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CONTRACT NO. DE-AC05-86OR21548

WELDON SPRING QUARRY SUPPLEMENTARY ENVIRONMENTAL MONITORING INVESTIGATIONS SAMPLING PLAN: ADDENDUM 3

Weldon Spring Site Remedial Action Project
Weldon Spring, Missouri

DECEMBER 1995 **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: Weldon Spring Quarry Supplementary Environmental Monitoring Investigations Sampling Plan: Addendum 3	

APPROVALS

Originator	12-7-95 Date
Department Manager	12/7/95 Date
Data Administration Manager	12/11/95 Date
Compliance Manager	12/12/95 Date
Quality Assurance Manager for RPC	12/13/95 Date
Project Director (or Deputy Project Director)	12/15/95 Date

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Weldon Spring Site Remedial Action Project

Weldon Spring Quarry Supplementary Environmental Monitoring Investigations Sampling Plan: Addendum 3

Revision 1

December 1995

Prepared by

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for the

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

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1 INTRODUCTION

1.1 Purpose

The *Weldon Spring Quarry Supplementary Environmental Monitoring Investigations Sampling Plan*, (Ref. 1) included sampling locations and a list of parameters to be analyzed during the in situ groundwater sampling effort.

Phase I of the in situ groundwater sampling program was completed August 15, 1994. The initial results indicated that uranium contamination is stratified. During Phase I, the in situ water collection sampling technique was modified to include the use of temporal well points in areas where water inflow rates were too slow to obtain samples within a few hours.

Phase II, as defined in Addendum 2 (Ref. 1) of the in situ groundwater sampling program, was completed January 1995. The results of this study confirmed stratification of both uranium and nitroaromatic contamination.

Due to the overlap of scopes of the original *Supplemental Plan* and the *Quarry Residuals Sampling Plan* (Ref. 3), the *Sampling Plan* cross-referenced the *Supplemental Plan* for some of its data collection aspects using in situ sampling techniques. Addendum 3 adds additional sampling locations and provides data intended to close the remaining sampling plan data gaps regarding the extent of groundwater contamination. Because these data are collected for the express purpose of addressing sampling plan data needs, the quality objectives for these data are intended to reflect those specified in the *Quarry Residuals Sampling Plan* and therefore, are not reiterated specifically within this addendum.

1.2 Scope

Phase III of the in situ groundwater sampling will target the main uranium plume which is located north of the Femme Osage Slough and near Vicinity Property 9 (VP 9). The limits of contamination west of the quarry will also be examined. In addition, alluvium samples will be collected adjacent to the groundwater sample intervals to evaluate uranium sorption on sediments.

The scope of sampling of the existing well points inserted for Phase II will be expanded to include sampling after the May 1995 flood. Also groundwater samples for both Phase II and Phase III will be taken contemporaneously.

2 SAMPLE LOCATION AND CHEMICAL CHARACTERIZATION

2.1 Location and Methodology

Groundwater Samples

Twenty-eight additional samples from 13 locations north of the Femme Osage Slough around VP-9 and west of the quarry as outlined in Table 2-1. The locations of these samples are shown on Figures 2-1 and 2-2. Nine sampling locations will be west of the known uranium plume and four locations within the VP-9 area. A provision has been made to collect an additional 16 samples (eight locations) from currently undefined areas. The final number of sampling locations will depend upon the plume boundary and will be determined according to uranium analysis results. On-site uranium analysis will provide the data necessary to determine the approximate boundary of the main plume or to determine whether additional step-off sampling will be required. Some additional sampling may be required immediately south of the slough if the margins of the uranium plume cannot be determined north of the slough.

One-time groundwater samples will be collected with a special push-in stainless steel assembly left in the ground until sufficient sample volume has been collected. If inflow rates are slow (<1 l/hr), a 1 in. diameter polyvinyl chloride (PVC) well point will be temporarily installed at each sampling interval. All sampling points and temporary well point holes exceeding 10 ft will be grouted within 30 days after construction as per 10 CSR 23-4.080 and registered.

