DOE/OR/21548-600
CONTRACT NO. DE-AC05-86OR21548

ENGINEERING SOIL SAMPLING FOR THE QUARRY NORTHEAST SLOPE

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

JANUARY 1996 **REV. 1**

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

Prepared by MK-Ferguson Company and Jacobs Engineering Group

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PLAN TITLE: Engineering Soil Sampling for the Quarry Northeast Slope	

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Weldon Spring Site Remedial Action Project

Engineering Soil Sampling for the Quarry Northeast Slope

Revision 1

January 1996

Prepared by

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and
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7295 Highway 94 South
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for the

U.S. DEPARTMENT OF ENERGY
Oak Ridge Operations Office
Under Contract DE-AC05-86OR21548

SUMMARY OF CHANGES

1. The sample identification numbers in Table 3-1 have been changed to differentiate between engineering samples and remedial investigation samples.

2. Figure 3-1 has been changed from showing borehole locations to showing section lines and approximate borehole locations.

3. Section 5 has been revised to better describe sampling equipment and methods for engineering sampling.

4. The "Lab Location" column in Table 6-1 has been changed to reflect engineering sampling.

ABSTRACT

The *Engineering Soil Sampling for the Quarry Northeast Slope* is required to gain information for characterization of the extent of radiological contamination and determination of the extent and location of the contaminants to quantify the excavation cut line, and to provide lithology and other geological information needed for excavation design.

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1 INTRODUCTION

1.1 Site Description

The Weldon Spring Quarry is located in St. Charles County, Missouri, about 30 mi west of St. Louis. The 10-acre quarry is located about 6 mi southwest of the junction of Missouri State Route 94 and U.S. route 40/61. The quarry is accessible from State Route 94 and is fenced and closed to the public.

Information gained from previous excavation of the northeast slope of the quarry indicates that additional sampling and analysis will be required to further characterize the extent of radiological contamination of the northeast slope. Additional engineering samples will also be required to determine the extent and location of contaminants to better quantify the excavation cut lines of the northeast slope of the quarry.

1.2 Purpose

The purpose of collecting additional soil samples is to determine the volume estimate of contaminated soils that will require excavation. This additional sampling will also provide lithology and other geological information needed for excavation design.

1.3 Scope

This plan designates sample locations and depths, sample identification numbers, analytical parameters, equipment, sampling protocols, data review criteria, end use of the data, and quality assurance requirements.

1.4 Sampling Objectives

The objective of this sampling plan is to determine the volume of contaminated soil that will have to be excavated from the quarry northeast slope. To support this objective, this sampling plan identifies the procedures to be used to:

* Identify sampling locations and specify parameters (Section 3).

- Evaluate field sampling procedures (Section 5) and sample management (Section 6).
- Identify the sample handling and collection procedures (Sections 5 and 6).
- Specify quality assurance (QA) requirements, including procedures for data analysis and data management (Section 7).

2 DATA QUALITY OBJECTIVES

2.1 Summary

Development of this sampling plan involves implementation of the data quality objectives (DQOs) process. DQOs are qualitative and quantitative statements that specify the quality of the data required to support decisions during remedial response activities as specified in *Data Quality Objectives Process for Superfund* (Ref. 1).

2.2 Data Quality Objective Development Process

The DQO development process for engineering characterization sampling at the quarry northeast slope area requires completion of the seven steps (Ref. 1) summarized below. Sections 2.2.1 through 2.2.6 provide a detailed discussion of each step of the DQO development process.

2.2.1 State the Problem

Currently, there is uncertainty associated with the volume of contaminated soil that must be removed from the quarry northeast slope. Additional sampling will determine the upper limit or volume estimate of contaminated soils that will require excavation and placement into the disposal cell.

2.2.2 Decision Identification

A decision has been made to define excavation cut lines for the quarry northeast slope. This data will be used to determine whether soils require placement in the temporary storage area (TSA) or can be placed elsewhere.

2.2.3 Study Inputs

Inputs include:

- Contaminants of concern concentrations in the soil samples.

