G-000-303.20

2431

CHANGES TO RI/FS WORK PLAN DOCUMENTS

11/30/90

DOE-355-91
DOE-FO/EPA
2
LETTER

[redacted]

[redacted] 2431

Department of Energy
FMPC Site Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6319

NOV 30 1990
DOE-355-91

Ms. Catherine A. McCord, Remedial Project Manager
U. S. Environmental Protection Agency
Region V - 5HR-12
230 South Dearborn Street
Chicago, IL 60604

Mr. Graham E. Mitchell, DOE Coordinator
Ohio Environmental Protection Agency
40 S. Main Street
Dayton, OH 45402

Dear Ms. McCord and Mr. Mitchell:

CHANGES TO RI/FS WORK PLAN DOCUMENTS

Reference: 1) Letter, C. A. McCord to B. J. Davis, "QAPP U.S. DOE Fernald OH6 890 008 976," dated October 7, 1990

2) Letter, C. A. McCord to B. J. Davis, "QAPP U.S. DOE Fernald OH6 890 008 976," dated October 13, 1990

Enclosed is a complete listing of all changes made to the RI/FS Work Plan documents including the QAPP. The approval statement in the status column refers to site approval for incorporation into the Work Plan not U.S. EPA approval. Also enclosed with this letter are all changes made to the Work Plan documents since the initial U.S. EPA approval was received on these documents in 1988.

Please note that the first six DCRs were incorporated into the documents prior to U.S. EPA approval.

If you have any questions, please call Oba Vincent at FTS 774-6937.

Sincerely,

Andrew P. Avel
FMPC Remedial Action
Project Manager

DP-84:Vincent

Enclosure: As stated

cc w/o encl.:

R. P. Whitfield, EM-40, FORS
W. D. Adams, EW-90, ORO
P. J. Gross, SE-31, ORO
W. E. Muno, USEPA-V
P. Q. Andrews, USEPA-V
J. Benetti, USEPA-V
K. J. Pierard, USEPA-V
D. A. Ullrich, USEPA-V
E. Schuessler, PRC
R. L. Glenn, Parsons

DCR STATUS LOG

DCR#	DOC	Date	Title	Status
1		3-88	Incorporated into Rev. 3	Approved
2		3-88	Incorporated into Rev. 3	Approved
3		3-88	Incorporated into Rev. 3	Approved
4		3-88	Incorporated into Rev. 3	Approved
5		3-88	Incorporated into Rev. 3	Approved
6		3-88	Incorporated into Rev. 3	Approved
7	QAPP	1-5-89	Use of 10" and 8" casing	Approved
8	QAPP	1-5-89	Rinsate Sample Frequency	Approved
9	QAPP	void	Addition of 6 Labs	Void (see#11)
10	WP	1-5-89	Add 3, move 2 wells	Approved
11	QAPP	2-27-89	Add 6 Labs	Approved
12	QAPP	9-19-88	Water Collection Form Change	Approved
13	WP/SP	9-5-89	Biased Sampling at 250'	Approved
14	WP	1-5-89	24 additional wells	Approved
15	QAPP	3-23-89	Revise Section 6.0	Approved
16	WP/SP	10-14-88	Correct ID on 301 and 401	Approved
17	QAPP	1-5-89	Revise Section 5.0	Approved
18	WP	9-5-89	Additional Labs per QAPP	Approved Not issued
19	SP	2-27-89	Additional Labs per QAPP	Approved
20	QAPP	11-7-88	Revision to Section 12.0	Approved
21	WP	2-27-89	10 additional wells	Approved
22	SP	2-27-89	Sample numbering change	Approved
23	All	12-5-88	Change well number from 3 to 4 digits	Approved
24	QAPP	9-5-89	Section 16.0	Under Review
25	QAPP	9-5-89	Added Alk. to Section 6.2	Approved
26	QAPP	12-20-88	Revise Section 5.1	Approved
27	WP	Not issued	Management Plan	Not issued
28	QAPP	9-5-89	Revise Section 15.0	Approved

#3

Attachment to: 11-374 (doc-355-91

[redacted]

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DCR STATUS LOG
(continued)

DCR#	DOC	Date	Title	Status
29	WP/SP	9-5-89	Eh Analyses	9-5-89
30	SP		Unique number system	Under review
31	QAPP	void	Fernald Project Procedures	Void
32	WP	Not issued	Delete Wells 3071 & 4071	Not issued
33	WP	10-13-89	Production & Add. Suspect Areas	Approved
34	CRP	12-13-89	Community Relations Plan	Approved Not issued
35	WP	void	K-65 Sampling	Void
36	WP	void	South Plume	Void
37	WP	void	30 additional wells	Void
38	WP	3-23-90	31 additional wells	Approved Not issued
39	WP	4-19-90	51 additional wells	Approved Not issued
40	H&S	4-4-90	Health & Safety Specific Plans	To be issued
41	WP	7-19-90	Sampling & Analyses 0U-2	Revision "B" to be issued
42	QAPP	void	Revise Sections 2,3,9,15	Void
43	WP	6-8-90	6 additional wells	Approved
44	WP	6-26-90	12 low priority wells	Approved Not issued
45	QAPP	7-6-90	8" well casing	Approved
46	WP	Issued	0U-1 Sampling	Under review
47	QAPP	Not issued	Revision to Section 15	Not issued
48	WP	7-6-90	Delete Section 6.0	Approved
49	QAPP	7-24-90	Health & Safety Calibration Update	Approved
50	WP	10-10-90	K-65 Sampling Work Plan Addendum	Approved

DOCUMENT REVISION LOG SHEET

Place in front of section 5 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
7	QAPP Vol. V	5.2	24	3.1
7	QAPP Vol. V	5.2	37	3.1

- After the walkover of the grid is completed, the scaler and timer are stopped and the following items are recorded on the Surface Measurements Field Logbook Form (Figure 5-3): (1) grid ID number, (2) the total count, and (3) the elapsed time.

- Return to each location which has been "flagged" within the grid and perform a systematic survey beginning at the flag and working outward to determine the areal extent of the elevated reading.