Alluvium Samples

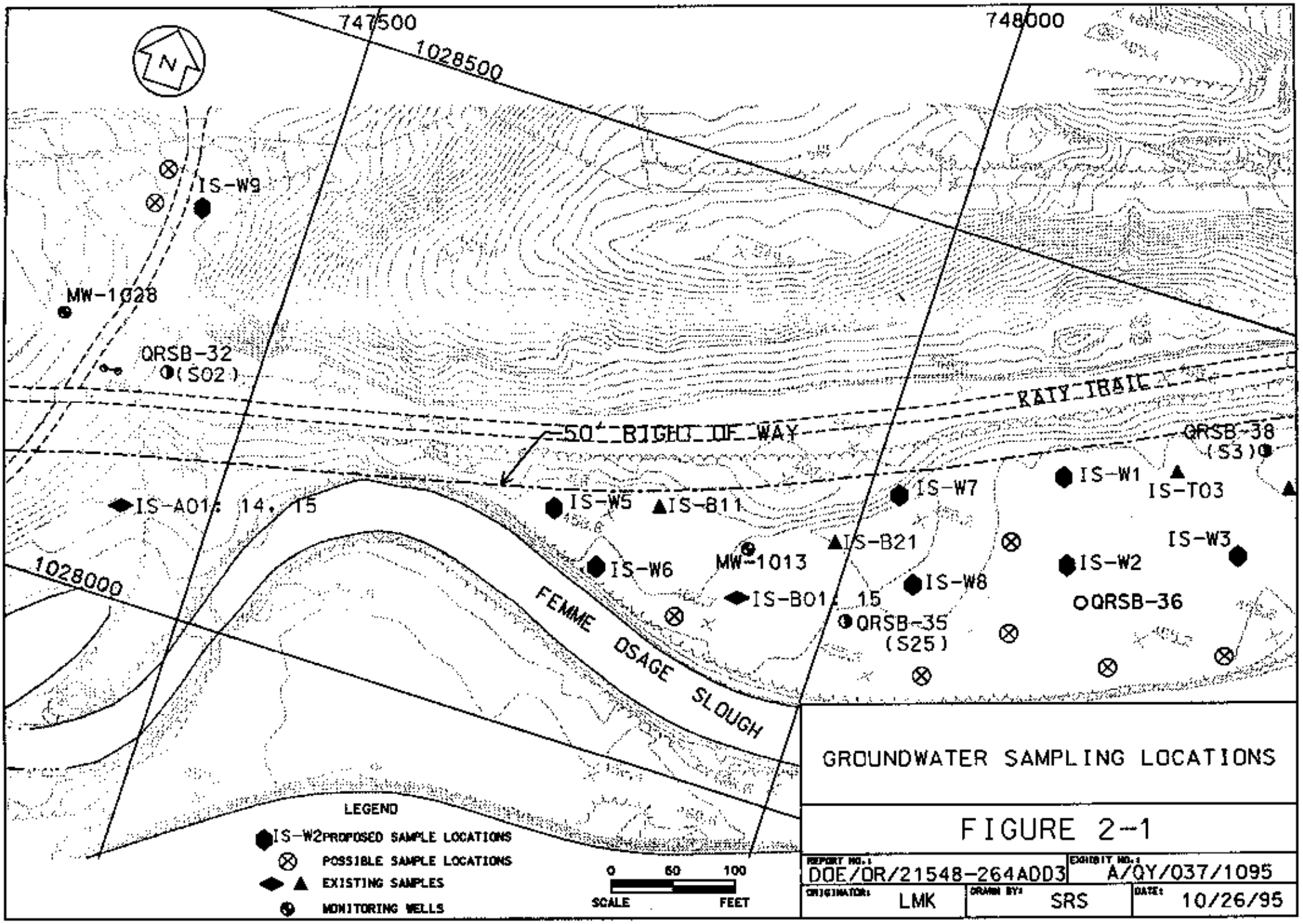
Ten sampling locations with two samples each will be collected using a push tool assembly. The unopened tool will be pushed to the upper screen depths, opened, a sample collected, and retrieved. This methodology will enable the collection of alluvium samples over the same stratigraphic interval as the existing or previously sampled groundwater interval. The sampling locations are shown in Table 2-2. These will be offsets (≤ 1 ft) of existing surveyed groundwater sampling locations.