- Field scans of all borings with 2x2 sodium iodide (NaI) or a 44-9 detector.

2.2.4 Define the Boundaries of the Study

This study includes the soils located at the quarry northeast slope.

2.2.5 Develop a Decision Rule

The decision as to whether excavation lines for contaminated soil removal should be further defined is based upon the data collected.

2.2.6 Developing Uncertainty Constraints

Uncertainty constraints associated with this sampling event are not applicable.

3 SAMPLE LOCATIONS AND PARAMETERS

3.1 Quarry Northeast Slope

The coordinates for sampling locations, the sample identification numbers, and the analytical parameters to be evaluated are specified in Table 3-1. Figure 3-1 shows the borehole locations. Other information can be found in the text.

Sample locations were selected by analyzing previous engineering characterization data from the work zone. Samples will be collected continuously at each borehole location.

The possibility exists that some locations may need to be modified in the field. If such modifications are required, notes regarding reasons for modifications will be made in the logbook, and the new location will be surveyed.

TABLE 3-1 Quarry Northeast Slope

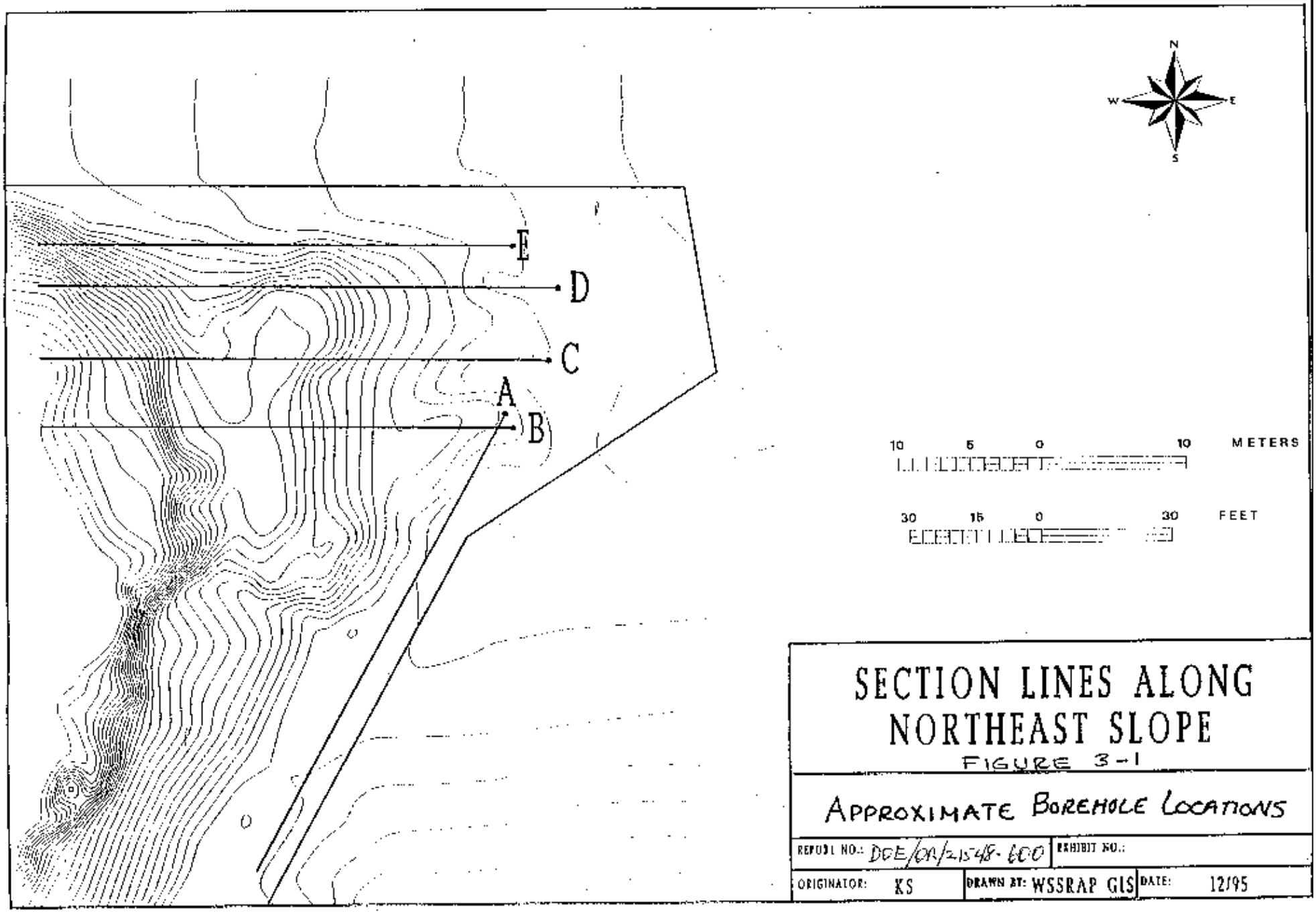
BORING NO.	BORING ANGLE	NORTHING	EASTING	SAMPLE ID*
A-0T12**	0°	1028913	748532	SO-196001-31 thru SO-196001-43
A-30T12	30°	1028913	748532	SO-196002-31 thru SO-196002-38
A-45T12	45°	1028913	748532	SO-196003-31 thru SO-196003-39
B-0T12	0°	1028919	748528	SO-196004-31 thru SO-196004-40
B-25T12	25°	1028919	748528	SO-196005-31 thru SO-196005-36
B-47T12	47°	1028919	748528	SO-196006-31 thru SO-196006-39
B-66T12	66°	1028919	748528	SO-196007-31 thru SO-196007-41
C-0T12	0°	1028935	748537	SO-196008-31 thru SO-196008-42
C-30T12	30°	1028935	748537	SO-196009-31 thru SO-196009-37
C-50T12	50°	1028935	748537	SO-196010-31 thru SO-196010-39
C-63T12	63°	1028935	748537	SO-196011-31 thru SO-196011-42
D-0T12	0°	1028951	748539	SO-196012-31 thru SO-196012-42

