Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

March 14, 1989

ADDRESSEES

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROGRAM PLAN

Enclosed is Revision 0 of the "Remedial Investigation Quality Assurance Program Plan" for the Weldon Spring Site. This plan has been revised to address comments received from the U. S. Environmental Protection Agency and the Missouri Department of Natural Resources as indicated in the "Responsiveness Summary", also enclosed.

Sincerely,

for R. R. Nelson
Project Manager
Weldon Spring Site
Remedial Action Project

Enclosure:
As stated

cc w/enclosure:
Administrative Record

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QF

Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

February 25, 1988

Mr. Dan Wall
U. S. Environmental Protection Agency
Region VII
726 Minnesota Avenue
Kansas City, Kansas 66101

Dear Mr. Wall:

REMEDIAL INVESTIGATION DOCUMENTS

Enclosed are six copies of the following documents for your review:

- Quality Assurance Program Plan Weldon Spring Site DOE/OR/21548-011 (Draft Copy) February 1988.
- Community Relations Plan
- Construction Safety and Health Management Program prepared under Contract No. DE-AC05-86OR21548 April 17, 1987
- WSSRAP Procedures Manual Volume No. V - Environmental Safety and Health Contract No. DE-AC05-86OR21548 (Revision 20, January 11, 1988)
- Waste Assessment Raffinate Pit Sampling Plan Weldon Spring Site DOE/OR/21548-010 (Draft Copy) February 1988

The QAPP and its enclosures were prepared following the format and content of the Galena, Kansas QAPP provided to DOE by EPA as an example. The Waste Assessment - Raffinate Pit Sampling Plan requires your formal concurrence prior to commencement of field activities.

ADMINISTRATIVE RECORD (_____ ARFS)
FILE NUMBER: _____ SECTION: _____
DOCUMENT NUMBER: _____ DATE: _____
DOCUMENT TITLE:
AUTHOR: _____ RECIPIENT: _____
TYPE: _____ # OF PAGE: _____

Your expeditious review and concurrence is requested in order to begin field activities. In order to avoid delays, should a question arise during the review process that an immediate answer by the PMC staff would help clarify, please contact me so arrangements with the proper site personnel can be made.

Sincerely,

Kenneth D. Lawver
Environmental Engineer
Weldon Spring Site
Remedial Action Project

Enclosures

cc w/enclosures:
Dave Bedan, MDNR

QF

Department of Energy
Oak Ridge Operations
Weldon Spring Site
Remedial Action Project Office
Route 2, Highway 94 South
St. Charles, Missouri 63303

February 25, 1988

Mr. David E. Bedan
Division of Environmental Quality
Missouri Department of Natural Resources
Post Office Box 176
Jefferson City, Missouri 65102

Dear Mr. Bedan:

REMEDIAL INVESTIGATION DOCUMENTS

Enclosed are five copies of the following documents for your review:

- Quality Assurance Program Plan Weldon Spring Site DOE/OR/21548-011 (Draft Copy) February 1988.
- Community Relations Plan
- Construction Safety and Health Management Program prepared under Contract No. DE-AC05-86OR21548 April 17, 1987
- WSSRAP Procedures Manual Volume No. V - Environmental Safety and Health Contract No. DE-AC05-86OR21548 (Revision 20, January 11, 1988)
- Waste Assessment Raffinate Pit Sampling Plan Weldon Spring Site DOE/OR/21548-010 (Draft Copy) February 1988

The QAPP and its enclosures were prepared following the format and content of the Galena, Kansas QAPP provided to DOE by EPA as an example. The Waste Assessment - Raffinate Pit Sampling Plan requires your formal concurrence prior to commencement of field activities.

Your expeditious review and concurrence is requested in order to begin field activities. In order to avoid delays, should a question arise during the review process that an immediate answer by the PMC staff would help clarify, please contact me so arrangements with the proper site personnel can be made.

Sincerely,

Kenneth D. Lawver
Environmental Engineer
Weldon Spring Site
Remedial Action Project

Enclosures

cc w/enclosures:
Dave Bedan, MDNR

DOE/OR/21548-011
(CONTRACT NO. DE-AC05-86OR21548)

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROGRAM PLAN

For The :
Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

Prepared By MK-Ferguson Company
DECEMBER, 1988

REV. 0

U.S. Department Of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

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DOE/OR/21548-011/REV. 0

Weldon Spring Site Remedial Action Project

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROGRAM PLAN

December 1988

Prepared By

MK-FERGUSON COMPANY

Route 2, Highway 94 South

St. Charles, Missouri 63303

Project Management Contractor

For The

U.S. DEPARTMENT OF ENERGY

Oak Ridge Operations Office

Under Contract DE-AC05-86OR21548

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WSSRAP Project Manager	J. Hammond	1-13-89
WSSRAP Project Quality Assurance Manager	J.J. Hairston	1-13-89
DOE Project Manager	R. R. Nelson	1-23-89
DOE Quality Assurance Director	No Signature Required	

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DOCUMENTS INCORPORATED BY REFERENCE

OPERATIONAL PLANS AND PROCEDURES

Standard Operating Procedures (WSSRAP Procedures Manual, Volumes 1 through 5)

metaTRACE, Inc. Quality Assurance Manual, July 1987

WSSRAP Environmental, Safety and Health Plan, Rev. 0, January 1987

WSSRAP Spill Prevention, Control and Countermeasure Plan, January 1988

WSSRAP Community Relations Plan, Rev. 3, October 1988

Emergency Plans and Procedures for the Weldon Spring Site Remedial Action Project, Rev. 3, June 1988

SAMPLING PLANS

WSSRAP Chemical Soil Investigation Sampling Plan for Chemical Plant/Raffinate Pits, Rev. 1, May 1988

Hydrogeologic Investigation Sampling Plan, Rev. 0, November 1988

Waste Assessment - Raffinate Pit Sampling Plan, Rev. 1, May 1988

Buildings Sampling Plan, Rev. 0, August 1988

Geophysical/Geotechnical Investigation Sampling Plan, Rev. 1, July 1988

Other Investigations:

Radiological and Chemical Uptake by Edible Portions of Selected Biota at the Weldon Spring Site, November 1988

Plan for the Sampling and Analysis of Lake and Stream Sediments Influenced by the Weldon Spring Chemical Plant Drainage, November 1987

ABSTRACT

The Remedial Investigation Quality Assurance Program Plan (RIQAPP) for Weldon Spring Site Remedial Action Project (WSSRAP) is distinguished by purpose from the WSSRAP overall Quality Assurance/Quality Control Program Plan (QAPP). The RIQAPP is focused only on meeting EPA requirements under CERCLA whereas the QAPP is designed to meet quality assurance program requirements for nuclear facilities: NQA-1 (ANSI, 1986).

The RIQAPP specifically addresses factors, methods and criteria presented in Section 300.68 of the National Oil and Hazardous Substances Pollution Contingency Plan. Specific QC procedures are contained in existing documents incorporated into the plan by reference. These include Standard Operating Procedures, laboratory QA procedures, and activity level sampling plans. Most of the sampling and analysis activities rely heavily upon guidance in SW-846E (EPA, 1984).

The existing procedures provide many of the required QA elements: measurement, sampling, sample and document custody and control, calibration, analysis and data reduction, validation and reporting. Additional QA elements addressed in the RIQAPP include performance and system audits, surveillance, and reporting and correction of deficiencies.

System audits, on a regularly scheduled basis, will evaluate all components of measurement systems to determine capability, proper selection and use. Performance audits, on a scheduled basis, will determine adequacy and accuracy of a given measurement system and/or procedural compliance. Surveillance, both scheduled and unscheduled, of field and laboratory activities will be performed to verify conformance to specified requirements.

Audit reports will require responses from audited organizations which must include commitment dates for completion of actions

recommended to correct deficiencies. Completion of all corrective actions will be verified. Deficiencies noted during surveillance will be documented and will require responses and follow-up action.

All correspondence, plans, reports, certification and other relevant documentation will be processed through the WSSRAP Document Control Department.

