 Laboratory Control Program

A laboratory QCP will be required of the subcontract laboratory prior to the start of work. This Plan will accompany this QCP.

9.4 Analytical Holding Times

Maximum holding times are presented in Table H-1 of the USATHAMA QAP for each analytical parameter to be used at JPG. These holding times will be strictly adhered to and the laboratory workload should be arranged to maximize sample analysis and meeting sample-holding times. This will require coordination between the contractor QA Coordinator and the laboratory Quality Control Manager on the basis of anticipated sampling and shipping schedule.

10.0 DATA REDUCTION, INTERPRETATION, VALIDATION, AND REPORTING

Data reduction is the process of converting measurement-system outputs to a common or consistent format or unit of measurement, which allows the comparison of "like" data. Documentation will be provided to fully interpret the data, as well as protect it against scientific challenges. Field variance logs, internal review records, field and laboratory records of tests and analyses, field logs, COC records, reports, computer files and codes, programs, and printouts will all be designed to eliminate errors during data entry and reduction. If the reduction of data requires complex mathematical calculations, the computer programs used for this reduction will be QA verified by running a set of test data whereby the results are known. Calculation steps will be described in the technical and analytical procedures or software listings. Routine data-transfer and entry-validation checks will be performed. Also, audits will be performed on calibration results, data packages, and data records. This may include independent checking of calculations.

10.1 Data Validation

The USATHAMA IRDMIS provides a means for validation. All data that are properly formatted to the IRDMIS are entered into a Level I file. Examples of files produced for JPG include the following:

- GMA - map files
- GFD - field drilling files
- GWC - well construction
- GGS - water-level
- CGW - groundwater analyses
- CSO - soil analyses
- CSW - surface water analyses
- CSE - sediment analyses

Validation/acceptance of the data will be performed by USATHAMA through IRDMIS software, and a review by the contractor QA Coordinator will be performed on hard-copy

file data versus the original field or laboratory records for accuracy, completeness, and reasonableness. The laboratory will also submit QC results to USATHAMA for validation. Once these initial activities have been completed, the files will enter Level 2 in the IRDMIS.

A weekly or monthly progress report will be prepared that lists the files submitted to USATHAMA, the date submitted, and the status of the files. For files where data are missing, a summary of proposed actions will be included to obtain or correct the incomplete files. The laboratory will maintain a tracking system for the files they produce, which will include a listing of sample lots, ID numbers, date received, date analyzed, and date entered into the IRDMIS system. This will allow the laboratory to track the sample from receipt to Level 3 in the IRDMIS.

The contractor will have direct access to the IRDMIS system. The subcontract laboratory will access the contractor's system. All transfers of data to IRDMIS will be made through the contractor to allow a review of the data files prior to transfer.

Following the validation of the data, the contractor data management personnel will execute a PCTool "Record Check" and "Group Check" software program supplied by USATHAMA to verify that the data entry is complete and correctly formatted. Audit reports will be reviewed by the QA Coordinator on a weekly basis. Verified Level 1 data may contain error files. These files will also be reviewed by the QA Coordinator and data-management personnel for resolution and resubmittal of corrected files.

All data files will be submitted according to the delivery schedule specified by USATHAMA as shown in Table 3.

Table 3. Delivery Schedule for Data Files as Specified by USATHAMA

File	Due Date
GMA	NLT 14 days after work completion
GGs	NLT 7 days after last measurement
GFD, GWC	NLT 30 days after last installation
CGW, CSO, CSE, CSW	NLT 40 days after collection

The IRDMIS system is designed for accepting or rejecting analytical data on the basis of the data being within specified control limits and ranges for each certified analytical method and parameter. This includes such things as range of analytes, standard additions for determining matrix interferences, tracers, replicate analysis, control samples, or cation/anion balance.

10.2 Reporting Limits

The analytical laboratory will report only those data that fall within the certified range established by USATHAMA during the method certification process. These reporting limits will vary between instruments and laboratory contractors. If results exceed the certified

reporting limits, the laboratory may run a series of dilutions to bring the concentration to within the limits. Results below these limits will be identified as less than a certified reporting limit.

11.0 INTERNAL QUALITY CONTROL CHECKS

11.1 Field Quality Assurance

11.1.1 Trip Blanks

Trip Blanks are necessary to assess the potential for the contamination of samples with VOCs as a result of sampling or shipping activities. This sample consists of a VOC sample container, which is shipped to the site with other VOC containers filled with reagent water. A trip blank will be sent back to the laboratory with each shipment of samples scheduled for VOC analysis. The trip blank will be analyzed for VOCs with the other VOC samples.

11.1.2 Equipment Blanks

Equipment blanks will be collected to assess the effectiveness of decontamination procedures employed in the field. One equipment blank will be collected for each 20 samples collected during each sampling event. Following decontamination of water sampling equipment and/or soil-sampling equipment, a rinsate sample will be taken from rinse water (approved source) passed through or over the sampling equipment. These samples will be collected from a portion of the equipment that contacted potentially contaminated materials.