- Record the highest count rate and the approximate location and areal extent; insert a marker at the location of highest reading.

5.2 DRILLING PROCEDURES

Soil borings are made to determine the nature, arrangement, thickness and extent of the soil strata. The depth of borings, frequency, and the type of testing and sampling required are dependent upon the purpose of the subsurface investigation.

Borehole advancement for monitoring wells will be performed using cable tool drilling techniques. The use of mud rotary or continuous flight hollow stem augers is prohibited for monitoring wells. A soil auger drilling rig will be used to collect undisturbed soil samples in clay layers that may be found in the till. With the cable tool techniques, the hammer is used to dislodge the soils and mix them with potable water for recovery and removal from the hole. Cable tool borehole drilling will be performed in accordance with Section 2.2.5, Percussion Drilling Borehole Advancement, IT Manual of Practice, Subsurface Investigations.

Comments from the IT Manual of Practice, Subsurface Investigations pertinent to the cable tool drilling technique follow:

- When advancing the boring using cable tool drilling techniques, a temporary steel casing will be drilled, driven, or pushed as the borehole is advanced. The temporary casing will be nominal ten-inch diameter to allow for construction of the monitoring well in the 100, 200, and 300 series borings. The temporary casing in the 400 series boring will be nominal ten-inch diameter to approximately 150 foot depth, then telescope to nominal eight-inch diameter to allow for the construction of the monitoring well. Cuttings will be removed from the borehole using a sand pump or dart valve bailer.

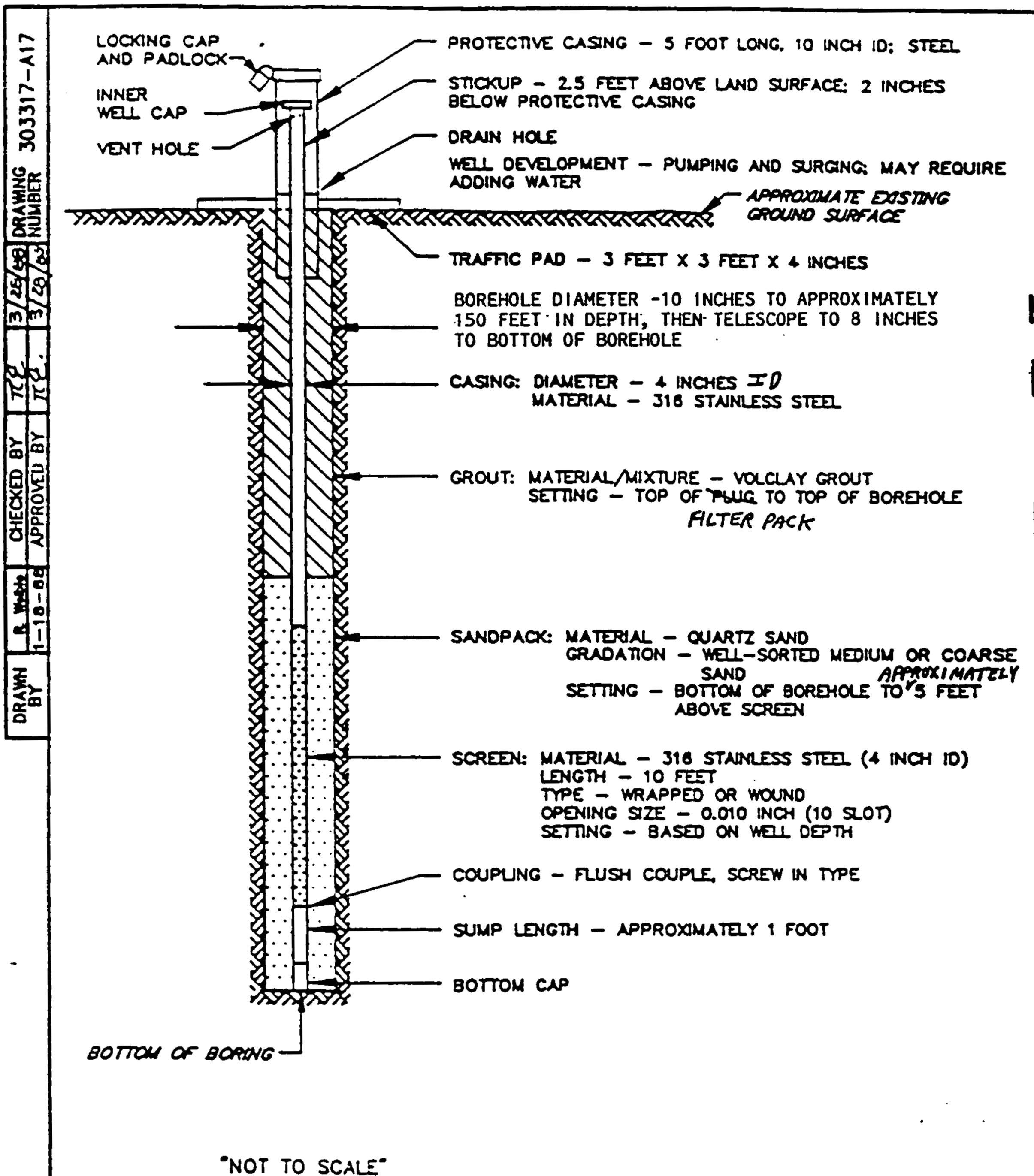


FIGURE 5–15

SUMMARY OF SPECIFICATIONS FOR WELL COMPLETION
300– AND 400– SERIES WELLS

"Do not Scale This Drawing"

8 [redacted]

DOCUMENT REVISION LOG SHEET

Place in front of section 6 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
8	QAPP Vol. V	6.1	8	3.1
8	QAPP Vol. V	6.4	22	3.1
8	QAPP Vol. V	6.5	24	3.1
8	QAPP Vol. V	6.6	26	3.1

- When the pump and lines are removed from a well, they will be placed on plastic sheeting to avoid contact with the ground.