TABLE 3-1 Quarry Northeast Slope (Continued)

BORING NO.	BORING ANGLE	NORTHING	EASTING	SAMPLE ID*
D-30T12	30°	1028951	748539	SO-196013-31 thru SO-196013-37
D-52T12	52°	1028951	748539	SO-196014-31 thru SO-196014-40
D-64T12	64°	1028951	748539	SO-196015-31 thru SO-196015-42
E-0T12	0°	1028961	748529	SO-196016-31 thru SO-196016-41
E-45T12	45°	1028961	748529	SO-196017-31 thru SO-196017-39
E-70T12	70°	1028961	748529	SO-196018-31 thru SO-196018-45

* All samples may not be collected. Depth codes will start at "-31" to differentiate engineering samples from QR RI samples collected from the same core. RI depth codes will begin with "-01".

** Optional boring



SECTION LINES ALONG NORTHEAST SLOPE

FIGURE 3-1

APPROXIMATE BOREHOLE LOCATIONS

REPORT NO.: DOE/OR/21548-600		EXHIBIT NO.:	
ORIGINATOR: KS	DRAWN BY: WSSRAP GIS	DATE: 12/95	

4 SAMPLE DESIGNATION AND CUSTODY

4.1 Sample Designation

Sample numbering will follow Procedure ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*. The specific sample identification numbers are detailed in Section 3. Sample forms from Procedure ES&H 4.4.5, *Soil/Sediment Sampling*, will be completed for each sample, with a minimum of the following information:

- Sample ID Number
- Location
- Date
- Time of collection
- Sample collection method
- Preservation
- Names of samplers

4.2 Chain-of-Custody Requirements

Chain-of-custody forms for laboratory samples will be completed and placed in the sample coolers. Sample coolers prepared for shipment will be sealed with chain-of-custody control seals signed and dated by the shipper. Chain-of-custody forms and seals will be prepared in accordance with Procedure ES&H 4.1.2, *Initiation, Generation, and Transfer of Environmental Chain of Custody*.