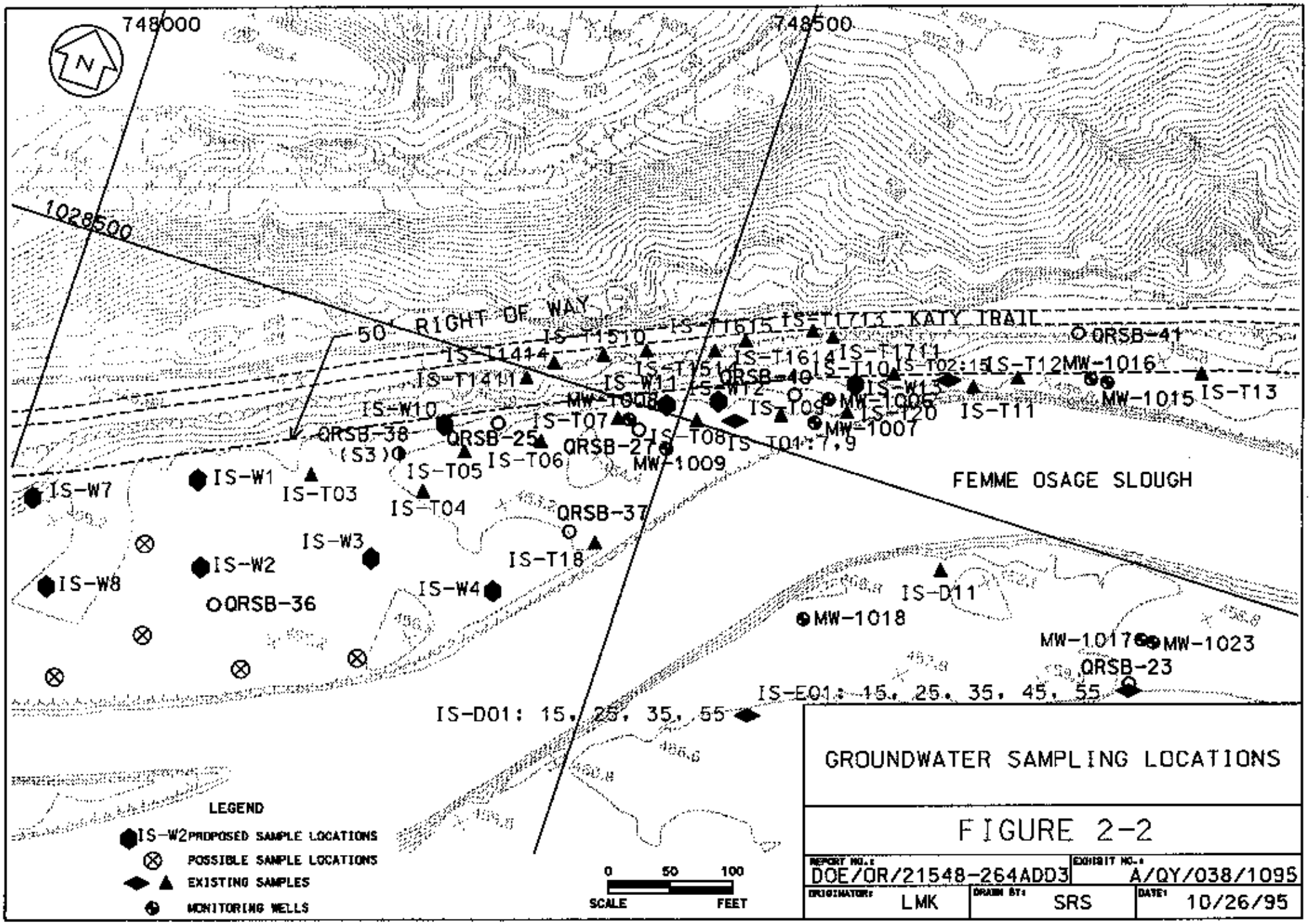
TABLE 2-1 Groundwater Sampling Locations

ID	EST'D DEPTH (FT)	OFFSET	COMMENTS
IS-W1	10, 17	75' WSW IS-TO3	Outside existing plume
IS-W2	10, 17, 37	75' SSW IS-TO3	Outside existing plume
IS-W3	10, 22	75' SW IS-TO4	Outside existing plume
IS-W4	10, 17, 37	75' SE IS-TO4	Outside existing plume
IS-W5	10, 15	75' WSW IS-B11	Outside existing plume
IS-W6	10, 25	75' SSW IS B-11	Outside existing plume
IS-W7	10, 16	75' NNE IS-B21	Outside existing plume
IS-W8	10, 25	75' E IS-B21	Outside existing plume
IS-W9	10, 15	250' SW MW-1039	Outside existing plume
IS-W10	8, 10	40' N IS-TO5	Within existing plume
IS-W11	8, 10	40' NW IS-TO8	Within existing plume
IS-W12	8, 10	40' NE IS-TO8	Within existing plume
IS-W13	8, 10	25' NW IS T10	Within existing plume

TABLE 2-2 Soil Sampling Locations

ID	STARTING DEPTH (FT)	OFFSET
IS-SO01	3.8, 8.6	≤1' IS-T03
IS-SO02	8.7, 11.7	≤1' IS-T05
IS-SO03	7.3, 10.8	≤1' IS-T06
IS-SO04	7.5, 9.4	≤1' IS-T07
IS-SO05	7.3, 11.4	≤1' IS-T08
IS-SO06	9.7, 14.0	≤1' IS-T10
IS-SO07	11.1, 14.7	≤1' IS-T12
IS-SO08	7.8, 12.8	≤1' IS-T18
IS-SO09	7.3, 9.8	≤1' IS-T20
IS-SO10	11.2, 20.2	≤1' IS-B21