11.1.3 Field Duplicates

A field duplicate will be collected for every 20 samples as a check on the repeatability of results as an indication of the ability of the sampling procedure to produce representative samples.

11.2 Laboratory Quality Control

11.2.1 Quality Control Batching

Samples will be analyzed by lot. A lot is the maximum number of samples, including QC samples, that can be manually processed through the rate-limiting step of the method during a 24-hour period. Typically, a lot will consist of a maximum of 20 samples. The following lists the number and concentrations of QC samples to be analyzed for every lot according to method class:

CLASS 1

- 1 - Standard Matrix Method Blank
- 3 - Standard Matrix Spikes (approx. 2, 10 & 10 CRL)
- 1 - Standard Matrix Spike - Extended range or 100 CRL or near method max.

CLASS 1A

1 - Standard Matrix Method Blank/Spike
(0 CRL non-surrogate, 10 CRL surrogate, all-natural matrix spikes, 10 CRL surrogate)

CLASS 1B

1 - Standard Matrix Method Blank
1 - Standard Matrix Spike (approx. 10 CRL)

CLASS 2

1 - Standard Matrix Method Blank
1 - Standard Matrix Spike (1 CRL)
1 - Standard Matrix Spike - Extended range (110 CRL or near method max.)

11.2.2 Standards and Surrogates

Standard and surrogate compounds to be used are identified in the certification requirements for each method. Specifications for these standards specify the degree of purity required (i.e., > 99.5 percent).

11.2.3 Control Charts

Control analytes are specified for each certified USATHAMA method. From these control analytes, control limits will be established. From the analysis of these control analytes, control charts will be maintained. The minimum number of required in-control data values per lot are specified (i.e., two-thirds of the control analytes) in the USATHAMA QAP. If a system is found to be out of control, the laboratory must investigate the problem and the system may require repair or recalibration.

The following control charts are generated by the laboratory:

- Single-Day X-Bar Control Chart - High Spike Concentration
- Single-Day Range Control Chart - High Spike Concentration
- Three-Day X-Bar Control Chart - Low Spike Concentration
- Three-Day Range Control Chart - Low Spike Concentration

11.3 Data Sheets

Daily review of all field-data sheets will also be an internal check of data quality. Data will be reviewed for completeness and accuracy of entry. If the data are to be transferred to a data base, the data-base output will be checked against the original data sheet for accuracy in data entry.

12.0 PERFORMANCE AND SYSTEM AUDITS

12.1 Scope

Performance and system audits of field and laboratory activities will be performed prior to and during the project to ensure the quality of the data. The audits will cover all systems and procedures identified for each work task and will be performed during the work to allow the identification and early correction of deficiencies in the system (i.e., improper or incomplete procedures).

The System Audit will evaluate the adequacy of the systems (i.e., procedures, equipment, and personnel) to collect and provide data of known and acceptable quality. The System Audit will be performed early in project activity. The audit will describe any deficiencies observed in the system and will make recommendations on corrective action required to improve the system.

A Performance Audit (i.e., surveillance) will be done later in the project and will verify that the procedures identified for the work tasks are being properly implemented and followed.

12.2 Audit Personnel

Personnel assigned to perform the audits will be experienced Quality Assurance personnel and qualified technical personnel. The Quality Assurance personnel will lead the audits and the technical personnel will assist. Technical personnel will be selected largely on the basis of their knowledge of the systems and procedures being audited.

12.3 Audit Procedure

For each system of performance audit, a pre-audit checklist will be prepared like the audit checklist presented in the USATHAMA QAP (see Appendix A, this plan). This checklist will provide the audit team a list of project, site, or activity-specific requirements that must be met in order to ensure that quality data are being collected. These requirements may include:

- Whether instruments and equipments selected meet the requirements of the project objectives.
- Whether personnel meet the requirements of skill, responsibility, and training required for a specific activity for which they are assigned.
- Whether procedures specified are adequate and are being followed.
- Whether the calibration procedures are being followed and the results are within the specified limits.
- Whether health and safety procedures are adequate for the job being performed and the procedures are being properly implemented.

These audits will likely include members of the USATHAMA QA staff. A copy of the pre-audit checklist will be presented to the USATHAMA Project Officer providing project oversight prior to the audit(s).

An audit of the subcontract laboratory will be made prior to the start of work at JPG. This audit will ensure that all of the proper certifications are in place, that Standard Operating Procedures are in place, that the equipment available is adequate for the sampling and analysis program proposed, that the laboratory QA/QC program is complete and in

compliance with USATHAMA requirements, and that the proper qualified and trained personnel are available to perform the work.