5 SAMPLING EQUIPMENT AND COLLECTION METHODS

5.1 Sample Collection Procedures for Laboratory Analysis

Samples from angle holes will be collected using a drill rig with a hollow-stem auger and a continuous sampler. The samples from vertical holes will be collected continuously alternating between a split spoon (to retrieve blow counts) and a Shelby tube (using a torvane device to sample the bottom of the tube) for strength parameters. Samples will be placed in glass or plastic sample containers as required for the specific parameter(s) (Section 6.2). All samples will then be placed in coolers while in the field (with the exception of radiological samples that do not require cooling). Sample labels will be completed and attached to all containers prior to placement in the coolers. Sample collection and labeling of containers will be in accordance with Procedures ES&H 4.4.5, *Soil/Sediment Sampling*, and ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*. Sample locations, samples collected, and related data will be recorded in a logbook, at the time of collection in accordance with Procedure ES&H 1.1.4, *Logbook Procedure*, and on the soil sampling data sheet as per ES&H 4.4.5, *Soil/Sediment Sampling*. Lithologic logs will be developed by Contractor per Procedure ES&H 4.4.7, *Soils/Sediment Sampling*.

5.2 Sampling Procedures for Field Analyses

Soils will be visually examined and field notes will document any variations in the soils during sampling. All borings will be field scanned with a 44-9 and/or a 2x2 Sodium Iodide (NaI) meter, and the readings will be noted in the logbook and/or soil/sediment field sheet. Engineering samples for radiological analyses will be collected from any area of a soil core that produces meter readings greater than 2 times background. Engineering samples for soil moisture analyses will be collected at 5 ft intervals from each core.

Soil cores will be collected in 5 ft intervals but will be divided into smaller sections for handling and archiving. all core segments that will be used for engineering samples will be split in half longitudinally, with one half to be designated as the engineering sample and the other to be archived for future Quarry Residuals RI sampling. Each engineering sample will consist of a composited linear foot of the core segment. Core sections that are not required for engineering purposes will archived unsplit for Quarry Residuals.

After remediation of the northeast slope is complete, samples to support Quarry Residuals will be collected from the archived soil core sections, which were collected from areas that were not removed during remediation. Samples will be collected in a manner consistent with the guidelines set forth in Addendum 1 to the Quarry Residuals sampling plan.

If other analyses are performed, then the sample location, type of information collected, and related information will also be recorded in the logbook in accordance with Procedure ES&H 1.1.4, *Logbook Procedure*, and/or on the soil/sediment sampling field sheet as per ES&H 4.4.5, *Soil/Sediment Sampling*.

5.3 Equipment Decontamination

Tools used to collect or transfer samples will be cleaned and decontaminated between each sample. Decontamination will be performed in accordance with Procedure ES&H 4.1.3, *Sampling Equipment Decontamination*.

6 SAMPLE HANDLING AND ANALYSIS

6.1 Analytical Methods

Analytical methods will conform to the quantitative quality assurance (QA) parameters of precision, accuracy, and detection limit as specified in the *Analytical Support Services Specification* (Ref. 3), or for on-site analysis the on-site radiological laboratory operational and quality assurance plan (Ref. 7).

6.2 Preservation Methods and Sample Containers

Preservation methods and containers for samples will be in accordance with the requirements specified by the selected analytical methods. Table 6-1 details the requirements for each parameter.

6.3 Packaging Samples for Shipment and Transportation of Samples

When an off-site laboratory is used, samples will be packaged and transported to the laboratory in accordance with U.S. Department of Transportation Requirements, the *Site Consolidation Transportation Activity Manual* (Ref. 2), and Weldon Spring Site Remedial Action Project (WSSRAP) procedures. A separate custody record must accompany each sample cooler or package (Ref. 3).