747500
748000
1028500
1028000
N
IS-W9
MW-1028
QRSB-32
(S02)
50' RIGHT OF WAY
KATY TRAIL
QRSB-38
(S3)
IS-W1
IS-T03
IS-W7
IS-A01: 14, 15
IS-W5
IS-B11
IS-B21
IS-W3
IS-W6
MW-1013
IS-W2
IS-W8
IS-B01: 15
QRSB-36
QRSB-35
(S25)
FEMME OSAGE SLOUGH
LEGEND
IS-W2 PROPOSED SAMPLE LOCATIONS
POSSIBLE SAMPLE LOCATIONS
EXISTING SAMPLES
MONITORING WELLS
0 50 100
SCALE FEET
GROUNDWATER SAMPLING LOCATIONS
FIGURE 2-1
REPORT NO.: DOE/OR/21548-264ADD3
EXHIBIT NO.: A/QY/037/1095
ORIGINATOR: LMK
DRAWN BY: SRS
DATE: 10/26/95



GROUNDWATER SAMPLING LOCATIONS

FIGURE 2-2

REPORT NO.:	EXHIBIT NO.:	
DOE/OR/21548-264ADD3	A/QY/038/1095	
ORIGINATOR: LMK	DRAWN BY: SRS	DATE: 10/26/95

TABLE 2-3 Analytes for Groundwater and Alluvium Samples

	GROUNDWATER	ALLUVIUM
FIELD DETERMINATIONS		
pH	all	NA
Eh	all	NA
Specific conductance	all	NA
Color	all	all
Clarity	all	NA
ON-SITE ANALYSIS		
Uranium (total)	all	all
TNT/TNB	all	all
Total organic carbon	all	NA
Ferric/ferrous iron	all	NA
Sulfate	all	NA
Alkalinity	all	NA
Litho logging	NA	all
OFF-SITE ANALYSIS		
Uranium (isotopic)	Selected*	Selected*
Nitroaromatics	Selected*	Selected*
Total organic carbon	NA	Selected*

* Based on results of on-site analyses.

2.2 Analytes of Concern

The original sampling plan (Phase 1) did not call for the analysis of nitroaromatic compounds. On-site and off-site analyses for Phase III will be performed, as outlined in Table 2-3.

3 SAMPLE ANALYSIS AND DATA EVALUATION

Analytical results received from off-site laboratory analyses will undergo data verification as outlined in the original sampling plan and according to established site procedures. All field, on-site, and off-site results will be tabulated, analyzed, correlated, and/or plotted on graphs, maps, and/or cross sections. These data will be combined with the data obtained from Phases I, and II, in situ groundwater sampling. A referenceable completion report, including all analytical results and data analyses, will be produced at the completion of the in situ groundwater sampling efforts.

4 REFERENCES

1. MK-Ferguson Company and Jacobs Engineering Group. *Weldon Spring Quarry Supplementary Environmental Monitoring Investigations Sampling Plan*, Rev. 0. DOE/OR/21548-264. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. August 1992.

2. Kleeschulte, Michael J. *Water-Quality Data for the Missouri River and Missouri River Alluvium Near Weldon Spring, St. Charles County, Missouri--1991-92*, U.S. Geological Survey, Open-File Report 93-109. Prepared in cooperation with the U.S. Department of Energy, Rolla, Missouri. 1993.

3. MK-Ferguson Company and Jacobs Engineering Group. *Quarry Residuals Sampling Plan*, Rev. 1. DOE/OR/21548-382. Prepared for the U.S. Department of Energy, Oak Ridge Operations Office. St. Charles, MO. January 1994.

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 4.1.4, *Quality Control Samples for Aqueous and Soil Matrices: Definitions, Identification Codes, and Collection Procedures*

ES&H 4.4.1, *Groundwater Sampling*

ES&H 4.4.4, *Subsurface Monitoring Device Plugging and Abandonment Procedure*

ES&H 4.5.1, *pH and Temperature Measurement in Water*

ES&H 4.5.6, *Measurement of Dissolved Oxygen in Water*

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*

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MK-Ferguson Company
Weldon Spring Site Remedial Action Project

TRANSMITTAL OF CONTRACT DELIVERABLE

Date: 12/18/95 Transmittal No.: CD-0090-01

Title of Document: Weldon Spring Quarry Supplementary Environmental Monitoring Investigations Sampling Plan: Addendum 3

Doc. Num.: 264 Rev. No.: 1 Date of Document: December 1995

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

James R. Powers
Project Director

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