- Prior to re-use, the pump and lines will be drained and the outside surfaces will be decontaminated with a water wash and deionized water rinse. The internal surfaces will be decontaminated by pumping deionized water through the pump system. Purging of the next monitoring well will further reduce the possibility of cross-contamination. Should the equipment become visibly contaminated, it will be disassembled and cleaned by the following procedures:

  - In the case of inorganic contaminants, the equipment will first be washed with a nonphosphate detergent and then rinsed with dilute (0.1 N) hydrochloric acid followed by two separate deionized water rinses.

  - In the case of organic contaminants, the equipment will first be washed with a nonphosphate detergent and then rinsed with tap water, methanol, and two separate deionized water rinses.

  - As described above, the equipment will be thoroughly rinsed with two deionized water rinses to remove traces of hydrochloric acid, detergent, and methanol (acetone may be substituted for methanol if volatile organic compounds are not being determined).

  - Sampling equipment will not be placed directly on the ground or on other contaminated surfaces prior to insertion into the well, but will be placed on a clean plastic sheet adjacent to or around the well.

  - The final deionized water rinse will be sampled and analyzed at a frequency of one per every set of twenty locations, or fraction thereof, to check for cross-contamination between monitoring wells.

  - Decontamination of the submersible sampling pump(s) and other sampling equipment will be performed at a designated central staging area at the FMPC. If this is not possible due to extenuating circumstances, the sampling equipment may be decontaminated in the field.

- Existing wells with limited access will be sampled from the pump discharge.

- o Make sure samples are properly labeled and chain-of-custody records, sample collection logs, water quality field collection reports (Figure 6-1), and laboratory request for analysis forms are properly filled out.

6.4 Surface Soil Sampling

Surface material or soil will be collected using a hand trowel, scoop, or coring device in accordance with the Work Plan and the Surface Soil Sampling Task Procedures. The following procedures will be used for soil sampling:

- o Samples will be collected using a trowel, scoop, or coring device in accordance with the sampling plan.
- o Decontamination of all sampling equipment will be performed at a designated central staging area at the FMPC. Decontamination in the field will only be performed if circumstances prevent equipment decontamination at the staging area. The trowel, scoop, or coring device, and other sampling equipment such as pans, gloves, etc. will be decontaminated between each sample collection by cleaning with a nonphosphate detergent and a bottle brush, rinsing with tap water, methanol (acetone may be substituted if volatile organic compounds are not being determined), and two separate deionized water rinses.
- o The final deionized water rinse following equipment decontamination will be sampled and analyzed at a frequency of one per every set of twenty locations or fraction thereof to check for potential cross-contamination between surface soil sample locations.
- o Sufficient sample and rinsate volumes will be collected to perform all required analyses.
- o Samples will be transferred directly from the hand trowel, scoop, or coring device to the appropriate sample containers.
- o If soil samples are being collected for volatile organics analysis (VOA), the sample must be transferred to standard VOA vials. Vials should be completely filled to minimize any head space in the containers.

- Soil samples collected for other organic or inorganic analyses should be transferred to glass containers with screw cap closures.

- A field/trip blank for each sample set will accompany the samples back to the laboratory. The field/trip blank will consist of organic-free deionized water used in the field to decontaminate the sampling equipment.

- Sampling equipment will not be placed directly on the ground or other contaminated surfaces prior to use, but will be placed on a clean plastic sheet.

- Samples of the final deionized water rinse will be collected and analyzed at a frequency of one per every set of twenty locations or fraction thereof to check for cross-contamination between sampling points.

Decontamination of the sampling equipment will be performed at a designated central staging area at the FMPC. If this is not possible due to extenuating circumstances, the sampling equipment may be decontaminated in the field, but only as a last resort.

o A sufficient amount of samples will be collected to perform all required analyses.

o Samples will be transferred directly to a stainless steel pan for thorough mixing of the sample prior to transfer to the proper sample container.

o Collected samples will be stored in the field in an ice chest filled with commercially available icing material and maintained at approximately 4 degrees Celsius.

o Samples will be properly labeled and chain-of-custody records, field collection reports, and laboratory request for analysis forms will be properly completed.

6.6 <u>SUBSURFACE SOIL SAMPLING</u>

6.6.1 COLLECTION OF SUBSURFACE SOIL SAMPLES

Subsurface material or soil will be collected using a split-spoon sampler or thin-wall tube in accordance with the Work Plan. Once collected, sampling equipment will be decontaminated and samples will be transferred to appropriate containers (see Section 6.4).

Subsurface materials or soils will be collected from soil borings. The borings will be advanced using cable tool drilling for monitoring wells and a soil auger drill rig for geotechnical and geochemical borings. Other suitable means may be used for the geotechnical borings depending on the characteristics of the

- Subsurface soil samples collected for other organic or inorganic analyses should be transferred to glass containers with screw cap lids.

- Samples to be tested for physical characteristics requiring undisturbed soil should not be transferred but should be left in the Shelby tube. The ends of the Shelby tube are capped, taped, and sealed with wax.

- A sample label, chain-of-custody form, field collection report, and a laboratory request for analysis form will be filled out in the field.

- The split-spoon sampler and other sampling equipment such as trowels, pans, gloves, etc. will be decontaminated between each collected sample by cleaning with tap water and a bottle brush, rinsing with deionized water, methanol, and deionized water again. Should the sampling equipment become heavily contaminated, it will be cleaned according to the following procedures:

    - In the case of inorganic contaminants, the equipment will first be washed with a nonphosphate detergent and then with dilute (0.1 N) hydrochloric acid, followed by two separate deionized water rinses.

    - In the case of organic contaminants, the equipment will first be washed with a nonphosphate detergent and then rinsed with tap water, methanol, and two separate deionized water rinses.

    - As described above, the equipment will be thoroughly rinsed with two deionized water rinses to remove traces of hydrochloric acid, detergent, and methanol (acetone may be substituted for methanol if volatile organic compounds are not being determined).

    - Sampling equipment will not be placed directly on the ground or other contaminated surfaces prior to insertion into the boring, but will be placed on a clean plastic sheet adjacent to or around the boring.

    - Samples of the final deionized water rinse will be collected in sample bottles containing the appropriate preservatives and analyzed at a frequency of one per set of twenty locations or fraction thereof to check for cross-contamination between borings.