Soil samples to be taken outside or inside of the controlled area will be scanned with a Geiger-Mueller gamma detector prior to leaving access control, and instrument readings will be recorded in accordance with ES&H procedures. This includes samples that are being sent to off-site or on-site laboratories and those that are being analyzed by immunoassey.

6.4 Sample Custody

Sample custody activities for sampling will be conducted in accordance with the sample custody program for the Weldon Spring site, which includes documentation of procedures for the preservation of samples, sample identification, recording sample collection location, and specific considerations associated with sample acquisition. Applicable forms for recording these

TABLE 6-1 Sample Preservation and Collection Details

ANALYSIS	LABORATORY LOCATION TURNAROUND TIME	CONTAINER SIZE AND TYPE	PRESERVATIVE
Ra-226 Ra-228	Analyzed wet on site; 24-hr turnaround time	**ON-SITE:** plastic bag	N/A
Ra-226 Ra-228 Th-230 Th-232 U-238	Analyzed dry off site; 2 week turnaround time (only a subset of the samples analyzed on site will be sent for off-site analysis)	**OFF-SITE:** 500 ml clear glass	N/A

data, and the tracking of samples as required by chain-of-custody procedures, are specified in Procedures ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*; 4.1.2, *Initiation, Generation, and Transfer of Environmental Chain of Custody*; 4.1.4, *Quality Control Samples of Aqueous and Solid Matrices: Definitions, Identification Codes, and Collection Procedures*; and 4.4.5, *Soil/Sediment Sampling*.

Samples will be accompanied by chain-of-custody records. Completed chain-of-custody documents will be retained as QA records and maintained in accordance with the WSSRAP quality assurance program.

Authorized sample custodians at the laboratory will sign for incoming samples, obtain documents of shipment, and verify data entered onto the sample custody records. If any damage or shipping discrepancy is noted upon receipt of samples, the laboratories will be required to inform the Project Management Contractor immediately.

6.5 Data Evaluation and Reduction

Data packages received from the subcontracted laboratory will undergo several processes to evaluate the quality of the data. When the data are first received, copies will be distributed to the Verification Group and data users for review as described below. If validation of sample

analysis has been requested, a copy will be forwarded to the Validation Group for data qualification.

6.5.1 Data Verification

All sample analytical results received from the laboratory will be reviewed in accordance with ES&H 4.9.1, *Environmental Monitoring Data Verification*. The following factors will be evaluated to verify if a sample has been properly handled according to WSSRAP protocol:

- Chain-of-custody
- Holding times
- Sample preservation requirements
- Laboratory chain of custody
- Sample analysis request form
- Quality control samples
- Laboratory receipt forms

6.5.2 Data Review

Copies of the data packages will be distributed to the data users for their review. The data will be reviewed to identify discrepancies in the field quality control samples, inconsistencies with characterization data, and apparent abnormalities. Deficiencies reported by data users will be reported to the Verification Group. Data users may request validation of any data that appear to be of questionable quality. This review will be done in accordance with ES&H Procedure 4.9.3, *Data Review Procedure for Surface Water, Groundwater, and Soils*.

6.5.3 Data Validation

Randomly selected laboratory data and data selected by verification or data users will undergo thorough reviews of the analytical process in accordance with ES&H 4.9.2, *Environmental Monitoring Data Validation*. These reviews will be conducted by the Validation Group. Ten percent of laboratory data associated with this plan will be validated.

The purpose of this validation procedure will be to specify a consistent means for reviewing and evaluating the data resulting from laboratory analyses and for providing a consistent means of documenting the evaluations and reporting the usefulness of the data to the data users. This will be accomplished through a thorough review of the analytical data using laboratory analytical records to assess laboratory conformance to quality control criteria, data quality requirements for data quality objectives, and procedural requirements.

7 QUALITY ASSURANCE

MK-Ferguson Company, the Project Management Contractor (PMC) at the Weldon Spring Site Remedial Action Project (WSSRAP), has developed the *Project Management Contractor Quality Assurance Program* (QAP) in accordance with DOE Order 5700.6C. The PMC QAP applies a graded approach to ensure that activities performed at the WSSRAP are of documented quality (Ref. 4).