Key QA positions in the PMC organization are the Project Quality Manager (PQM), reporting administratively to the Project Manager and authoritatively to the PMC's corporate QA/QC Manager, and a QA Engineer/Lead Auditor reporting to the PQM.

1.0 INTRODUCTION

The overall WSSRAP QA/QC program (including subsequent remedial action activities) is designed to meet the quality assurance program requirements for nuclear facilities: NQA-1 (ANSI, 1986). This RIQAPP is focused only on the EPA requirements under CERCLA. It is intended to meet the requirements of applicable EPA guidance documents, including Part 1 of Region VII's Quality Assurance Program Plan (EPA, 1986a) and U.S. EPA's Interim Guidelines and Specifications for the Preparation of Quality Assurance Project Plans (EPA, 1980). The primary purpose of this document is to provide a complete and accurate framework of information for assessing the amount and extent of hazardous materials present on site.

This plan incorporates the following operational plans and procedures by reference: a set of Standard Operating Procedures (WSSRAP Procedures Manual, Volumes 1 through 5); an Analytical Methods/Detection Limits Document (metaTRACE, Inc. Quality Assurance Manual, July 1987); WSSRAP Environmental, Safety and Health Plan, Rev. 0, January 1987; WSSRAP Spill Prevention, Control and Countermeasure Plan, January 1988; WSSRAP Community Relations Plan, Rev. 3, October 1988; and Emergency Plans and Procedures for the Weldon Spring Site Remedial Action Project, Rev. 3, June 1988. Additionally, this plan incorporates by reference the following Remedial Investigation sampling plans: WSSRAP Chemical Soil Investigation Sampling Plan for Chemical Plant/Raffinate Pits, Rev. 1, May 1988; Hydrogeologic Investigation Sampling Plan, Rev. 0, November 1988; Waste Assessment - Raffinate Pit Sampling Plan, Rev. 1, May 1988; Buildings Sampling Plan, Rev. 0, August 1988; Geophysical/ Geotechnical Investigation Sampling Plan, Rev. 1, July 1988; Radiological and Chemical Uptake by Edible Portions of Selected Biota at the Weldon Spring Site, November 1988; and Plan for the Samplng and Analysis of Lake and Stream Sediments Influenced by

the Weldon Spring Chemical PLant Drainage, November 1987.

The QA/QC program detailed in this document and within the associated sampling plans is intended to be utilized by personnel involved with the Remedial Investigation/Feasibility Study (RI/FS) at the Weldon Spring Site. Specific quality control procedures are detailed in the attached Standard Operating Procedures and in the individual remedial investigation sampling plans. This RIQAPP presents a methodology for gathering and analyzing information that will be included in the WSSRAP RI/FS-Environmental Impact Statement Report. This program is intended to fulfill DOE's commitment to meeting the requirements of the Federal Facilities Agreement signed by DOE and EPA for the Weldon Spring Site.

The RIQAPP addresses all 16 QA elements (see Table 1.1), as specified for environmentally related measurements by EPA's Office of Monitoring Systems and Quality Assurance (EPA, 1980).

TABLE 1.1

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROGRAM PLAN ELEMENTS

QA Elements	Information Provided In
1. Title Page	RIQAPP[1]
2. Table of Contents	RIQAPP
3. Project Description	RIQAPP RI/FS-EIS Work Plan[2]
4. Project Organization and Responsibility	RIQAPP RI/FS-EIS Work Plan
5. Quality Assurance Objectives for Data Measurement	RIQAPP Sampling Plans[3]
6. Sampling Procedures	SOPs [4] Sampling Plans
7. Sample and Document Custody	RIQAPP Sampling Plans SOPs Laboratory QA Procedures[5]
8. Calibration Procedures	SOPs Laboratory QA Procedures
9. Analytical Procedures	Laboratory QA Procedures
10. Data Reduction, Validation, and Reporting	Sampling Plans SOPs

TABLE 1.1 (cont.)

REMEDIAL INVESTIGATION QUALITY ASSURANCE PROGRAM PLAN ELEMENTS

11.	Internal Quality Control	RIQAPP Sampling Plans SOPs Laboratory QA Procedures
12.	Performance and System Audits	RIQAPP
13.	Preventive Maintenance	RIQAPP SOPs Laboratory QA Procedures
14.	Specific Routine Measures Used to Assess Data (Precision, Accuracy, and Completeness)	RIQAPP Sampling Plans SOPs
15.	Corrective Action	RIQAPP
16.	Quality Assurance Reports to Management	RIQAPP

1 Remedial Investigation Quality Assurance Program Plan

2 Work Plan for the Remedial Investigation and Feasibility Study-Environmental Impact Statement for the Weldon Spring Site, Weldon Spring, Missouri (August 1988).

3 Sampling Plans: WSSRAP Documents as Listed on Page iv

4 SOPs: Standard Operating Procedures

5 metaTRACE, Inc. Quality Assurance Manual, July 1987

2.0 PROJECT DESCRIPTION

2.1 PHYSICAL SETTING

The Weldon Spring Site is located in St. Charles County, Missouri, about 30 miles west of St. Louis. The site consists of a 3.4-hectare (9-acre) former limestone quarry, a 21-hectare (51-acre) raffinate disposal area (settling basins), a 67.8-hectare (166-acre) abandoned uranium feed materials plant, and various vicinity properties that are contaminated as a result of past Department of Army (DA) and Atomic Energy Commission (AEC) activities at the site.

Approximately 238,600 cubic meters (312,000 cubic yards) of contaminated soil, equipment, and buildings remaining on the Weldon Spring Chemical Plant (WSCP) site require cleanup to meet current DOE guidelines for unrestricted use. In addition, surveys show that radioactive contamination of the surrounding vicinity properties, which occurred during and subsequent to plant operation, would require removal of about 20,800 cubic meters (27,200 cubic yards) of soil to meet guidelines for unrestricted use.

The Weldon Spring Raffinate Pits (WSRP) contain approximately 168,200 cubic meters (220,000 cubic yards) of uranium and thorium residues. In addition, soil underlying the raffinate pits is probably contaminated and will require remedial action.

During the period 1943-1957, the DA utilized an abandoned limestone quarry, about four miles from the site (used as an ordnance works during World War II), for disposal of rubble and soils contaminated with TNT and DNT. Also the AEC later disposed of building rubble and soils contaminated with thorium, uranium, and their decay products. The quarry contains about 95,000 cubic meters (124,000 cubic yards) of waste, including quarry materials contaminated by the presence of this radioactive waste.

A detailed project description including site history, environmental setting and a summary of the known and suspected nature and extent of existing contamination is presented in the Remedial Investigation/Feasibility Study - Environmental Impact Statement (RI/FS-EIS) Work Plan.

2.2 PROJECT OBJECTIVES

Specifically, the RI activities are undertaken to define the extent of contamination at the site and surrounding area and allow the determination of the potential impacts of these hazardous substances on public health, welfare, and the environment. In addition, the RI data will allow for the formulation of strategies to develop and implement appropriate Interim Remedial Actions (IRAs), prior to the final selection of remedial actions.

The FS activities are undertaken to assess and develop, through the FS process, types of remedial and/or removal actions that should be considered. These actions must be the most economically feasible measures to mitigate threats to and provide protection for the public health, welfare, and environment. In addition, an RI/FS-EIS report will be prepared which will address the technical and demographic issues and impacts associated with selecting viable and feasible remedial measures.

2.3 DATA QUALITY OBJECTIVES

The purpose of the RI program is to ensure that all data used to support decisions made by DOE meet quality requirements imposed by Federal and state regulatory agencies. Specifically, the data collected at the Weldon Spring Site shall be of adequate quantity and quality to accurately characterize the site and to evaluate and delineate remedial measures.

The data collection, evaluation and subsequent remedial measures,

and other actions on site, are governed by a Federal Facilities Agreement (FFA) between EPA and DOE. This agreement defines the procedures and actions necessary for DOE and EPA to discharge their respective responsibilities for effective completion of WSSRAP. It specifies that all actions pursuant to the agreement shall be done in accordance with all applicable or relevant and appropriate Federal laws, regulations and executive orders, and applicable state and local laws and regulations. A preliminary identification of applicable or relevant and appropriate project requirements (ARARs) is presented in the RI/FS Work Plan.