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of WORK PLAN Rev. 3

Document Change Request	Document	Section	Page	Rev.
10	WORK PLAN	4	NA	3.1

DCR No. 10 deals with requests for additional wells.

ORIGINAL

2431 [redacted]

DOCUMENT CHANGE REQUEST NO. 10

PAGE 1 OF 2

RI/FS DOCUMENT CHANGE REQUEST

This form is used to initiate and update RI/FS plans and procedures, only.

SAFETY	
YES	NO
☐	☒
INVOLVED	

DO NOT WRITE IN THIS BLOCK	
REQUEST NO:	10
Completed by:	[signature]
Revision/ Issue Date:	3.1 1/5/89

REQUESTOR Robert Lenvk PHONE NO.: 738-3100 DATE August 24, 1988

DOCUMENT TITLE Work Plan DOCUMENT NUMBER N/A

SECTION/PARAGRAPH/PAGE NO.: Section 4.2.1.3/Pages 23-41 of 98; Section 4.2.1.4/Pages 41-

ISSUE DATE January 1987 LATEST REVISION DATE March 1988

JUSTIFICATION

At the request of the OEPA, two wells, a 200- and 300-series, are to be installed to determine whether or not airborne contaminants have entered the ground water northeast of the FMPC site. Three wells on SOWC property, one existing (271) and two proposed (371/471), have to be moved because they are inaccessible and unavailable for sampling. *

CONTENT OF CHANGE

Install three additional off-site monitoring wells and move two previously-proposed monitoring wells to a new location. Installation of these five monitoring wells will follow RI/FS well drilling, development, and sampling criteria. The two monitoring wells requested by the OEPA will be 298 and 398 (see attached map). The replacement for existing Monitoring Well 271 will be 297. Also, at the 97 location, 397 and 497 will be installed to move the previously-proposed 371 and 471.

* WELL NUMBERS WILL BE CONVERTED TO 4 DIGIT NUMBER AT A LATER DATE PER A DOCUMENT CHANGE REQUEST. [initials] 11/?/88

CANCELLATION INSTRUCTIONS

CANCEL DOCUMENT NO.: N/A

Reason for cancellation:

REQUIRED APPROVALS

RT Wilde	8-28-88	Denny J. Carr	12-15-88
ASI PROJECT DIRECTOR/DATE		WMCO PROJECT MGR./DATE	
[signature]	8/31/88	[signature]	12/20/88
ASI QA OFFICER/DATE		WMCO IMPACT ASSESS. MGR./DATE	
[signature]	8/30/88	H.E. Richardson	12/15/88
IT PROJECT DIR./DATE		WMCO QA OFFICER/DATE	
[signature]	30 Aug 88	[signature]	1/5/89
IT QA OFFICER/DATE		DOE COTR/DATE	

TO BE COMPLETED BY DOE

A. PRIOR EPA NOTIFICATION REQUIRED ? YES ✓ NO ____

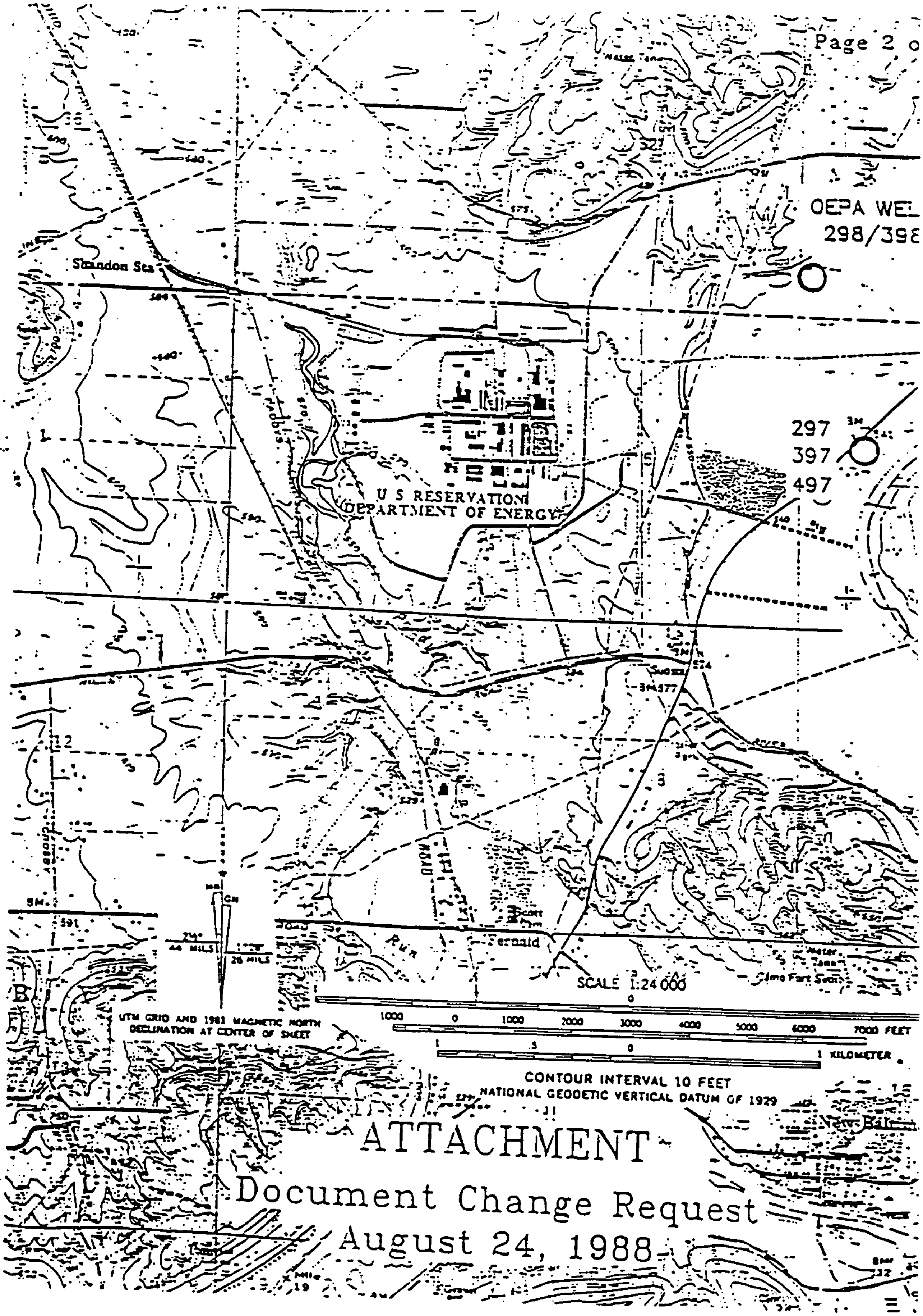
B. PRIOR EPA APPROVAL REQUIRED ? YES ✓ NO ____