12.4 Audit Report

A written report, which will provide a summary of any audit findings, a list of problem areas requiring corrective action, recommendations for improving or correcting any problems identified, and a timetable for any corrective action required, will be prepared following the audit(s). This audit report will be prepared by the contractor QA Coordinator with input from any other appropriate audit team member, including USATHAMA personnel. The report will be distributed and reviewed by the appropriate USATHAMA Quality Assurance staff, the Project Director, the Project Manager, and the Field Operations Leader.

A follow-up response to any items where corrective action was required will be prepared by the QA Coordinator. This response will indicate what corrective action was performed and the resulting affect of this action on data quality.

13.0 PREVENTATIVE MAINTENANCE

Equipment, instruments, tools, gauges, and other items required to perform work tasks both in the field and the laboratory that require preventative maintenance will be serviced in accordance with the manufacturer's recommendations and instructions.

Technical procedures will identify the manufacturer's instructions for purging and cleaning the equipment prior to, during, and after use.

The laboratory will maintain a maintenance schedule for servicing critical items in order to minimize the downtime of measurement systems and to arrange for service as required.

Preventative maintenance will be performed on equipment according to manufacturer's recommended maintenance schedule. Where possible, critical spare parts will be maintained and replaced prior to equipment failure (e.g., lamps for PIDs). These spare parts will be stored in the on-site field storage area to minimize downtime. An adequate supply of tools will also be maintained at the site.

14.0 ASSESSMENT OF DATA QUALITY

The purpose of data quality assessment is to ensure that data generated under the RI at JPG are accurate and consistent with project objectives. The timely assessment of data quality

can also save costly resampling and analysis by finding and correcting problems while personnel and equipment are still available at the site.

Data assessment procedures used to evaluate accuracy, precision, completeness, representativeness, and comparability are as follows:

- Accuracy is the nearness of a measurement or the mean (\bar{x}) of a set of measurements to the true value. Accuracy is assessed by means of reference samples and percent recoveries.
- Precision is the agreement between a set of replicate measurements without assumptions or knowledge of the true value. Precision is assessed by means of duplicate/replicate sample analysis.
- Completeness is the measure of the amount of valid data obtained from a measurement system compared to the amount that was expected under normal conditions. Sample completeness will be evaluated after results from each sampling round are returned. The target for data completeness is 90 percent.
- Representativeness is the term that represents the degree to which a measurement of a subject of a population (e.g., a specific sample from a specific location within a site) is characteristic of the population as a whole. This will be assessed by comparison of "like" data from location to location to determine if they appear to be representative or an anomaly.
- Comparability of data is ensured through the use of standard analytical methods with demonstrable equivalency in terms of method performance criteria and equivalent reported units.

Data quality assessment will begin with the proper selection of sampling and measurement equipment on the basis of their ability to achieve the project objectives. An example might be the selection of the proper geophysical technique for identifying shallow buried objects. Many techniques may be eliminated on the basis of geologic conditions, hydrologic conditions, etc.

During the actual data-collection phase of the project, results will be assessed to determine if the results are adequate for the objective of the project. This assessment may be made by comparing results to specified standards (i.e., drinking water standards) or through review of results from performance audits, QC sample results, and data completeness reviews.

After the completion of the project, all data collected will be assessed for quality using the previously defined techniques for assessing accuracy, precision, and completeness. This assessment will be completed by personnel specifically responsible for the evaluation of data for specific uses. This might include the assessment of hydrologic data by the project hydrologist or assessment of contaminant distribution by a toxicologist. The QA Coordinator will assess the data from the standpoint of meeting QA/QC criteria for being within established control limits, etc.

Laboratory data will be assessed for accuracy, precision, and completeness through the validation process of the USATHAMA IRDMIS. The data must meet all of the data-acceptance criteria before being advanced to Level 2.

15.0 CORRECTIVE ACTION

Corrective action may be required when a potential or existing condition is identified that may adversely affect the quality of the data collected. A nonconformance and corrective action program will be provided to discern, identify, and correct errors and defects at any point in the project-implementation process. The data-validation activities and Performance and System Audits may identify some of the key errors or deficiencies. Deficient data will be tallied; documentation of the results of corrective actions will be maintained; and causes will be eliminated prior to continuing work.

15.1 Nonconformance Reporting

A nonconformance is defined as a malfunction, failure, deficiency, or deviation that renders the quality of an item as unacceptable or indeterminate. The nonconformance program pertains to all field equipment, measurements, and activities associated with the collection of data needed to fulfill project requirements. Any contractor employee can originate a nonconformance report. Use of the report, however, should be restricted to items that make data unacceptable. Minor variations or deviations may be recorded in the individual field logbooks by the person noting the problem. This information will also be used to assess the quality and validity of data. An example of a Nonconformance Report form is shown in Figure 11.