This RIQAPP specifically addresses those factors, methods and criteria presented in Section 300.68 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This RIQAPP also provides a mechanism for further evaluation of the existing data for its adequacy and usability and a method for extensive monitoring of the QA/QC procedures utilized at the time of data collection and their accompanying documentation.

A three-staged Data Quality Objective (DQO) program has been delineated by EPA and will be followed on the WSSRAP. A phased investigative approach allows for a "refinement or redefinition of data collection needs at the completion of each phase" (EPA, 1987). Data collected and analyzed under the DQO process can be used to support decisions related to remedial responses at the WSS.

The three stages identified in the DQO development process are as follows:

Stage 1- Identify Decision Types
Stage 2- Identify Data Uses/Needs
Stage 3- Design Data Collection Program

The Stage 1 program identifies types of decisions needed for site remediation, designates individuals responsible for decisions and

data users, and establishes data adequacy. Data users will include the technical staff of the Project Management Contractor, DOE, EPA, Missouri Department of Conservation, Missouri Department of Health, Agency for Toxic Substances and Disease Registry, and other governmental agencies and citizen groups.

Specific data needs and uses are identified in the Stage 2 DQO process. Individual sampling plans identify uses, types, quantity, and quality of data, and establish Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameter goals. Since measurement data will be used for site characterization and remedial design, goals are for the highest practical attainable level of precision and accuracy. Definitions and examples of PARCC parameters are presented in this section.

Investigative activities at the Weldon Spring Site (WSS) have progressed, for the most part, beyond Stage 1, particularly the site characterization for radiological contamination. Extensive data are available from previous investigations to allow for the development of a conceptual model of the site.

The conceptual model can be expanded, data needs and uses can be redefined, and revisions or additions to the data collection program can be implemented under the DQO program. For example, groundwater samples will be collected and analyzed under the Stage 3 program. Results of this laboratory analysis will be evaluated under the Stage 1 data evaluation process.

The RI/FS-EIS Work Plan delineates those site characterization and environmental monitoring activities that have been conducted prior to submittal of this RIQAPP. These activities have included the acquisition of extensive data relating to the chemical and physical characteristics of soil, groundwater, surface water, sludges and sediments, building waste and debris, and existing facilities at the WSS. The characterization

programs have included hydrogeological, soils, geological, meteorological, radiological and geophysical studies conducted by DOE and predecessor governmental agencies and private organizations. Aquifer parameters, extent of both soil and groundwater contamination, site geology, and the hydrologic regime have been partially defined. A summary is presented in the RI/FS-EIS Work Plan.

Sufficient preliminary data are available to delineate sources of contaminants, e.g. raffinate pits, existing contaminated buildings, transformer storage areas, overhead piping with asbestos, etc., and to define the approach to future sampling activities.

Existing data, however, are not sufficiently complete for Weldon Spring Site characterization. Additional data collection activities are required. These data will be used to further define the extent of soil, groundwater, surface water and air contamination. Those media and existing structures and facilities will be sampled in accordance with the five sampling plans listed in Section 1.0.

Data collected under these sampling and analysis plans will also be utilized to modify current health & safety plans (if required) to assure worker protection, to evaluate risk to public health and environment, to delineate remediation measures, and to modify current and proposed monitoring programs. The collection and analysis of environmental and biological samples will partially fulfill the data requirements for the preparation of an RI/FS-EIS.

2.4 SITE ASSESSMENT

The National Contingency Plan (40 CFR Part 300, Subpart F, CFR, 1988) stipulates that assessment of a hazardous waste site (conducted under CERCLA) must be a phased response action,

including preliminary assessment and removal actions, site evaluation to determine whether the site should be included on the National Priorities List (NPL), and remedial action. Included under the latter are requirements and criteria for conducting investigations and feasibility studies.

The RI process at the WSS has advanced through initial or preliminary assessment and site evaluation phases. Extensive data have been collected at the site and vicinity properties. Individual sampling plans discuss the validity, sufficiency, and sensitivity of these data, and additional data needs and uses. These sampling plans also address site history and summarize the existing data base.

Hazardous substances considered to be potentially on site have been defined after a thorough review of the site history records. This review includes a documentation of manufacturing processes, wastes deposited on site, building construction materials, and support items (e.g. transformers, storage tanks containing chemicals, etc.). These source studies have provided a basis for defining data needs as well as potential impacts to the public and environment and for determining the need for removal action.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Department of Energy (DOE) is responsible for conducting remedial actions at the Weldon Spring Site that will place the site in a radiologically and chemically safe state in accordance with guidelines by DOE and EPA. The responsibility for management and technical direction of remedial actions has been delegated to the DOE Oak Ridge Operation Office. MK-Ferguson (MK-F) is the project management contractor (PMC) assisting DOE in the planning and management of remedial action activities. Headquartered in Cleveland, Ohio, MK-F is a wholly owned affiliate of Morrison Knudsen Company, a multi-disciplinary firm located in Boise, Idaho. Joining MK-F as an integrated member of the PMC team is Jacobs Engineering Group, Inc., headquartered in Pasadena, California.

The RI/FS-EIS Work Plan describes the environmental compliance process and the role of the various organizations (including the PMC) under contract to DOE for the implementation of remedial activities at the Weldon Spring Project.

Prior to the issuance of the RI/FS-EIS, it is the responsibility of the PMC to complete a site characterization program, in accordance with EPA's RI requirements. The RI/FS-EIS will be prepared in a format consistent with the requirements of a Feasibility Study (FS) and will contain the level of detail required by EPA under CERCLA/SARA.

The Project Organization Chart, Figure 3-1, shows lines of authority, responsibility and communication assigned to key project entities.

Listed below are the reporting responsibilities and duties of key PMC personnel.