C. IMMEDIATE IMPLEMENTATION. YES ✓ NO ____

16 [redacted]

2431 [redacted]

DOCUMENT CHANGE REQUEST NO. 10



ATTACHMENT

Document Change Request

August 24, 1988

2431 [redacted]

DOCUMENT REVISION LOG SHEET

Place in front of section 2 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
11	QAPP Vol. V	2.0	1	3.1

18 [redacted]

2.0 PROJECT DESCRIPTION

The tasks that comprise the site characterization for the remedial investigation are as follows: description of current situation, work plan requirements, site investigation, site investigation analysis, laboratory and bench-scale studies, reports, community relations support, and assistance with the Federal Facility Compliance Agreement (FFCA).

The following ten laboratories, which are (1) CLP-certified (presently have a U.S. EPA contract), (2) participate in CLP (presently analyze Performance Evaluation Samples), or (3) participate in the U.S. EPA Cross-Check Program (radiological laboratories only), will be used to analyze FMPC samples.

Laboratory	Type of Analysis
Radiological Sciences Laboratory (RSL) (3) Oak Ridge, Tennessee	Radiological
Mixed Waste Laboratory (MWL) (2) Oak Ridge, Tennessee	Chemical
Middlebrook Pike Laboratory (1, organics only; 2) Knoxville, Tennessee	Chemical
Export Laboratory (1, organics only; 2) Pittsburgh, Pennsylvania	Chemical, Geotechnical
Special Analysis Laboratory (2) Knoxville, Tennessee	Dioxins
Santa Clara Valley Laboratory (1, pesticides only) San Jose, California	Organo-phosphorus pesticides
Cerritos Laboratory (1, organics only; 2) Cerritos, California	Chemical
Austin Laboratory (2) Austin, Texas	Chemical
PEI Laboratory (1, organics only; 2) Cincinnati, Ohio	Chemical
Edison Laboratory (2) Edison, New Jersey	Acute & Chronic

Laboratory-specific attachments of the laboratories are supporting procedures to the QAPP and are controlled documents that are considered proprietary information. Copies of applicable documents can be supplied to WMCO or others as directed by WMCO for this project, if requested.

2.1 Site Description and History

The FMPC is an industrial facility owned by the United States government and operated for the DOE under a management contract with WMCO. WMCO is administratively responsible to the Department of Energy -- Oak Ridge Operations Office (DOE-ORO).

The FMPC is located in a rural area of southwestern Ohio approximately ten miles northwest of Cincinnati and eight miles southwest of Hamilton. The site occupies 1,050 acres and is bounded by Highway 126 to the north, a transmission line to the east, Willey Road to the south, and Paddy's Run Road and the Ohio and Chesapeake Railroad to the west (see Figure 1-1, Work Plan).

The facility commenced operations in 1952; prior to 1986, it was operated by National Lead of Ohio, Inc. (NLO) under contract with DOE. The primary function of the FMPC is the production of metallic uranium fuel cores and other uranium compounds for use in United States defense programs. In addition, small amounts of

5 2431 [redacted]

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
11	QAPP Vol. V	4.1	1	3.1
11	QAPP Vol. V	4.2	3	3.1

[redacted]

4.0 QUALITY ASSURANCE PROGRAM

The purpose of a QA program is to establish policies for the implementation of regulatory requirements and to provide an internal means for control and review so that the work performed is of the highest professional standard.

The responsibility for the overall direction of the QA program rests with the QA officer. The QA officer is responsible for maintaining the QA program and verifying its implementation through audits and surveillances.

4.1 Quality Assurance Documents

The QA program is documented in this QAPP and supporting procedures that direct quality-related activities. The policies and procedures specified by these manuals define acceptable practices to be used by personnel. The QAPP is project-specific and serves as the governing QA document for this project.

The QA manuals of IT Analytical Services and IT Engineering Services and Laboratory-Specific Attachments of RSL, Mixed Waste Laboratory, Middlebrook Pike Laboratory, Special Analysis Laboratory, Santa Clara Valley Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and the Export Geotechnical Laboratory are supporting procedures to the QAPP and are controlled documents that are considered proprietary information. Copies of applicable documents can be supplied to WMCO or others as directed by WMCO for this project, if requested.

4.2 Project Quality Assurance Objectives

Project quality assurance objectives are that:

- Scientific data will be of sufficient or greater quality to meet scientific and legal scrutiny;
- Data will be gathered or developed in accordance with procedures appropriate for the intended use of the data; and
- Data will be of known or acceptable precision, accuracy, completeness, representativeness, and comparability as required by the FMPC project.

- Laboratory-Specific Attachments for RSL, Mixed Waste Laboratory, Middlebrook Pike Laboratory, Special Analysis Laboratory, Santa Clara Valley Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and Export Geotechnical Laboratory;

- RCRA Ground-Water Monitoring Technical Enforcement Guidance Document (TEGD), September, 1986.