The QAP is supported by site quality procedures that direct the evaluation of quality-affecting activities by implementing independent assessments and processes to identify nonconforming conditions and to ensure corrective actions.

The PMC has developed the *Environmental Quality Assurance Project Plan* (Ref. 5) to guide all environmental activities conducted at the WSSRAP in accordance with U.S. Environmental Protection Agency EPA QA/R-5 (Ref. 6).

7.1 Analytical Procedures

The on-site or off-site quantitative laboratory conducting radiological and chemical analysis have submitted controlled copies of its site-specific Quality Assurance Project Plans (QAPjP) and standard operating procedures (SOPs). These plans and SOPs have been reviewed and accepted by the PMC. The WSSRAP and contract laboratory SOPs direct the operations, analyses, and activities that will be thoroughly prescribed, documented, and performed in accordance with accepted standards and methodologies. Any changes to controlled SOPs and the QAPjP are reviewed by the PMC. The laboratory QAPjP and SOPs specify quality control requirements to demonstrate the precision and accuracy of methods and procedures.

All data generated by analytical activities (i.e., calculations, chromatographs, calibration curves, quality assurance analyses) are quality assurance (QA) records and will be maintained in accordance with the quality assurance program.

Maintenance and storage of completed records, charts, and logs of all pertinent calibrations, analyses, quality control activities, and data generated by the laboratory will be kept in a WSSRAP-specific project file. Both electronic and hard-copy data reports must be available

at the laboratory's facilities for 3 years after termination or expiration of any contract. Storage areas must keep records safe from damage by moisture or fire.

7.2 Internal Quality Control Checks

Quality control samples will be collected to ensure consistent and accurate performance of sample collection and laboratory analysis. Table 7-1 provides a summary list of the quality control samples that will be collected to support the sampling effort.

TABLE 7-1 Field Quality Control Sample Summary

QUALITY CONTROL SAMPLE TYPE	FREQUENCY	PURPOSE
Matrix Spike/Matrix Spike Duplicate or Matrix Duplicate	1 per 20 or 1 per 14 days[a]	Assess matrix and possible interlaboratory variability
Field Replicate	1 per 20	Assess matrix and interlaboratory variability
Equipment Blank (nondedicated equipment only)	1 per 20	Assess effectiveness of decontamination
Deionized Water Blank[b]	1 per month	Assess quality of deionized water
Field Blank[b]	1 per month	Assess impact of ambient conditions on samples

(a) Whichever is of higher frequency.
(b) Collected together on the same day.

7.2.1 Quality Assurance Records

Records generated as a result of this plan will be maintained as QA records. Field sampling forms, analytical data, equipment calibration records, and confirmation and validation documentation records will all be considered QA records and will be maintained in accordance with the requirements of SQP-7, *Quality Assurance Records*. This will provide both security and protection to critical records.

8 REFERENCES

1. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. *Data Quality Objectives Process for Superfund*, EPA/540/G-93/071, Publication 9355.9-01. Washington, D.C. September 1993.

2. MK-Ferguson Company and Jacobs Engineering Group. *Site Consolidated Transportation Activity Manual*, Rev. 0. DOE/OR/21548-309. Prepared for the U.S. Department of Energy, Oak Ridge Field Office. St. Charles, MO. October 1992.

3. *Analytical Support Services Specification*, Rev. 1, Contract No. DE-AC05-86OR21548. Weldon Spring Site Remedial Action Project, Weldon Spring, Missouri. November 1994.

4. MK-Ferguson Company and Jacobs Engineering Group. *Project Management Contractor Quality Assurance Program*, Rev. 2. DOE/OR/21548-333. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. December 1995.

5. MK-Ferguson Company and Jacobs Engineering Group. *Environmental Quality Assurance Project Plan*, Rev. 1. DOE/OR/21548-352. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. July 1993.