The Project Director reports to DOE and the MK-F Senior

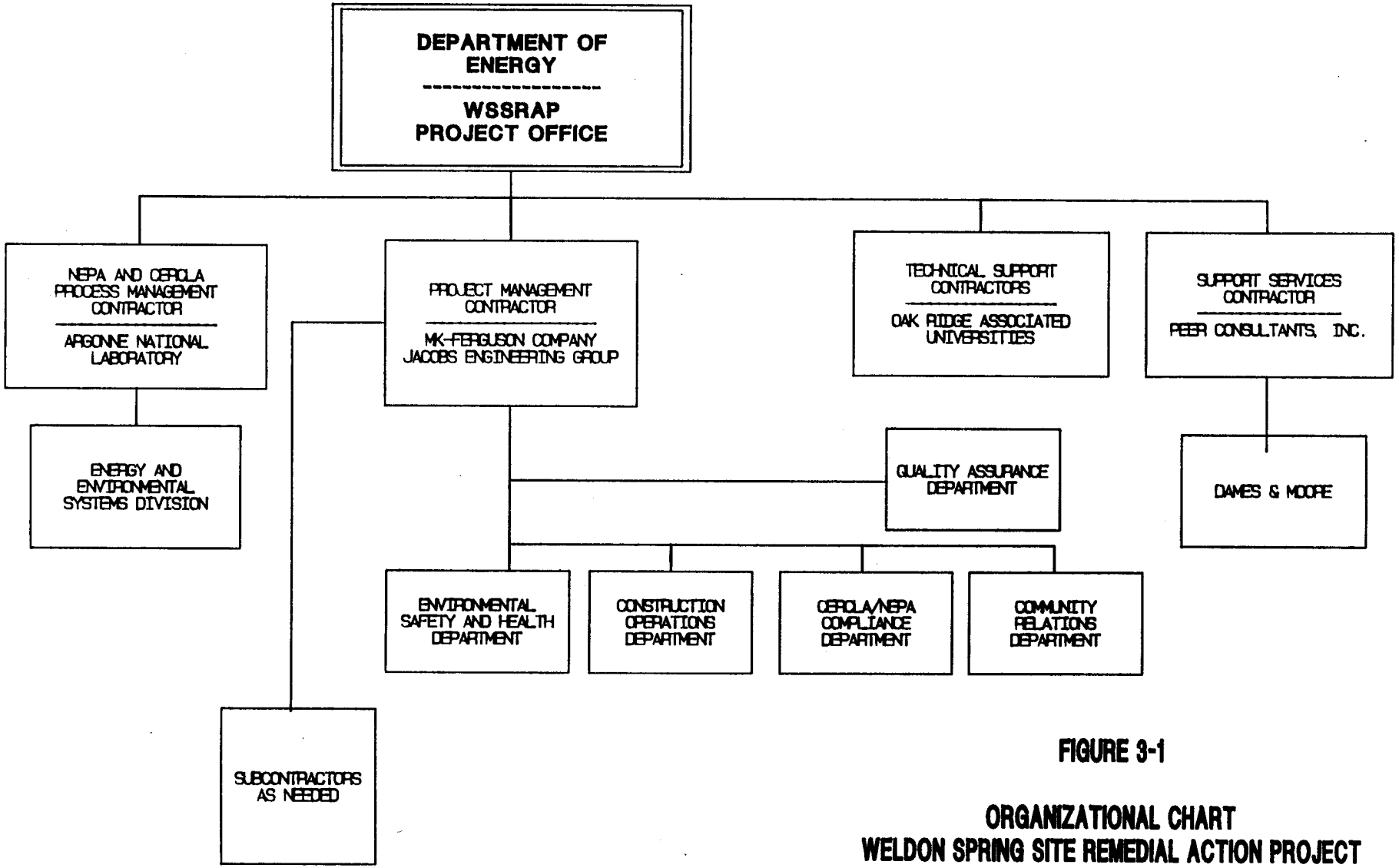

FIGURE 3-1

ORGANIZATIONAL CHART
WELDON SPRING SITE REMEDIAL ACTION PROJECT

Vice-President - Operations, and is responsible for the overall WSSRAP management. This includes completion of all contract requirements within the approved schedule and budget, and in accordance with applicable codes, standards, specifications, and the Quality Assurance Program.

The Project Manager (PM) reports to the Project Director and is responsible for regular project management and administrative duties. He directs and integrates the engineering, construction and environmental, safety and health efforts. The PM is authorized to act for the Project Director in his absence from the project office.

The Administrative Manager (AM) reports to the Project Director and is responsible for all project administrative matters, i.e. general records control, time-keeping, payroll, industrial relations, site security, property control, and all financial matters.

The Project Procurement Manager (PPM) reports to the Project Manager and is responsible for all project procurement and issuance of subcontracts, including evaluation and analysis of bids. Additional responsibilities include warehouse functions for disposal of excess property and materials.

The Community Relations Manager (CRM) reports to the Project Director and is responsible for the WSSRAP Public Information and Participation Plan. The CRM is responsible for interfaces with public groups and government agencies, arranging public presentations and all news media relations.

The Planning & Analysis Control Manager (PAM) reports to the Project Director and is responsible for the overall project management control system which includes the development of budgets and schedules, preparation of management reports and submittals, and review and analysis of progress.

The CERCLA Compliance Manager (CM) reports to the Project Manager. The CM is responsible for the preparation, review, control and distribution of all environmental compliance documentation used to perform and monitor the work. Additionally, the CM is responsible for assuring that all design documents contain all engineering information and instructions required by the contract and all applicable codes, standards and regulations.

The Environmental, Safety and Health (ES&H) Manager reports to the Project Manager. The ES&H Manager is responsible for construction safety, radiological and environmental monitoring and analysis, applied health physics, and all training required by these activities.

The Construction/Operations (C/O) Manager reports to the PM and is responsible for construction management and coordination of all subcontractors, constructability reviews, and resolution of field problems. The C/O Manager is additionally responsible for all construction type operations and maintenance functions for existing facilities, new facilities, utilities, and equipment.

The Project Quality Manager (PQM) reports to the Project Manager on an administrative and communication basis. Authoritatively, the PQM reports off-site to the corporate QA/QC Manager. The PQM is responsible for the development and implementation of the Quality Assurance Program and has the authority to stop the work or control further processing; identify the need for corrective action; initiate, recommend, coordinate and/or provide solutions and verify implementation of solutions and corrective actions related to the quality of the work. The PQM is assisted by a QA Engineer/Lead Auditor for performance and systems audits (described in Section 9.0 of this RIQAPP).

The Quality Control Supervisor (QCS) reports to the PQM and is responsible for performing and/or assigning certified inspection

personnel to perform inspections. The QCS is responsible for assuring that required inspections are performed and documented, that inspection reports identify the items inspected, and types of inspections performed, that applicable accept/reject criteria are specified, and that inspection results are indicated. The QCS is responsible for the timely performance of inspections and transmittal of inspection reports and documents to Quality Assurance Records.

Any unresolved difference between Project Quality Assurance and other project groups is first brought to the attention of the Project Manager and Project Director, and if still unresolved, it is then brought to the attention of the MK-F Senior Vice-President - Operations for resolution through the Corporate QA/QC Manager.

Names of key personnel responsible for specific components of the site characterization program and are listed below.

o **Sampling Operations**	
Soils	Kenneth Meyer (JEG)
Groundwater and Surface Water	Don Penniman (JEG)
Waste Characterization	
Raffinate Pit Sludge	Rick Ferguson (JEG)
Buildings and Equipment	Steven Green (JEG)
Geophysical/Geotechnical Investigation	William Knight (JEG)
Environmental	Paul Blacker (JEG)
Other Investigations	
Lake & Stream Sediment	Kenneth Meyer (JEG)
Bio-uptake	Mark Lusk (JEG)
o **Laboratory Analysis**	Richard Manz (metaTRACE)
o **Data Processing Activities**	Yusuf Noorani (JEG)

- **Sampling and Analysis QA/QC**

Soils	Robert Hoffman (JEG)
Hydrogeology	Jim Meier (JEG)
Waste Assessment	Rick Ferguson (JEG)
Geophysical/Geotechnical Investigations	Edward Tom (MK-E)
Environmental	Karen Borkowski (JEG)
Laboratory	Kenneth Baughman (metaTRACE)
Data Processing QC	Yusuf Noorani (JEG)
Data Quality Review	Roger Nelson (JEG)
Performance Auditing	Joe Guyette (MK-F)
Systems Auditing	Joe Guyette (MK-F)
Overall QA	J.J. Hairston (MK-F)

4.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT

The overall purpose of establishing quality assurance objectives for measurement data is to ensure that data of known and acceptable quality are provided for the intended data use. These objectives apply to both existing and future sampling and field measurement data. Data reviewed or generated by this project are to be of such quality that they can be used as a direct indicator of the nature and extent of radiologic and chemical contamination at the Weldon Spring Site. Most sampling and analysis activities to be performed during the conduct of the WSSRAP rely heavily upon the guidance in SW-846 (EPA, 1984).

4.1 PARAMETERS

This section describes the five major data quality objective parameters: Precision, Accuracy, Representativeness, Completeness and Comparability (PARCC). These parameters comprise the major quality assurance objectives for all measurements made as part of the WSSRAP.

4.1.1 Precision

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value.

Sampling and analytical precision will be demonstrated respectively by:

- Collecting field replicate samples and examining replicate results for degree of variance.

- Determining if sampling error has occurred by the variance of replicates.

- Creating and analyzing laboratory replicates of field samples for degree of variance.

- Computing an overall relative standard deviation that is applicable to all the field investigation data from a particular sampling episode.

- Validating data on groups of samples that should all have the same composition by examining the variance in each group in comparison to the overall variance (invalid data are discarded).

For example, at a recent WSSRAP sampling event (3/87) duplicate groundwater samples were collected from WSS monitoring well 2003. Results from analyses in ug/l of both samples are cited below:

Well #	2,4,6 TNT	2,4 DNT	2,6 DNT	NO_3	SO_4	Cr^-	F^-
2003	<0.5	0.3	0.7	886	223	33.2	14.7
2003D	<0.5	0.4	0.7	945	232	33.0	14.6

If there is mutual agreement among the individual measurements for samples that were collected under prescribed similar conditions, then sampling precision has been demonstrated (as with the above example).