- Code of Federal Regulations (CFR), 40 CFR 261, Appendix II, "EP Toxicity Test Procedures;"

- U.S. EPA Quality Assurance Handbook, (U.S. EPA 600/9-76-005);

- Proposed Sampling and Analytical Methodologies for Addition to Test Methods for Evaluating Solid Waste Physical/Chemical Methods, U.S. EPA, (PB85-103026);

- American Society for Testing and Materials (ASTM) Standards, Section 11, Volumes 11.01 and 11.02, "Water," and Section 4, Volume 04.08, "Soil and Rock, Building Stones;"

- American Public Health Association, Standard Methods for the Examination of Water and Waste Water, 16th Edition, 1985;

- Methods for Chemical Analysis of Water and Wastes, (U.S. EPA-600/4-79-020);

- Federal Register, Volume 49, October 26, 1984, 40 CFR 136, pages 43234-43436;

- Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, U.S. EPA (SW-846);

- Handbook for Sampling and Sample Preservation of Water and Waste Water, U.S. EPA (PB83-124503);

- Field and Laboratory Methods Applicable to Overburdens and Mine Soil, (U.S. EPA-600/2-80-054);

- Prescribed Procedures for Measurement of Radioactivity in Drinking Water, (U.S. EPA-600/4-80-032);

- Code of Federal Regulations, 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants;"

- American National Standards Institute (ANSI) NQA-1, <u>Quality Assurance Program Requirements for Nuclear Facilities</u>;

DOCUMENT REVISION LOG SHEET

Place in front of section 8 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
11	QAPP Vol. V	8.0	1	3.1
11	QAPP Vol. V	8.2	3	3.1

8.0 EQUIPMENT CALIBRATION/MAINTENANCE

Measuring and test equipment used in the field and laboratory will be controlled by a formal calibration program (e.g., Section 5.5 of the IT Engineering Services QA Manual, Section 6.1 of the IT Analytical Services QA Manual, Section 7 of the IT/RSL QA Manual, and in Laboratory-Specific Attachments for the Mixed Waste, Middlebrook Pike, Special Analysis Laboratory, Santa Clara Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and Geotechnical Laboratories). The program will provide equipment of the proper type, range, accuracy, and precision to provide data compatible with the specified requirements and desired results. Calibration of measuring and test equipment may be performed internally using in-house reference standards traceable to national Bureau of Standards (NBS) or some other nationally-reliable recognized standard, or externally by agencies or manufacturers.

8.1 Responsibilities

The responsibility for the calibration of laboratory equipment rests with the applicable laboratory manager. The site manager is responsible for the calibration of field equipment and field equipment provided by subcontractors.

8.2 Calibration Procedures

Documented and approved procedures will be used for calibrating measuring and test equipment. Whenever possible, widely-accepted procedures, such as those published by ASTM or the U.S. EPA, or procedures provided by manufacturers in equipment manuals, will be adopted. Procedures for measuring and test equipment routinely calibrated are discussed in the IT Analytical Services QA Manual, the IT/RSL QA Manual, the IT/RSL Radioanalytical Methodology and QA Procedures Manual, and in Laboratory-Specific

Attachments for the Mixed Waste, Middlebrook Pike, Special Analysis Laboratory, Santa Clara Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and Geotechnical Laboratories. Procedures for the calibration of major equipment that may be used for this project are presented in Tables 8-1 through 8-3. Calibration procedures specific to the analytical methods referenced in Tables 4-1 through 4-3 are

Records will be prepared and maintained for each piece of calibrated measuring and test equipment to indicate that established calibration procedures have been followed. Records for subcontractor field equipment used only for this specific project will be kept in the project files. Records for equipment controlled by the IT calibration system (Section 6.0 of the <u>IT Analytical Services QA Manual</u>, Section RS12.0 of the <u>IT/RSL QA Manual</u>, and Mixed Waste, Middlebrook Pike, Special Analysis Laboratory, Santa Clara Valley Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and Geotechnical Laboratory-Specific Attachments) will be maintained by the appropriate IT laboratory.

DOCUMENT REVISION LOG SHEET

Place in front of section 9 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
11	QAPP Vol. V	9.0	1	3.1

9.0 LABORATORY ANALYTICAL PROCEDURES

The laboratory analytical procedures required for the FMPC Work Plan are described in the following sections. The analytical procedures for the specific sampling plans are provided in the IT Analytical Services QA Manual, the IT/RSL QA Manual, and the Laboratory-Specific Attachments for RSL, Mixed Waste, Middlebrook Pike, Special Analysis Laboratory, Santa Clara Valley Laboratory, Cerritos Laboratory, Austin Laboratory, PEI Laboratory, Edison Laboratory, and Geotechnical Laboratories.

9.1 Laboratory Program Flow Chart

The generation of project chemical data and results will follow the standard IT laboratory analytical program management scheme as discussed in the above-referenced manuals and attachments. The laboratory analysis flow chart (Figure 9-1) outlines the management scheme, which consists of five major areas:

- Project initiation;
- Handling of collected samples;
- Laboratory testing program initiation;
- Data verification; and
- Report preparation.

These areas are described in Sections 9.0 and 10.0.

9.1.1 Project Initiation

Prior to initiation of laboratory testing, a planning session with the appropriate laboratory and project staffs will be conducted to discuss the specific aspects of the following project tasks that must be completed at this time:

- Define project requirements, including equipment, parameters, sampling procedures (Section 6.0), QC samples, and analytical methods (Section 9.3) selection.

- Request sample bottles from laboratory's sample custodians.

- Prepare sample bottles with appropriate labels and preservatives (Sections 6.6 and 7.1.1).

- Provide blank chain-of-custody and request for analysis forms with sample bottles; these will be shipped to the site.

DOCUMENT REVISION LOG SHEET

Place in front of section 6 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
12	QAPP Vol. V	6.0	3	3.1

DOCUMENT CHANGE REQUEST NO. 12

FERNALD
RI/FS

Date: ____
Time: ____
Page: ____ of ____
Page: ____

WATER QUALITY FIELD COLLECTION REPORT

PROJECT NAME ____ SAMPLE LOCATION ____
PROJECT NUMBER ____
DATE COLLECTED ____
TIME COLLECTED ____ SAMPLE NUMBER ____
COLLECTED BY ____ SAMPLE TYPE ____

SAMPLING INFORMATION

AIR TEMPERATURE ____
DO SATURATION IN AIR ____
WATER TEMPERATURE ____
DEPTH OF SAMPLE ____
WATER LEVEL ____

FIELD READINGS

	READ 1	READ 2	READ 3
pH			
Spec. Cond. uMHOS/cm			
D.O. MG/L			

METER CALIBRATION

pH Temp.	pH Std.	pH Std.	D.O. Temp.	D.O. Zero	D.O. Full Sc	D.O. Calib. O_2	Spec. Cond Temp.	Spec. Cond. Low	Spec. Cond. High
OK ✓			OK ✓				OK ✓		

WEATHER CONDITIONS ____
ADDITIONAL REMARKS ____

TEST EQUIPMENT LIST

EQUIPMENT NUMBER	EQUIPMENT NAME

NOTE: ONLY EQUIPMENT SUBJECT TO CALIBRATION NEED BE LISTED.