The nonconformance report will be used to document results that are out of control of established quality-control limits due to equipment malfunctions, equipment failure, operator error, or other conditions that adversely affect the data quality (i.e., use of contaminated equipment). The originator of the report will document the nature and extent of the problem identified (i.e., the number of measurements or samples likely to be affected). The report will be given to the Field Operations Leader, Project Manager, or the QA Coordinator. All reports will be reviewed by the QA Coordinator, who will then coordinate the proper disposition of the nonconformance. The equipment, item, or activity in question will be stopped while the nonconformance is investigated. If the nonconformance is found to not significantly affect the data quality, the work may continue at the direction of the QA Coordinator and Project Manager. All reports will be maintained in the project files pending resolution. A copy of all nonconformance reports will be sent to the USATHAMA Project Officer.

Data generated by analytical laboratories will also be monitored for out-of-control situations. All out-of-control situations requiring corrective action will also be placed in a report, which will be distributed to contractor QA Coordinator, Laboratory QA Manager, and the appropriate USATHAMA QA personnel.

15.2 Corrective Action

If corrective action is required to correct problems identified through the nonconformance reporting system, through QA audits, or through laboratory QC reports, the proposed corrective action must be reviewed and approved by the QA Coordinator, Project Manager, or Field Operations Leader and, when necessary, the appropriate USATHAMA

		Nonconformance Report		13. NCR No.:	
				Page 1 of ____	
1. Purchase Order Number:		2. Title or Subject		3. Document No. or Title Revision	
4. Project, Program, or Activity		5. Supplier Name/Address		6. Job No. or ID No.	
7. Item	8. Description of Nonconformance		14. Disposition/Justification Instructions		
9. Probable Cause of Condition					
10. Recommended Action to Correct					
11. Originator's Signature or Name Date					
12. QA Coordinator Signature Date					
15. Design Document Change Required?		16. Reportable As An Event?		17. Corrective Action Required?	
<input type="checkbox"/> Yes (Document No. _____) <input type="checkbox"/> No		<input type="checkbox"/> Yes (Report No. _____) <input type="checkbox"/> No		<input type="checkbox"/> Yes (Specify _____) <input type="checkbox"/> Yes (CAR No. _____) <input type="checkbox"/> No	
Approval	18. Technical Representative	Date	Signature	Date	Signature
	QA Coordinator	Date	Signature	Date	Signature
Close Out	19. <input type="checkbox"/> Disposition Completed As Directed				
	<input type="checkbox"/> Other (Specify): _____ <div style="text-align: right;">Originator or QA Coordinator</div>				
Distribution	20. Action				
	Information Copies				

Figure 11. Example Nonconformance Report Form

representative. The corrective action, once initiated, will be tracked and reviewed by the QA Coordinator with a Field Corrective Action Report (see Figure 12) for evidence that the data or activity is within established control limits. Failure to demonstrate that the corrective action is effective will result in work stoppage until the problem is corrected. In the case of laboratory data, the laboratory may be requested, when possible, to run the analyses in question until acceptable data are obtained. This will not be possible, however, for samples with short holding times. In this case, additional samples may be required to be collected (when practical).

A report of all nonconformance and out-of-control items that required corrective action will be prepared including a statement of the nature of the problem, solutions identified for the problem, corrective action taken, and the overall results of the action on data quality. These reports will be sent to the appropriate contractor management personnel and USATHAMA representatives. If the corrective action required modification of existing procedures, the procedures will be revised and all applicable personnel will be trained on the procedure as modified.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

16.1 Field-Generated Reports

A number of data quality-related reports and records will be produced in the completion of the various field activities at JPG. These reports and records will be reviewed by the QA Coordinator and Project Manager and will be kept in a QA/QC file in the field-office trailer. These reports include:

- Instrument Calibration Records
- Field Readiness Review Meeting Records
- Personnel Training Records
- Nonconformance Reports
- Field Audit and Surveillance Reports
- Corrective Action Reports
- Standard Operating Procedures
- Project Work Plan Documents

16.2 Laboratory-Generated Reports

A number of laboratory-generated reports will be provided to the QA Coordinator and USATHAMA QA personnel (Chemistry Branch). These include:

- Hard copy of Control Charts
- Report on Out of Control Situations
- Report on Corrective Actions
- Results of System Audits
- Certification Packages (as requested)
- Weekly QC Sample Results Report

QUALITY ASSURANCE/ QUALITY CONTROL		Ref:
Field Corrective Action Report		Site Number:
		Matrix:
FIELD OPERATIONS LEADER (print name):		
Comments:		
Signature:		Date:
SAMPLER (print name):		
Comments:		
Signature:		Date:
QUALITY ASSURANCE (print name):		
Comments:		
Signature:		Date:
MANAGEMENT (print name):		
Comments:		
Signature:		Date:

CNES FORM QACA-291

Figure 12. Example Field Corrective Action Report Form

17.0 REFERENCES

U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), 1987. Geotechnical Requirements for Drilling, Monitoring Wells, Data Acquisition, and Reports; Aberdeen Proving Ground, Maryland.

USATHAMA, 1988. Installation Restoration Data Management User's Guide - Version 86.6; U.S. Army AMCCOM Scientific Computer Center.