The precision values calculated from the field replicates will be used in the data interpretations to determine how sensitive the site characterizations are to the variances in the data. Any data that are being compared to a standard, criteria, or action level will be compared as the reported value, the lower bound value, and the upper bound value. If this comparison identifies data that may be either above or below the standard or criteria, it will be mentioned in the report. Subsequent

sampling of these borderline areas will incorporate appropriate frequency of QC samples to reduce the variance to the point where more definitive statements can be made.

4.1.2 Accuracy

Accuracy measures the degree of bias in a measurement system. Sample collection and preparation accuracy will be monitored by using sample container blanks, shipping and storage blanks, and field handling blanks. These samples will provide information that could detect inconsistent field procedures.

Accuracy involved in laboratory analysis will be evaluated using matrix spike/matrix spike duplicates. Analytical accuracy will be monitored using recovery of analytes from surrogate spikes, matrix spikes, reference QC samples and performance evaluation samples.

Accuracy is the degree of agreement of a measurement with an accepted reference or true value and is usually expressed as percent recovery of spiked samples, where percent recovery is:

$$\frac{\text{(spiked result)} - \text{(unspiked result)}}{\text{(amount spiked)}} \times 100$$

Errors may occur during the sampling or the analysis operation. Samples may be contaminated in the field or laboratory. Errors may result from improper use of equipment during collection and analysis, improper preservation, handling and storage. For example, improper decontamination of equipment from a previous monitor-well drilling or sampling operation may result in groundwater contamination in a newly installed well. Also, an error or inaccuracy in analytical results can be introduced by an instrument being out of calibration during a portion of the analysis. Inaccuracy can result from random error or systematic error.

The WSS sampling plans (listed in Section 1.0) have incorporated requirements for accuracy (both sampling bias and laboratory analysis) and the protocol for monitoring to determine that these requirements are met. The sampling plans also provide a method for the project staff to detect the occurrence of cross contamination or external influences.

As described in the individual sampling plans, accuracy will be determined by:

- Computing percent recoveries for performance audit samples and spiked samples.
- Calculating the standard deviation in the overall average recovery value.
- Determining the range of uncertainty at a given level of confidence.

The accuracy data will be used to determine any bias in the analytical methods. All analysis will be performed according to the methods and standards set forth in the Contract Laboratory Program (CLP), (EPA, 1986b) where appropriate. The CLP provides control limits for the laboratory spikes and the appropriate qualifications for the use of the data if the control limits are not met. For the performance audit samples, the average recovery for each compound or element will be calculated and compared to the certified values. If the performance audit sample has an acceptable range stated by the CLP, an average recovery within this range will be considered acceptable. If the average recovery falls outside the acceptable range, the field sample results will be qualified as having either a high or low bias and the amount of bias will be calculated. The field sample results will not be adjusted for bias, but the bias will be considered in the interpretation of the data.

4.1.3 Representativeness

Representativeness is a measure of how closely the measured results reflect the actual concentration or distribution of the compounds in the sampled media.

Some typical examples of representativeness consideration include:

- Sampling of media at defined and representative depths.
- Pumping tests with observation wells at select locations and screened in consistent discrete zones to define aquifer parameters, confining layers, perched zones, etc.
- Sampling procedures for water quality, asbestos, waste, and soil contamination will be in accordance with those procedures appropriate for the media being sampled.
- Adherence to approved sampling plans, e.g. radiation sampling for building characterization, will include sampling of ceilings, walls, attic, air, piping, floors and exterior to define hazards and extent of contamination.

Data collected should represent actual conditions existing at the area to be sampled. For example, a groundwater sample collected at the top of the water table would not be a representative sample if potential contaminants had a higher specific gravity than water. A soil sample to be analyzed for PCBs or nitroaromatics should be collected in known storage areas for those contaminants in order to define representative contamination of that specific area; however, it would not necessarily be representative of PCB or nitroaromatic soil

contamination throughout the entire WSS area.

During the work planning process, existing data have been reviewed and site investigations have been designed so that they will yield information representative of site conditions. The sampling plans contain proper sample collection and handling techniques, equipment decontamination procedures, sampling locations, and rationale used to determine sampling locations.

4.1.4 Completeness

Completeness is a comparison of the amount of valid data that was obtained from a measurement system to the amount that was expected and needed to meet the project data goals. Completeness is typically expressed as a percentage.

For example, assume an environmental monitoring plan requires groundwater sampling activities to be performed quarterly for a one-year period. If one sampling event is missed, or if an analytical error occurred, or samples were unusable or invalid, data may still be complete if there is little quarterly variation.

Quality assurance completeness at the Weldon Spring Site will be calculated as the total number of samples collected for which acceptable analytical data are generated divided by the total number of samples collected, then multiplied by 100.

4.1.5 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another as long as precision and accuracy are known. The comparability objective is to provide assurance that the data developed during separate field investigations are comparable to each other and that data

developed during the investigation are comparable with applicable hazard identification criteria.

Comparability is addressed by assuring consistency of measuring units, standardized sampling, sample preparation, methods of analysis and data format. Comparability allows for the comparison of one set of data against another. For example, it is preferable to report all boring log depths at WSS in feet instead of meters.

Standard sampling techniques (see WSSRAP SOPs) will be used to provide consistency in subsequent sampling episodes. The WSSRAP SOPs and the Analytical Methods/Detection Limits Document used at metaTRACE Laboratory or other selected laboratories address sampling procedures and analytical methodology.

5.0 SAMPLING, ANALYTICAL AND CALIBRATION PROCEDURES

The objectives for sampling procedures and field measurements are to obtain samples and measurements that are representative and comparable. The location of the sampling and field measurements will be selected to meet the data gaps identified in the scoping process. Trace levels of contaminants from external sources and cross-contamination will be eliminated through the use of experienced field personnel, good sampling techniques, proper sampling equipment and adequate decontamination.

Operational procedures are explained in detail in the activity-specific sampling plans. The WSSRAP SOPs include descriptions of sampling techniques, sample preparation requirements, sample packaging and labeling, equipment calibration, and decontamination procedures. Substantive changes or deviations from these standard operating procedures will be approved by EPA and DOE prior to implementation.

The standard Operating Procedures contain the means for demonstrating and documenting instrument accuracy, e.g.:

- All measurement devices will be assigned individual identification numbers. Documentation will be provided for each device which identifies its use, maintenance performed, and standards used for calibration.

- Each measuring device will be calibrated against a standard of known and, if possible, higher accuracy.

- Sampling and analytical methodology is documented and referenced to federal standards.

The Standard Operating Procedures and analytical methods, then, describe operations, analyses, or actions which are thoroughly

- Engineering Design Documents
- Design Procedures
- Standard Operating Procedures
- Safety Plans

6.3.2 Field and Laboratory Data

Records generated by the site RI/FS program are, where practicable, numbered and assigned to individuals designated to perform specific tasks. They include:

- Field logbooks
- Field data record forms, e.g. well inventory forms, pumping test data sheets
- Analytical logbooks
- Lab data, calculations, graphs, etc
- Location maps, photos, selected drawings
- Checklists of equipment performance
- Equipment maintenance logs including repair and calibration information
- Photographic logs

6.3.3 Project Files

A WSSRAP filing system has been established and is under the jurisdiction of the Document Control Specialist. Project files have been assigned identifying numbers. Files will contain those controlled documents, logbooks, field data sheets, and tracking forms described above, as well as contractual documents, reports, correspondence, health and safety records, telephone conversation records, design information, notes, calculations, standard operating procedures, letters of transmittal, and other records necessary to document site activities.

6.3.4 Computerized Data

A large amount of data will be generated during site characterization. Those data collected and analyzed during the sampling and analysis program will be reduced for input into the computerized data base. These data will include logs, tracking forms, and results of laboratory analyses. Computer software is protected and documentable.