Figure 6.1

DOCUMENT REVISION LOG SHEET

Place in front of section 2 of Sampling Plan, Volume 1, Rev. 3

Document Change Request	Document	Section	Page	Rev.
13	Sampling Plan	2.0	4	3.1

and perimeter of the Waste Storage Area; and (2) remaining areas within the FMPC site boundary at 1,000-foot grid points. The boundary and off-site areas are: (1) locations at 250-foot intervals along the northern and eastern property boundaries; (2) eight locations at 200-foot intervals along a line extending due east from the eastern property boundary at the sewage treatment area; and (3) 16 additional off-site locations in areas where previous sampling programs did not provide sufficient sample density. In addition, surface soil samples will be taken off site at locations where vegetation samples will be collected and on site where required to provide data for field calibration of radiation measurement instruments.

In particular, samples will be collected at the following locations:

- <u>Production Area, Sewage Treatment Area, and Perimeter of the Waste Storage Area</u>

  Sample locations for radiological analysis will be determined upon conclusion of the radiation measurement survey. The radiation isopleth maps will be used to define areas where surface soil samples will be taken. Areas that exhibit radioactive contamination exceeding the reference levels defined in the Radiation Measurement Plan will be selected for surface soil sampling (Section 1.0). Such areas identified for collecting surface soil samples are biased since soil samples will be taken in areas known to contain elevated soil concentrations.

  Within the defined biased sampling areas, the two methods to determine specific locations for surface soil sampling include: (1) if the radiation survey indicates specific areas with elevated concentrations of radionuclides, the flagged area corresponding to the highest reading within a grid will be sampled; (2) if there are uniform, elevated readings across multiple 100-foot grids, then a non-biased sample will be taken. The locations of non-biased samples in these areas will be grid points at 250-foot intervals on the state plane grid coordinates. It is estimated that 200 soil samples locations will be required to adequately characterize the radiological contamination of surface soil in these areas.

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of Work Plan, Rev. 3

Document Change Request	Document	Section	Page	Rev.
13	Work Plan	4.0	17	3.1

contamination that exceeds the reference level defined in the Radiation Measurement Plan (Section 4.2.1.1). Such areas identified for collecting surface soil samples are biased since soil samples will be taken in areas of known elevated radiological contamination. Within the defined biased sampling areas, there are two methods of determining specific locations for taking soil samples. If the radiation survey indicates nuclides, the flagged area corresponding to the highest reading within a grid will be sampled. If there are uniform, elevated readings across multiple 100-foot grids, then a non-biased sample will be taken within the grids. The locations for non-biased samples in these areas will be grid points at 250-foot intervals on the state plane grid coordinates. It is estimated that approximately 200 soil sample locations will be required to adequately characterize the radiological contamination of surface soil in these areas.

Biased samples for chemical analysis will be collected at any known accidental spill sites, areas adjacent to storage tanks, areas adjacent to railroad tracks, and areas adjacent to transformer pads. Selected samples will also be analyzed for chemical constituents to determine the presence of soil contamination. It is estimated that 10 soil samples will be collected for chemical analysis.

o <u>Remaining Areas Within the FMPC Site Boundary</u>

Samples in other areas of the FM<PC will be collected for radiological analysis only. Sample locations will be at the 1,000-foot grid points. Selection of the 1,000-foot spacing as a sampling frequency is based on a statistical sampling approach, "kriging", which optimizes the information that can be obtained from sampling in areas expected to have atmospheric deposition of contaminants. Approximately 35 sample locations will be identified in these areas.

o <u>Northern and Eastern Property Boundaries</u>

Sampling will be performed at 250-foot intervals along the northern and eastern property boundaries of the FMPC.

o <u>Off Site, East of the Sewage Treatment Area</u>

Eight sampling locations will be established in undisturbed areas beginning at the eastern property boundary at the sewage treatment area and extending along a line due east of the site at 200-foot intervals.

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of Work Plan, Rev. 3

Document Change Request	Document	Section	Page	Rev.
14	Work Plan	4.2	NA	3.1

DCR No. 14 deals with requests for additional wells.

DOCUMENT CHANGE REQUEST NO. 14 2431 2432

RI/FS DOCUMENT CHANGE REQUEST

This form is used to initiate and update RI/FS plans and procedures, only.

SAFETY YES [ ] NO [X] INVOLVED

PAGE 1 OF 15

REQUEST NO: 14
Completed by: [illegible]
Revision/ Issue Date: 3.1 3-23-89
DO NOT WRITE IN THIS BLOCK

REQUESTOR Timothy L. Ellenberger PHONE NO.: 738-3100 DATE October 19, 1988
DOCUMENT TITLE Work Plan DOCUMENT NUMBER N/A
SECTION/PARAGRAPH/PAGE NO.: Sec. 4.2.1.3; pg. 23 of 48; Sec. 4.2.1.4 pg. 41 of 98
ISSUE DATE January 1987 LATEST REVISION DATE March 1988

JUSTIFICATION

Justification for the location of the wells is provided in the attached "Installation Plan for Additional Wells" dated October 1988.

CONTENT OF CHANGE

Increase the number of wells to be installed on site by 24. Increase the number of borings to be drilled by 8. Revise project schedule to provide for the installation of the 24 additional wells.