USATHAMA, 1990. Quality Assurance Program; PAM 11-41, Rev. 0, Aberdeen Proving Ground, Maryland.

U.S. EPA, 1986. Test Methods for Evaluating Solid Waste; SW-846, Third Edition, November, 1986.

U.S. EPA, 1986. User's Guide to the Contract Laboratory Program.

U.S. EPA, 1988. Guidance for Conducting Remedial Investigation and Feasibility Studies under CERCLA; EPA/540/G-89/004 (OSWER Directive 9355.3-01).

APPENDIX A
AUDIT CHECKLISTS

LABORATORY AUDIT CHECKLIST

EVALUATED LABORATORY

SUBJECT PROJECT

QC Coordinator _____

Analytical Task Manager _____

Project Manager _____

Project Officer _____

Evaluator _____

Evaluation Date _____



AUDIT CHECKLIST

YES NO COMMENT

PRE-AUDIT

1. Notified laboratory
2. Notified project officer
3. Made travel arrangements
4. Reviewed background information/
data
5. Requested laboratory to have data/
methods/personnel available
6. Prepared agenda

IN-BRIEFING

7. Introduced participants
8. Described goals and objectives of
audit/agenda
9. Identified specific areas for
review that could require some
laboratory preparation
10. Discussed general overview/status
on project
11. Discussed problem areas



YES NO COMMENT

GENERAL

12. a. Has detailed Project QC Plan (QAPjP) been submitted?
- b. Has individual been appointed as QAC who is independent from analysis?
- c. Have sufficient facilities, personnel, and instrumentation been provided to perform the required analyses?
- d. Does the QAC have the resources to function effectively?
- e. Are chemicals and reagents of sufficient quality so as not to compromise the analytical system?
- f. Is housekeeping commensurate with analytical techniques?
- g. Has a training plan been developed and training been documented?
- h. Is the correct version of USATHAMA supplied software being used?



AUDIT

YES

NO

COMMENT

13. Samples chosen to follow through laboratory:

Inorganic

Organic

14. Sample receiving:

- a. Are procedures/SOPs available?
- b. Are samples checked upon receipt?
- c. Is the sample checking documented?
- d. Is area secure?
- e. Are chain-of-custody forms filed?
- f. Are internal chain-of-custody forms generated?
- g. Are samples logged in according to SOP?
- h. Are USATHAMA numbers assigned?
- i. Are numbers allocated for QC samples?



AUDIT (cont)YESNOCOMMENT

j. Are samples stored in refrigerator until needed?

k. Is the temperature of refrigerator monitored?

l. Is there a sign-out system for samples?

m. Are VOA samples isolated from other samples?

15. Inorganics Section:

a. Are logbooks kept for:

Digestion?

Analysis?

Instrument maintenance?

Standard preparation?

b. Are logbooks identified with unique number?

c. Are pages of logbooks numbered?

d. Are reagents/solvents/acids checked for purity, etc.?



<u>Inorganics (cont)</u>	<u>YES</u>	<u>NO</u>	<u>COMMENT</u>
--------------------------	------------	-----------	----------------

e. Are standards stored correctly?

f. Is inventory of standards maintained?

g. Are standard solutions labelled with date prepared?

h. Are solution validity checks documented?

i. Are standards traceable from receipt to use?

j. Are samples maintained and stored according to SOP?

k. Are procedures in place to minimize cross contamination?

l. Are samples analyzed according to certified methods?

m. Are results of analyses stored in data packages?

16. Organics Section:

a. Are logbooks kept for:

Extraction?

Analysis?

Organics Section (cont)YESNOCOMMENT

Instrument Maintenance?

Standard preparation?

- b. Are logbooks identified with unique number?
- c. Are pages in logbooks numbered?
- d. Are reagents/chemicals checked for purity, etc.?
- e. Are standards stored correctly?
- f. Is an inventory of standards maintained?
- g. Are standard solutions labelled with date prepared?
- h. Are solution validity checks documented?
- i. Are standards traceable from receipt to use?
- j. Are samples maintained and stored according to SOP?
- k. Are procedures in place to minimize cross contamination?



<u>Organics (cont)</u>	<u>YES</u>	<u>NO</u>	<u>COMMENT</u>
------------------------	------------	-----------	----------------

- | | | | |
|--|--|--|--|
| l. Is tuning of GC/MS performed and documented every 12 hours? | | | |
| m. Are samples analyzed according to certified methods? | | | |
| n. Are results of analyses stored in data packages? | | | |
| 17. Method selected is performed according to written certified method? | | | |
| 18. Have problem areas been discussed and corrective actions reviewed/recommended? | | | |
| 19. Data Management: | | | |
| a. Data packages prepared for each lot of analysis? | | | |
| b. Data packages readily available for review? | | | |
| c. Representative data packages from each method reviewed? | | | |
| d. Data package checklists included in each package? | | | |
| Filled out correctly? | | | |
| e. Notebook pages signed and dated? | | | |

Data Management (cont)YESNOCOMMENT

f. Computer print-outs readily identified?

g. Data processing according to SOPs?

h. Data transmittal to USATHAMA according to SOPs?