6.3.5 Document Ownership and Distribution

All project documents generated on the WSS are the property of DOE. The distribution of such documents to state agencies, federal agencies, other regulatory agencies, and citizens' groups is in accordance with DOE policies and guidelines. Distribution to third parties is upon receipt of a formal request and subsequent approval by DOE. Controlled documents, i.e. manuals, procedures, instructions and guidelines, are distributed on the basis of a written, approved Standard Distribution List. All documents distributed to parties other than DOE and PMC are inventoried and are accompanied by a document transmittal form. A return receipt is required and documented on the controlled document transmittal log.

6.3.6 Document Storage

Documents are stored in locked, secure filing cabinets. Dual document storage facilities will be provided at locations sufficiently remote from each other to eliminate the chance of simultaneous exposure to a hazard. Access to both facilities will be controlled by document control specialists. This applies to both computer generated data and hard copy documents. Copy-protected software is replaceable from the supplier.

measurement, temperature, conductivity, flow measurements, and air monitoring data are recorded in field logbooks or on field data record forms. All other samples are identified by a sample tag which delineates preservation methods and required laboratory analyses. All samples are accompanied by a chain-of-custody record.

6.2 LABORATORY SAMPLE CUSTODY

All samples are packaged and shipped to the laboratory in accordance with U.S. Department of Transportation procedures with a separate custody record accompanying each shipment. An authorized sample custodian at the laboratory facility signs for incoming field samples, obtains documents of shipment, and verifies data entered onto the sample custody records. The Analytical Methods/Detection Limits Document delineates the chain-of-custody, tracking and document control procedures employed by metaTRACE Laboratory or other selected laboratories.

6.3 EVIDENTIARY FILE AND DOCUMENT CONTROL

Documentation required for sample custody will be retained and incorporated into the WSSRAP Document Control Program. Evidentiary files will include all laboratory and field reports and will be maintained by the WSSRAP.

The goal of the WSS Document Control Program is to assure that all documents used by WSS personnel will be accounted for at the termination of project activities.

To achieve the stated goal, procedures for the identification and control of documents that specify methods of assuring data quality for WSSRAP project activities have been developed. These procedures include the establishment of a numbered document system and a document inventory procedure for accountable documents. This document control system allows for

the identification and retrieval of data for any characterization work component.

Document control for this program includes the following requirements:

- Originals and copies of documents are kept secure and under custody where necessary.

- Individuals holding documents.

- Individuals holding documents receive revisions and updates when appropriate.

At the Weldon Spring Site, prescribed project activities are documented in order to meet QA/QC requirements. Documents generated from these activities can be categorized as follows:

- Controlled Documents
- Field and Laboratory Data
- Tracking Forms
- Project Files
- Computerized Data

6.3.1 Controlled Documents

Controlled documents are those documents issued by authorized personnel that, in accordance with requirements of NQA-1, are assigned a unique identifying number and logged out to selected individuals. These documents specify quality requirements on prescribed activities affecting quality. A distribution list of these documents is maintained in Document Control for each document. These documents include:

- QA/QC Plans
- Procurement Plans

prescribed, documented, and performed in accordance with accepted standards.

Preventive maintenance and inspection procedures for laboratory and field equipment are also prescribed. Inspection and testing of equipment will be done on a regular basis. The SOPs describe calibration procedures to be employed on all field equipment, including referenced standards, QC samples employed, and operation methods. Also included are provisions for equipment maintenance.

On-site audits of both field and laboratory procedures as described in Section 9.0 will be conducted by the QA Engineer/Lead Auditor and designated technical specialist as required. Systems audits will consist of evaluation of all components of the applicable measurement systems to determine their proper selection and use.

In order for equipment to be used effectively, the operator must demonstrate an understanding of operating principles and procedures, and be competent in calibrating, reading and interpreting the instrument. Manufacturers' operating manuals provide comprehensive guides for the use of field and laboratory equipment. The operator must also be familiar with sample preservation, equipment decontamination, health and safety procedures (as applicable), and equipment limitations to assure the acquisition and analysis of valid samples in a safe manner.

6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

A major required component of all field investigation sampling plans is the maintenance of the integrity of the sample from collection to data reporting. To maintain and document sample possession, chain-of-custody procedures are followed on the WSSRAP. Elements of the chain may include sample seals, sample labels with a sample identification number to allow for sample tracking, field logbooks, field data record forms, chain-of-custody records, sample analysis request sheets, receipts, bills of lading, and field and laboratory tracking forms. Field and laboratory sample custodians or their designated representatives are responsible for maintaining custody of samples. A sample is considered to be under a person's custody if 1) it is in the person's physical possession, 2) in view of the person, 3) secured by that person so that no one can tamper with the sample, or 4) secured by that person in an area that is restricted to authorized personnel.

Sample custody is divided into three parts as follows:

- Field sample custody
- Laboratory sample custody
- Evidentiary files

6.1 FIELD SAMPLE CUSTODY

Sampling procedures for groundwater, soil, waste, etc. are addressed in the SOPs and the five individual sampling plans. The sample custody program for the Weldon Spring Site includes the documentation of procedures for the preparation of reagents, sample identification, the recording of sampling locations, and specific considerations associated with sample acquisition. Applicable forms for recording these data, and tracking of samples, as required by the chain-of-custody procedures are presented in the SOPs. In-situ measurements, e.g. pH

- Identity of sampling teams or team leader
- Sampling location
- Description of sampling location
- Collection technique
- Field preparation technique
- Laboratory analytical methods
- Laboratory detection limits

Data validation also entails a review of the QC data and the raw sample data to verify that the laboratory is operated within the required control limits, the analytical results are correctly transcribed from the instrument readouts, and which, if any, natural samples are related to any outside-of-control laboratory QC samples. The objective of the data validation is to identify any qualitative, unreliable, or invalid measurements and to also verify compliance with the CLP protocol for laboratory determination.

7.3 REPORTING

Documentation of the data collection and analysis process is an integral part of the QA/QC program. Data validation techniques require that standard operating procedures, sample tracking methods, validation formulas, QC checks on PARCC criteria, and all sampling and laboratory activities be documented. Data obtained from the sample collection and analysis operation will be recorded on standardized report forms or logbooks.

These documents include DOE, EPA and corporate management forms. Some of these documents are listed below:

- CLP Report Forms
- Receipt of Sample Forms
- Chain-of-Custody Forms
- Sample Labels
- Field Tracking Report Forms

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

Statistical parameters are used to assess the quality of data obtained. Section 4.0 addresses the procedures used to routinely assess precision and accuracy of Weldon Spring environmental monitoring and measurement data. This section presents data reduction schemes and validation criteria to be used for collected data.

7.1 DATA REDUCTION

A data reduction process has been developed for all data collected on site for WSSRAP. Generally these procedures are prescribed in the documents referenced in Section 1.0 of this document. Principal devices for field sample collection or measurement, as described in the Standard Operating Procedures (SOPs) include air, surface and groundwater, soil, and waste sample collection instruments. Associated in-situ measurements, e.g. water temperature, pH, specific conductance, meteorological, and radiation are also delineated in the SOPs. Where relevant, data reduction formulas are presented, e.g. SOP Section 2.06.05 lists formulae for computing background count rates, daily efficiency, and estimating radioactivity per unit surface area with the use of the Ludlum Model 2220/43-5 Alpha Detector.

7.2 DATA VALIDATION

Many measurement activities are underway at the WSS and large quantities of data will be obtained. A major component of the Data Quality Objective process involves the assessment of data adequacy, i.e. data validity and data sufficiency. For data validation at the WSS the following will be documented:

- Sampling date

data sets in terms of the QA/QC requirements for the current WSSRAP characterization program.

3. Utilize the existing data sets' QA/QC documentation and a retroactive data validation/evaluation program to categorize the existing data as discussed above.

- Laboratory Tracking Report Form
- Sample Analysis Request Forms
- PARCC Objectives Summary Forms
- QA/QC Report Forms for Laboratory
- Equipment Calibration Report Forms
- Standard Field and Laboratory Log Forms

7.4 QUALITY ASSURANCE FOR THE EXISTING DATA BASE

An important element of the WSSRAP is the validation of the large amount of data that has been collected on site at WSSRAP. The specifics of data evaluation and validation are discussed in the individual associated sampling plans listed in Section 1.0. A conceptual framework for evaluation of existing data is presented in this subsection.