6. U.S. Environmental Protection Agency. Quality Assurance Management Staff. *EPA Requirements for Quality Assurance Project Plan for Environmental Data Operations*. EPA QA/R-5. Washington, D.C. Draft Interim Final. August 1994.

7. MK-Ferguson Company and Jacobs Engineering Group. *On-Site Radiological Laboratory Operational and Quality Assurance Plan*. Rev. 0. DOE/OR/21548-593. Prepared for the U. S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. December 1995.

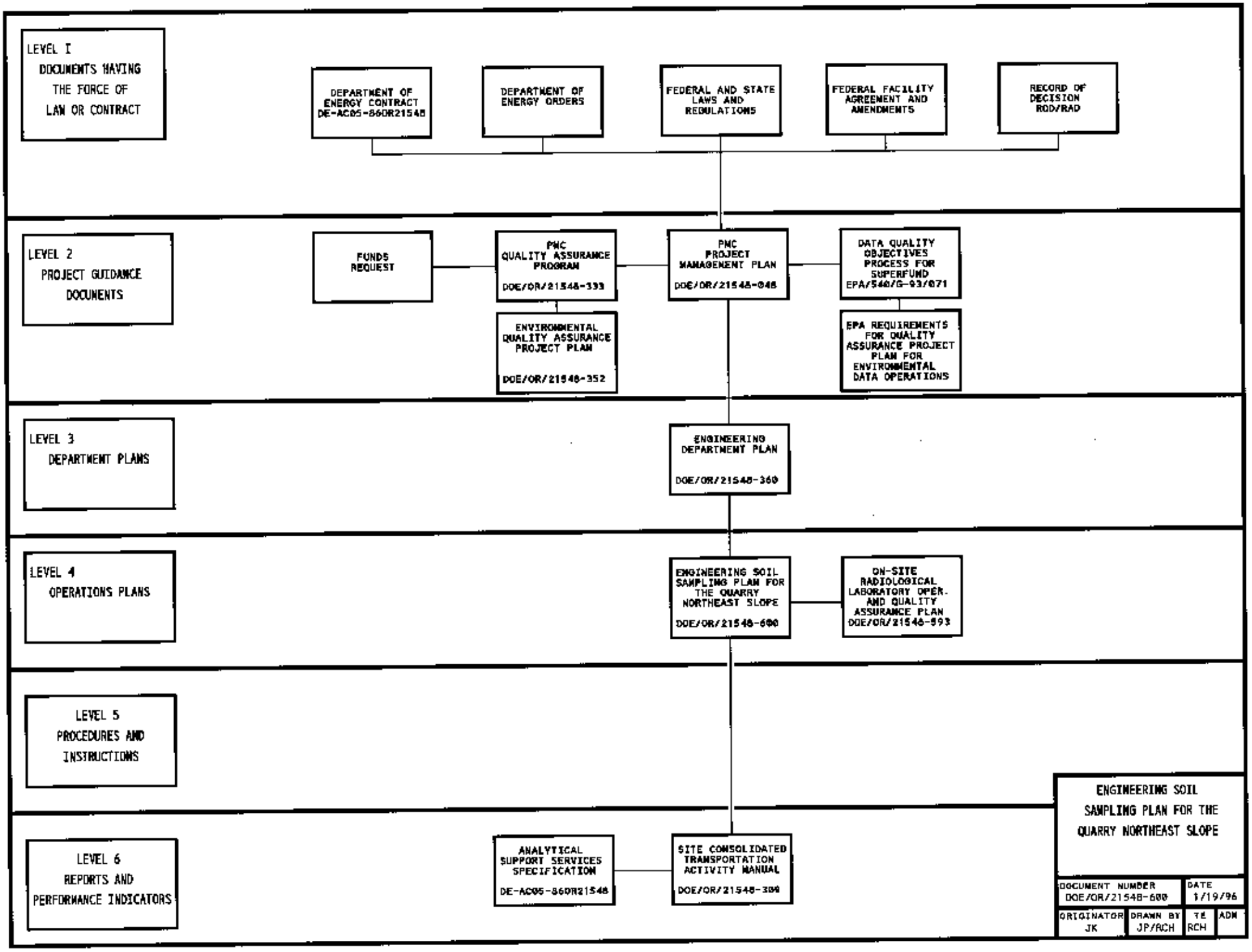
DOE ORDERS

5700.6C, *Quality Assurance Program A Total Management System*

PROCEDURES

ES&H 1.1.4, *Logbook Procedure*
ES&H 4.1.1, *Numbering System for Environmental Samples and Sampling Locations*
ES&H 4.1.2, *Initiation, Generation, and Transfer of Environmental Chain of Custody*
ES&H 4.1.3, *Sampling Equipment Decontamination*
ES&H 4.1.4, *Quality Control Samples of Aqueous and Solid Matrices: Definitions, Identification Codes, and Collection Procedures*
ES&H 4.4.5, *Soil/Sediment Sampling*
ES&H 4.4.7, *Soils, Rock Core, and Rock Chip Borehole Logging*
ES&H 4.9.1, *Environmental Monitoring Data Verification*
ES&H 4.9.2, *Environmental Monitoring Data Validation*
ES&H 4.9.3, *Data Review Procedure for Surface Water, Groundwater, and Soils*
RC-17, *Off-Site Transportation of Hazardous Materials*
SQP-7, *Quality Assurance Records*

APPENDIX A
Document Hierarchy


LEVEL I
DOCUMENTS HAVING THE FORCE OF LAW OR CONTRACT
DEPARTMENT OF ENERGY CONTRACT DE-AC05-86OR21548
DEPARTMENT OF ENERGY ORDERS
FEDERAL AND STATE LAWS AND REGULATIONS
FEDERAL FACILITY AGREEMENT AND AMENDMENTS
RECORD OF DECISION ROD/RAD
LEVEL 2
PROJECT GUIDANCE DOCUMENTS