20. Has data been validated according to USATHAMA internal SOP?

OUTBRIEFING

21. Summary given on findings, observations, conclusions reached?

22. Responded to laboratory questions/concerns?

23. Provided forum to rectify differences between laboratory staff and audit team?

24. Identified deficiencies and offered assistance in their correction?

25. Copy of completed audit checklist provided to laboratory?

26. Discussed future goals and objectives?



FIELD SAMPLING CHECKLIST



FIELD CHECKLIST

Signature of Auditor _____ Date of Audit _____

Project Coordinator _____ Project No. _____

Project Location _____

Type of Investigation _____
(Authority, Agency)

Briefing with Project Coordinator

Yes ☐ No ☐ N/A ☐1. Was a project plan prepared? If
yes, what items are addressed in the plan?_____

_____Yes ☐ No ☐ N/A ☐2. Were additional instructions given to
project participants (i.e., changes in project
plan)? If yes, describe these changes._____

_____Yes ☐ No ☐ N/A ☐3. Is there a written list of sampling
locations and descriptions? If yes, describe
where documents are._____

_____Yes ☐ No ☐ N/A ☐4. Is there a map of sampling locations? If
yes, where is the map?_____

_____Yes ☐ No ☐ N/A ☐5. Do the investigators follow a system of
accountable documents? If yes, what
documents are accountable?_____

_____

Revision No. 0Yes ☐ No ☐ N/A ☐

6. Is there a list of accountable field documents checked out to the project coordinator? If yes, who checked them out and where is this documented?

Yes ☐ No ☐ N/A ☐

7. Is the transfer of field documents (sample tags, chain-of-custody records, logbooks, etc.) from the project coordinator to the field participants documented? If yes, where is the transfer documented?

Yes ☐ No ☐ N/A ☐

8. Have the team members received the adequate training for their position? Documented?

Yes ☐ No ☐ N/A ☐

9. Have the team members received the required number of hours of OSHA training.



FIELD CHECKLIST

FIELD OBSERVATIONS

Yes ☐ No ☐ N/A ☐

1. Was permission granted to enter and inspect the facility (required if RCRA inspection)?

Yes ☐ No ☐ N/A ☐

2. Is permission to enter the facility documented? If yes, where is it documented?

Yes ☐ No ☐ N/A ☐

3. Were split samples offered to the facility? If yes, was the offer accepted or declined?

Yes ☐ No ☐ N/A ☐

4. Is the offering of split samples recorded? If yes, where is it recorded?

Yes ☐ No ☐ N/A ☐

5. If the offer to split samples was accepted, were the split samples collected? If yes, how were they identified?

Yes ☐ No ☐ N/A ☐

6. Are the number, frequency and types of field measurements, and observations taken as specified in the project plan or as directed by the project coordinator? If yes, where are they recorded?



Revision No. 0Yes ☐ No ☐ N/A ☐

7. Are samples collected in the types of containers specified for each type of analysis? If no, what kind of sample containers were used?

Yes ☐ No ☐ N/A ☐

8. Are samples preserved as required? If no or N/A, explain.

Yes ☐ No ☐ N/A ☐

9. Are the number, frequency, and types of samples collected as specified in the project plan or as directed by the project coordinator? If no, explain why not?

Yes ☐ No ☐ N/A ☐

10. Are samples packed for preservation when required (i.e., packed in ice, etc.)? If no or N/A, explain why.

Yes ☐ No ☐ N/A ☐

11. Is sample custody maintained at all times? How?

Yes ☐ No ☐ N/A ☐

12. Is the following information completed on each chain-of-custody record?

- Sample identification number;
- Sample collector's signature;
- Date and time of collection;
- Place and address of collection;
- Waste sample description;
- Shipper's name and address;
- Name and address of organization(s) receiving sample;



- Signatures and titles of persons involved in chain-of-possession; and
- Inclusive dates of possession for each possession.

Yes ☐ No ☐ N/A ☐

13. Does a sample analysis sheet accompany all samples on delivery to the laboratory sample custodian?

Yes ☐ No ☐ N/A ☐

14. At the minimum, has the following information been completed on each sample analysis request sheet?

- Name of person receiving sample (sample custodian);
- Laboratory sample number;
- Date of sample receipt;
- Sample allocation;
- Analyses to be performed;
- Collector's name, affiliation name, address, and phone number;
- Date and time of sampling;
- Location of sampling; and
- Special handling and/or storage requirements.