Data from previous sampling and analysis programs which were used in the development of the five sampling plans were considered to fall into one of the following categories:

- Data that are not useful
- Data that are adequate for a qualitative assessment of contamination (i.e. contaminated or not contaminated)
- Data that are adequate for semi-quantitative comparisons (i.e. order of magnitude)
- Good quantitative data not meeting all QA objective requirements (but generally valid)
- Data meeting all QA requirements

For qualitative development of the sampling plans, the following steps have been taken:

1. Determine what QA/QC documentation was available for a sampling/analysis program and obtain the documentation.

2. Evaluate QA objectives and QA/QC results of existing

Internal quality control at the laboratory also includes the utilization of matrix spikes, including EPA quality control ampules, Standard Reference Materials (SRMs) and laboratory-prepared solutions made from pure compounds.

The selected laboratory at WSS participates in EPA's Quality Control Program and utilizes those standards and guidelines prescribed by EPA for analyzing relevant chemical and radiological constituents.

The Users Guide to the Contract Laboratory Program (EPA, 1986b) presents analytical internal quality control operations which are applied at the WSS. They include:

- Inductively Coupled Argon Plasma (ICP) Interference Check Sample Analyses: Performed at least twice per eight-hour shift, to verify inter-element and background correction factors.

- Preparation Blank Analyses: Performed for each batch of samples or for each set of 20 samples, to ascertain whether sample concentrations reflect contamination.

- Spiked Sample Analyses and Duplicate Sample Analyses: Performed for each concentration and matrix within each set of 20 samples of a similar matrix, to provide information concerning sample homogeneity, analytical precision and accuracy, the effect of the sample matrix on the analytical methodology, and to allow for evaluation of the long-term precision of the method.

- Serial Dilution Analyses: Performed for each group of samples of a similar matrix type and concentration for each 20 samples received to ascertain whether significant chemical or physical interferences exist due to sample matrix.

8.0 INTERNAL QUALITY CONTROL

To achieve the highest practical attainable level of precision and accuracy, the sampling program at WSS includes the use of QC samples to measure field and laboratory performance. (Section 4.0 of this document discusses QA objectives for measurement.) QC samples are submitted to the laboratory as blind samples. To provide quality control information for interpretation of data, the following types of QC samples may be utilized:

- Background Samples: These samples are obtained from media characteristic of the site but outside of the zone of contamination; e.g. groundwater samples collected from the upper Burlington-Keokuk aquifer upgradient of the WSCP areas.

- Duplicate or Replicate Samples: These samples are collected at the same time from common collection manifolds, locations, or sampling devices, or as split samples from one sampling event, and sent to the same laboratory to verify sampling and laboratory precision. Generally, one out of every 20 investigative samples is replicated.

- Split Samples: Split or replicate samples, divided into two portions, are sent to different laboratories to assess laboratory precision.

- Field Blanks: Analyte-free deionized water is used to rinse sampling equipment that has been decontaminated, e.g. bailers, pumps, augers, split tube samplers, etc. One rinsate sample is collected per day or for every 20 investigative samples, whichever is greater. Upon analysis, these samples are used to assess the adequacy of the field decontamination process.

- Furnace Atomic Absorption QC Analysis: Required for quantification; incorporates duplicate injections and analytical spikes in order to evaluate the precision and accuracy of the individual analytical determinations on each sample.

- Laboratory Control Samples (LCS): Standards carried through sample preparation and analysis procedures to document the performance of the entire analytical process. The results for analysis of LCS are submitted with the data package. Laboratories on a quarterly basis verify their instrument detection limits, ICP linear ranges, ICP inter-element correction factors and ICP integration times.

It is the responsibility of the laboratory to document, in each data package submitted, that both initial and ongoing instrument and analytical QC requirements have been met. Any samples that have not been analyzed according to contract QC requirements are re-analyzed by the laboratory.

9.0 AUDITS AND CORRECTIVE ACTIONS

Quality assurance objectives for the Weldon Spring Site Remedial Action Project (WSSRAP) will be met in part by audits of field sampling and laboratory analysis activities. All existing and future data developed for the site will be evaluated to determine its validity and completeness. To accomplish this evaluation, audits will be conducted to insure that data of known and acceptable quality are provided. The goals or objectives of the Weldon Spring Site Characterization QA/QC audit program are to ensure that:

- Program-specific QA/QC training is provided to personnel and that QA/QC requirements are clearly established.

- Data quality meets specified goals in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) for all environmentally related measurement criteria.

- All sampling and analytical efforts are described by an approved sampling plan (listed in Section 1.0).

- Standard operating procedures are developed for each measurement activity, that qualified personnel are assigned to perform these activities in accordance with the procedures, and that proper documentation is performed in order to establish data validity.

- Audits are performed to determine compliance with the established QA/QC requirements.

- Corrective actions are proposed and implemented to address deficiencies identified during audits.

This section describes the performance, reporting and

documentation phases of the audit portion of the WSSRAP QAPP.

9.1 AUDITS-GENERAL

An audit system shall be implemented to assure compliance with the QA/QC program requirements established for the WSSRAP in the approved Project Quality Assurance Program Plan dated 02/03/87. This mechanism is intended to assess systems and procedure effectiveness. Audits will:

- Identify weaknesses and strengths.
- Dictate corrective actions as required.
- Allow for modifications and enhancement of the QA/QC program.
- Serve as a vehicle for providing necessary technical assistance.
- Measure the effectiveness of the QA/QC programs to assure quality of data.

The types of audits to be conducted during the course of actions for the WSSRAP will include performance and systems audits. These audits will be performed both internal and external to the Project Management Contractor (PMC).

System(s) audits consist of an evaluation of all components of the measurement system to determine their capability, proper selection and use. A systems audit includes a careful evaluation of field and/or laboratory quality assurance/quality control programs. Systems audits are normally performed prior to or shortly after systems are operational; however, such audits will be performed on a regularly scheduled basis for the duration of the WSSRAP.

Performance audits are conducted to determine the adequacy and accuracy of a total measurement system or on selected elements

of field or laboratory Quality Assurance/Quality Control programs to determine procedural compliance, thereby ensuring Data Quality Objectives. Performance audits are conducted periodically on a scheduled basis, generally after a system is operational and generating data.

Audits will be scheduled in intervals consistent with the schedule for accomplishing the activity and commensurate with the status and importance of the activity.

Audits shall be performed in accordance with written procedures or checklists based upon the QA/QC programs and the project's procedures manuals and conducted by appropriately trained personnel not having direct responsibilities in the areas being audited.

Audit results shall be documented by auditing personnel and reviewed by management having responsibility in the area audited.

Audits shall be performed under the direction of a certified Lead Auditor who is assisted by certified auditors and/or appropriately trained technical specialists as required to audit all components of the WSSRAP QA/QC programs.

9.2 AUDIT PREPARATION

The Lead Auditor is responsible for preparing and maintaining an audit schedule, reviewing and documenting the qualifications on all audit personnel including technical specialists, providing notification to the audited organizations, preparing and/or approving audit plans and checklists.

The Lead Auditor, after a review of applicable requirements, such as procedures, contracts, plans, standards and project schedules, prepares an audit schedule indicating the organization to be audited, subjects to be audited, schedule of

the audits and proposed Lead Auditor. The audit schedule shall be reviewed periodically and revised as necessary to assure that coverage is kept current. In advance of the scheduled audit the Lead Auditor will notify the organization to be audited of the proposed schedule and scope of the audit.

The Lead Auditor selects the audit team members including auditors, technical specialists and observers as required to best perform a comprehensive audit of the selected systems or components to be audited. The Lead Auditor will document the qualifications of audit team members selected.

The Lead Auditor is responsible for preparation of a written audit plan, when requested by the Project Quality Manager (PQM). The audit plan includes:

- Audit number
- Organization to be audited
- Subject(s) to be audited
- Scope of the audit
- Projects or activities to be audited
- Audit team members
- Audit schedule
- Applicable documents

The audit plan can be used to provide the audited organization(s) management with the proposed audit scope, audit requirements, audit personnel and the schedule for the audit.