FUNDS REQUEST
PMC QUALITY ASSURANCE PROGRAM DOE/OR/21548-333
PMC PROJECT MANAGEMENT PLAN DOE/OR/21548-048
DATA QUALITY OBJECTIVES PROCESS FOR SUPERFUND EPA/540/G-93/071
ENVIRONMENTAL QUALITY ASSURANCE PROJECT PLAN DOE/OR/21548-352
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ENGINEERING SOIL SAMPLING PLAN FOR THE QUARRY NORTHEAST SLOPE DOE/OR/21548-600
ON-SITE RADIOLOGICAL LABORATORY OPER. AND QUALITY ASSURANCE PLAN DOE/OR/21548-593
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PROCEDURES AND INSTRUCTIONS
LEVEL 6
REPORTS AND PERFORMANCE INDICATORS
ANALYTICAL SUPPORT SERVICES SPECIFICATION DE-AC05-86OR21548
SITE CONSOLIDATED TRANSPORTATION ACTIVITY MANUAL DOE/OR/21548-309
ENGINEERING SOIL SAMPLING PLAN FOR THE QUARRY NORTHEAST SLOPE
DOCUMENT NUMBER DOE/OR/21548-600
DATE 1/19/96
ORIGINATOR JK
DRAWN BY JP/RCH
TE RCH
ADM

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59358

MK-Ferguson Company
Weldon Spring Site Remedial Action Project

TRANSMITTAL OF CONTRACT DELIVERABLE

Date: 2/1/96 Transmittal No.: CD-0094-00

Title of Document: Engineering Soil Sampling for the Quarry Northeast Slope

Doc. Num.: 600 Rev. No.: 1 Date of Document: January 1996

Purpose of Transmittal: Request for Department of Energy acceptance of contract deliverable.

The Project Management Contractor has reviewed and approved the attached document and hereby delivers it to the U.S. Department of Energy, Weldon Spring Site Office.

The document will be considered accepted unless we receive written notification to the contrary within 30 days of the date of this transmittal.

James R. Powers
Project Director

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