Yes ☐ No ☐ N/A ☐

15. Has a field custodian been assigned for sample recovery, preservation, and storage until shipment?

Yes ☐ No ☐ N/A ☐

16. Where applicable, are sample collection containers rinsed three times with the sample material prior to collection?



Revision No. 0Yes ☐ No ☐ N/A ☐

17. Are glass containers with Teflon-lined screw caps used to collect the following types of samples?

- Water samples for organic analyses?
- Soil and sediment samples?
- Liquid and solid hazardous waste samples (*)?

Yes ☐ No ☐ N/A ☐

18. Are polyethylene bottles with solid polyethylene-lined caps used to collect the following types of samples?

- Water samples for metal analysis?
- Water samples for pH and fluoride analysis?
- Water samples for cyanide analysis?

Yes ☐ No ☐ N/A ☐

19. Are amber glass or aluminum foil-wrapped glass bottles used for samples suspected of being photosensitive?

* Highly alkaline wastes and wastes known to contain hydrofluoric acid should be collected in plastic containers. If it is suspected that highly alkaline materials or hydrofluoric acid is present, a small sample should be tested to determine if it reacts with the sample container.



QUALITY ASSURANCE/QUALITY CONTROL
SAMPLE DOCUMENTATION AND CHAIN-OF-CUSTODY

Yes ☐ No ☐ N/A ☐

1. Is the following information being recorded
in the field log book or on data sheets?

- Project name and project number;
- Purpose of sampling (e.g., quarterly sampling, resample to confirm previous analysis, initial site assessment, etc.);
- Date and time each sample was collected;
- Date and starting/stopping times (Hr:Min) for air samples;
- Date and well bailing time for groundwater;
- Blank, duplicate and split sample identification numbers;
- Sample description including type (i.e., soil, sludge, groundwater, etc.);
- Field measurement results (i.e., conductivity, pH, dissolved oxygen, combustible gas (e.g., LEL), radioactivity, etc.);
- Preservation method for each sample;
- Type and quantity of containers used for each sample;
- Weather conditions at time of sampling;
- Photographic log identifying subject, reason for photograph, date, time, direction in which photograph was taken, number of the picture on the roll;
- Sample destination;
- Analyses to be performed on each sample;
- Reference number from all forms on which the sample is listed or labels attached to the sample (i.e., chain-of-custody, bill of lading or manifest forms, etc.);
- Name(s) of sampling personnel; and
- Signature of person(s) making entries on each page.



Yes ☐ No ☐ N/A ☐

2. Is a chain-of-custody record completed for all samples collected?



CHECKLIST FOR MECHANICALLY CORED SAMPLES

Yes ☐ No ☐ N/A ☐

1. Was the rig set up at a staked and cleared borehole location?

Yes ☐ No ☐ N/A ☐

2. Was the location, date, time, and other pertinent information recorded on boring log form?

Yes ☐ No ☐ N/A ☐

3. Was polybutyrate core tubes cut to specification and placed into core barrel?

Yes ☐ No ☐ N/A ☐

4. Was augering and coring conducted according to the following sequence: 0-1 ft, 1-4 ft, 4-5 ft, 5-9 ft, and 9-10 ft, etc.?

Yes ☐ No ☐ N/A ☐

5. Was the core barrel removed from the borehole and opened at the completion of each coring interval?

Yes ☐ No ☐ N/A ☐

6. Was the 12-inch sections for laboratory analysis removed, capped with Teflon film lined plastic caps, sealed with tape, and immediately placed in a cooler?



Yes ☐ No ☐ N/A ☐

7. Were core sections which were previously etched length-wise taped with plastic caps to prevent opening during transport to the support facility?

Yes ☐ No ☐ N/A ☐

8. Were the polybutyrate line sections marked with an arrow to the top end, the boring number, and depth interval? Was a label giving the same information as well as the project name, number, the date, and the sampler's initials attached to the core in the sample handling trailer or at the site?

Yes ☐ No ☐ N/A ☐

9. Were clean polybutyrate liners placed in a clean core barrel for each additional coring increment to be drilled?

Yes ☐ No ☐ N/A ☐

10. Did the boring reach a predetermined depth or encounter the water table, whichever came first?

Yes ☐ No ☐ N/A ☐

11. For trench disposal areas was the coring performed to the maximum depth of observable contamination?

Yes ☐ No ☐ N/A ☐

12. Were all core sections transported to the support facility for logging and sample shipment preparation?



Yes ☐ No ☐ N/A ☐

13. Was the boring stake left in the ground adjacent to the borehole and a board placed over the hole until it was grouted?

Yes ☐ No ☐ N/A ☐

14. Were all boreholes greater than 1 ft in depth grouted the same day of construction and the borehole location stake placed in the grout?

Yes ☐ No ☐ N/A ☐

15. Were one foot deep borings backfilled with native materials available adjacent to the boring?

Yes ☐ No ☐ N/A ☐

16. Were the augers, and other downhole equipment decontaminated in the field prior to moving to the next borehole location upon completion of each boring?