The audit team will prepare audit checklists based on their review of applicable or relevant and appropriate requirements; documents including procedures, standards, contracts, and plans; and previous audits, if any, of the systems or tasks to be audited. The Lead Auditor is responsible for review and approval of the audit checklists. These checklists will be used to evaluate the performance of the audited activity.

The Lead Auditor provides the audit team with the audit plan and checklists, orients the team to the schedule for the audit and the internal and external organization and contractual interfaces and responsibilities of the organization to be audited.

9.3 AUDIT PERFORMANCE

The Lead Auditor conducts a pre-audit meeting at the audit site with the audit team and responsible management of the organization to be audited. The pre-audit meeting provides a means to introduce the audit team, establish contacts and interfaces, present and confirm the audit plan, scope and sequence, and schedule the post-audit meeting.

The audit will be conducted following the approved audit checklist as a guideline. The Lead Auditor may assign portions of the audit or checklist to members of the audit team commensurate with their expertise. The audit checklists are a guideline; responsible questioning or investigation may lead the audit into areas not described in the audit plan or by the audit checklist.

Audits shall include the objective examination of work areas, activities, processes and items; review of documents and records; and quality-related practices, procedures and instructions to determine compliance with the QA/QC program requirements and the project procedures manual. The audit checklists will be used by the auditors to record the results of their investigations.

Discrepancies or concerns discovered during the course of the audit by the audit team members will be presented to the Lead Auditor for review and discussion prior to formalizing. Audit discrepancies may be characterized as follows:

1) An observation is the recognition of an activity or action that might be improved but is not a significant violation of a specific requirement. Discrepancies that are corrected during the course of the audit may be addressed as observations. Isolated violations may be determined to be observations rather than findings.

2) A finding is the recognition of a specific requirement that has been significantly violated.

A post-audit meeting chaired by the Lead Auditor will be conducted at the conclusion of the audit. The objective of the post-audit meeting is to present the findings and observations to the responsible management of the audited organization. Resolution of findings and observations and commitments for corrective actions including a tentative schedule for completion of corrective actions should be discussed at this time.

9.4 AUDIT REPORTING

Audit reports will be submitted to responsible management by the PQM, or Lead Auditor. These reports will address the performance of measurement systems and data quality. Audit reports will include the dates of audit, audit procedures, names of auditors and audited organization participants, specific procedures audited, a summary of audit results including findings and observations (if any), recommendations for correcting deficiencies or improving the QA/QC programs, if necessary.

Audit findings are recorded on an Internal Quality Audit Finding Report Form and are included as part of the audit report.

Audit reports shall be issued promptly upon completion of the audit (within 30 days), and will contain the date required for response to audit findings. Audit findings require response

from the audited organization within 30 days of receipt. Audit finding responses should include a commitment date for completion of corrective actions to be taken, results of a review for potential impact on previous items or activities (if any) and the root cause of the deficiency.

Observations may or may not require a formal response depending upon the severity, type and number or specific deficiencies. The Lead Auditor will specify which of the observations require written response. Observations are recorded in the body of the audit report.

Completion of corrective actions noted in audit responses shall be verified upon receipt of the response or by the date specified on the response.

9.5 SURVEILLANCE

In addition to regularly scheduled audits, the QA Department shall perform surveillance of field or laboratory activities. Surveillance is the act of monitoring or observing to verify whether an item or activity conforms to specified requirements.

Surveillances may be planned or unplanned, scheduled or unscheduled. No checklist is required, rather the approved procedure for the operation or task will be followed to ensure adherence to the requirements. Surveillances will be documented by the individual performing the surveillance, and reviewed by the Lead Auditor.

When deficiencies are noted, the responsible department shall be notified by use of the Quality Deficiency Report (QDR).

Response to the QDR must be returned to the QA Department by the responsible department manager and appropriate follow-up actions must be prescribed at that time.

9.6 FINDING/DEFICIENCY CORRECTIVE ACTION AND CLOSURE

The Lead Auditor is responsible for the evaluation of corrective action responses to determine that the corrective action for each finding/deficiency is adequate, has been scheduled or has been completed. The Lead Auditor will ensure that responses to findings written by other audit team members such as technical specialists fully address the discrepancy identified during the course of the audit.

Follow-up may be accomplished through written communication, re-audit, surveillance or other appropriate means. Unsatisfactory responses will be addressed in writing, indicating why the response is unsatisfactory, and will specify a reply due date. Findings/deficiencies are considered open until the approved corrective action has been completed. The Lead Auditor is responsible for closing all findings/deficiencies.

9.7 QA RECORDS

All audit plans, correspondence relating to audits/surveillance, audit findings, audit reports, individual certifications, Quality Deficiency Reports and surveillance reports will be routed to Document Control for processing in accordance with Section 6 of this document.

10.0 PREVENTIVE MAINTENANCE

The preventive maintenance program at WSSRAP includes numerous tasks to prevent or minimize downtime of field sampling and laboratory analytical equipment. These measures are documented in Appendices A & B.

Operational checks and calibration procedures are prescribed in these appendices -- for example, Alpha Detector (SOP No. 2.06.01)-- and instruction manuals are referenced to show maintenance procedures. Duplicate instruments and spare parts are stocked for critical instruments in order that sampling and measurement operations can continue without delays and in an orderly manner.

Preventive and regular maintenance will be provided by trained, qualified specialists only. If feasible, maintenance responsibilities will be delegated to one or two individuals who will also bear the responsibilities of assuring proper documentation of equipment users, dates of use, maintenance and calibration, and inventory identification numbers. Preventive maintenance will be performed on a regular scheduled basis and in accordance with manufacturers' manuals and applicable SOPs.

In order to fulfill PARCC requirements, stand-by or duplicate laboratory or sampling equipment may be required.

11.0 REFERENCES

(CFR, 1988) Code of Federal Regulations 40 CFR Ch. 1, Part 300 - National Oil and Hazardous Substances Contingency Plan.

Effectuates the response powers and responsibilities created by CERCLA and Section 311 of the Clean Water Act, as amended.

(EPA, 1986a) U.S. Environmental Protection Agency, 1986, Quality Assurance Program Plan for Region VII. Doc. Control No. R7QAO-86-001. Kansas City, Missouri.

Describes data quality objectives; guidelines for preparation of Standard Operating Procedures.

(EPA, 1987) U.S. Environmental Protection Agency, Office of Emergency & Remedial Response & Office of Waste Programs Enforcement, March 1987, Data Quality Objectives for Remedial Response Activities. EPA 540/G-87/003.

Guidance on development of DQOs for site-specific activities.

(EPA, 1980) U.S. Environmental Protection Agency, Office of Monitoring Systems and Quality Assurance, Office of Research and Development, Dec. 29, 1980, Interim Guidelines & Specifications for Preparing Quality Assurance Project Plans. QAMS - 005/80.

Describes 16 elements that must be included in all QA project plans.

(EPA, 1984) Environmental Protection Agency, Office of Solid Waste, 1984 Proposed Sampling and Analytical Methodologies for Addition to Test Methods for Evaluating Solid Waste. SW-846.

Data acceptance and evaluation criteria.

(ANSI, 1986) Quality Assurance Program Requirements for Nuclear Facilities, ANSI/ASME NQA-1-1986. Published by American Society of Mechanical Engineers, New York.

Requirements for the WSSRAP QA Program Design Control.

(EPA, 1986b) U.S. Environmental Protection Agency, December 1986, Office of Emergency and Remedial Response, Users' Guide to the Contract Laboratory Program, Washington, D.C.

Outlines the requirements and analytical procedures of the new CLP protocols.

(DOE-MKF, 1987) Quality Assurance Program Plan for U.S. Department of Energy, Oak Ridge Operations, Weldon Spring Site Remedial Action Project (Contract DE-AC05-86OR21548).

Defines the overall Quality Assurance Program to be followed for the Weldon Spring Site Remedial Action Project in accordance with applicable DOE Orders and NQA-1-1986.

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