Yes ☐ No ☐ N/A ☐

17. When all borings in a specific source were completed was the drill rig initially cleaned at the source location?

Yes ☐ No ☐ N/A ☐

18. Upon completion of the initial cleaning was the drill rig transported to the decontamination pad where it was thoroughly steam-cleaned before entering another source area?



Yes ☐ No ☐ N/A ☐

19. Were enough augers and core barrels available so that when one set was in use a second set was being decontaminated?

Yes ☐ No ☐ N/A ☐

20. At the end of the working day did all equipment, except the drill rig, and personnel proceed to the decontamination pad where decontamination procedures were initiated?

Yes ☐ No ☐ N/A ☐

21. Were all bore cuttings drummed and stored while awaiting USATHAMA's directions for disposal?



CHECKLIST FOR HAND CORED SAMPLES

Yes ☐ No ☐ N/A ☐

1. Was a piece of Teflon film and plywood placed over the top of the polybutyrate tube and the tube pushed or driven into the ground by hand?

Yes ☐ No ☐ N/A ☐

2. Was the tube removed from the ground by shovel, the tube exterior wiped clean, the ends capped with Teflon film lined plastic caps, and sealed with tape?

Yes ☐ No ☐ N/A ☐

3. Were the sample tubes marked with the boring number, the depth of the interval sampled, and the upward direction?

Yes ☐ No ☐ N/A ☐

4. Was a label containing the same information written on the sample tube as well as the project name, number, the date, and sampler's initials taped to the outside of the core?

Yes ☐ No ☐ N/A ☐

5. Were cores logged and stored in a cooler with commercially available Blue Ice prior to and during transport to the support facility sampling area where they were logged for shipment?



FIELD CHECKLIST

DOCUMENT CONTROL

Yes ☐ No ☐ N/A ☐

1. Have all unused and voided accountable documents been returned to the coordinator by the team members?

Yes ☐ No ☐ N/A ☐

2. Were any accountable documents lost or destroyed? If yes, have document numbers of all lost or destroyed accountable documents been recorded and where are they recorded?

Yes ☐ No ☐ N/A ☐

3. Are all samples identified with sample tags? If no, how are samples identified?

Yes ☐ No ☐ N/A ☐

4. Are all sample tags completed (e.g., station number, location, date, time, analyses, signatures of samplers, type, preservatives, etc.)? If yes, describe types of information recorded.

Yes ☐ No ☐ N/A ☐

5. Are all samples collected listed on a chain-of-custody record? If yes, describe the type of chain-of-custody record used and what information is recorded.

Yes ☐ No ☐ N/A ☐

6. If used, are the sample tag numbers recorded on the chain-of-custody documents?



Yes ☐ No ☐ N/A ☐

7. Does information on sample tags and chain-of-custody records match?

Yes ☐ No ☐ N/A ☐

8. Does the chain-of-custody record indicate the method of sample shipment?

Yes ☐ No ☐ N/A ☐

9. Is the chain-of-custody record included with the samples in the shipping container?

Yes ☐ No ☐ N/A ☐

10. If used, do the sample traffic reports agree with the sample tags?

Yes ☐ No ☐ N/A ☐

11. If required, has a receipt for samples been provided to the facility (required by RCRA)? Describe where offer or a receipt is documented.

Yes ☐ No ☐ N/A ☐

12. If used, are blank samples identified?

Yes ☐ No ☐ N/A ☐

13. If collected, are duplicate samples identified on sample tags and chain-of-custody records?



Yes ☐ No ☐ N/A ☐

14. If used, are spiked samples identified?

Yes ☐ No ☐ N/A ☐

15. Are logbooks signed by the individual who checked out the logbook from the project coordinator?

Yes ☐ No ☐ N/A ☐

16. Are logbooks dated upon receipt from the project coordinator?

Yes ☐ No ☐ N/A ☐

17. Are logbooks project-specific (by logbook or by page)?

Yes ☐ No ☐ N/A ☐

18. Are logbook entries dated and identified by author?

Yes ☐ No ☐ N/A ☐

19. Is the facility's approval or disapproval to take photographs noted in a logbook?

Yes ☐ No ☐ N/A ☐

20. Are photographs documented in logbooks (e.g., time, date, description of subject, photographer, etc.)?



Yes ☐ No ☐ N/A ☐

21. If film from a self-developing camera is used, are photos matched with logbook documentation?

Yes ☐ No ☐ N/A ☐

22. Are sample tag numbers recorded? If yes, describe where they are recorded.



FIELD CHECKLIST

DEBRIEFING WITH PROJECT COORDINATOR

Yes ☐ No ☐ N/A ☐

1. Was a debriefing held with project coordinator and/or other participants?

Yes ☐ No ☐ N/A ☐

2. Were any recommendations made to the project participants during the debriefing? If yes, list recommendations.

Yes ☐ No ☐ N/A ☐

3. Was a copy of the field checklist left with the project coordinator at the conclusion of the debriefing?