CANCELLATION INSTRUCTIONS
CANCEL DOCUMENT NO.: N/A
Reason for cancellation:

REQUIRED APPROVALS

R.T. Wilde 10-19-88	[illegible]
ASI PROJECT DIRECTOR/DATE	WMCO PROJECT MGR./DATE
[signature] for M. Nicol	[signature] 3-23-89
ASI QA OFFICER/DATE	WMCO IMPACT ASSESS. MGR./DATE
[signature] Oct 19, 1988	[signature] 3-22-89
IT PROJECT DIR./DATE	WMCO QA OFFICER/DATE
Timothy L. Ellenberger 19 Oct 88	Mary E. Stone 1/5/89
IT QA OFFICER/DATE	DOE COTR/DATE

TO BE COMPLETED BY DOE
A. PRIOR EPA NOTIFICATION REQUIRED ? YES ___ NO done 12-16-88
B. PRIOR EPA APPROVAL REQUIRED ? YES ___ NO ___
C. IMMEDIATE IMPLEMENTATION. YES ___ NO ___

39 41

2431
~~2432~~

DOCUMENT CHANGE REQUEST NO. 14

INSTALLATION PLAN FOR ADDITIONAL WELLS

FOR THE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FERNALD, OHIO

OCTOBER 1988

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42

DOCUMENT CHANGE REQUEST NO. 14
INSTALLATION PLAN FOR ADDITIONAL WELLS FOR THE RI/FS

1.0 INTRODUCTION

This plan covers the installation of additional wells in three areas:

- Wells that are required to complete the monitoring net on the down gradient east side of the facility.
- Wells that will define the western and southern limits of the plume under the Waste Storage Area, which was identified with the initial drilling program.
- On-site wells to define the sources of the plume migrating off of the southern edge of the FMPC and determine the lateral and vertical extent of the plume.

The drilling plan is based on a review of the data from the first quarterly round of water sampling and the monthly water level data. The selection of these wells has taken into consideration the historical data for the site and discussions with the United States and Ohio EPAs.

The data from the first quarterly monitor well sampling verify that the initial wells installed for the RI/FS are in locations that have added valuable information regarding the extent, location, and concentration of contaminant plumes beneath the FMPC. Plumes that had been previously identified have been confirmed, and the shape and distribution of these plumes has been refined. The data indicate that there are two uranium plumes under the FMPC. One plume is centered under, and appears to originate from, the Waste Storage Area. This plume is moving east toward the Production Area. The second plume is located under the southwestern portion of the FMPC. The source of this plume is less clearly-defined. The source could be historical releases from the storm water runoff or leaching from either the South Field, old flyash area or the current flyash pile. The source could be all three areas contributing individually, either at various times or collectively.

The results of the sampling also indicate that there is a need for additional wells to refine the location of the boundaries of the plumes, determine the extent of vertical migration, and delineate the extent of some source areas. Besides the monitoring well data, these recommendations are based on discussions with both the United States and Ohio EPAs that occurred on August 23, 1988 and recent findings in the Plant 6 area.

Table 1 lists the wells and summary reasons for their installation. Figure 1 shows the location of the 24 wells that are proposed to be installed. In addition to the 24 wells, five contingency wells are described in this document. The decision to install these wells will be made on the basis of data gathered from the installation of the 24 wells. Table 2 provides a listing of the contingency wells and the basis for the decision for their installation. Figure 2 shows the locations of both the 24 and the five contingency wells.

2.0 EAST OF THE PRODUCTION AREA

Three 2000-series Argonne wells (numbers 2053, 2054, and 2055, respectively) will be installed in the Production Area. These wells will identify the influence of the activities in the Production Area on the upper part of the sand and gravel aquifer. These three wells will also help determine the magnitude and eastward extent of the plume moving from the Waste Storage Area.

In conjunction with these wells, two additional 2000-series wells will be installed on the east side of Plant 6 to determine whether or not operations in Plant 6 have contaminated the sand and gravel aquifer. One well, number 2109, will be located on the east side of Plant 6 down gradient of the pickeling area. The other, number 2118, will be located near the south east corner of Plant 6.

If elevated uranium concentrations are found in the 2000-series wells adjacent to Plant 6, an additional well cluster consisting of a 1000-, a 2000-, and a 3000-series well, will be installed east of Plant 6 as shown in Figure 2. The exact location of the cluster will be determined by the concentration of uranium in the wells and the local water table gradient.

Three 4000-series wells will be added to the eastern portion of the FMPC. Wells 4013, 4064, and 4067 will monitor the deep part of the sand and gravel aquifer along the eastern boarder of the FMPC. If these wells detect elevated uranium contamination, an additional 4000-series well will be installed at location 51.

One 4000-series well will be installed at location 10 to determine whether or not there are elevated concentrations of uranium in the deep part of the aquifer moving from the Waste Storage Area.

3.0 WEST AND SOUTH OF THE WASTE STORAGE AREA

A new well cluster will be installed 800 feet west of Cluster 34. These wells, numbers 2108 and 3108, will be located on the west side of Paddy's Run. The purpose of this cluster is to determine the western boundary of the plume that is associated with the Waste Storage Area. Similarly, a new cluster, consisting of Wells 2107 and 3107, will be installed 700 feet west-northwest of Well 1047. This cluster will pro[illegible]de information to help determine whether or not the plume from the Waste Storage Area is connected to the plume south of the flyash piles.

4.0 SOUTH OF THE FLYASH PILES

The presence of a plume in the area south of the flyash piles has been confirmed. There is, however, a considerable amount of uncertainty as to the source or sources of the plume, as well as to the distribution of the plume. The center axis of the plume has a north-south orientation. The location of the axis appears to shift to the west with depth when the 2000- and 3000-series well data are compared.

The active flyash pile and the stream carrying the storm water runoff from the Production Area are also possible sources. In order to better define the southern plume in this area, Wells 2048 and 2045 will be installed at the location of Wells 1048 and 1045, Wells 3065 and 3049 will be installed at locations 65 and 49, and Wells 4014 and 4016 will be installed at existing locations 14 and 16. Because of the westward shift in the location of the plume with depth, a new well cluster, consisting of Wells 2106 and 3106, will be installed on the south edge of the FMPC property, half-way between locations 15 and 17.

5.0 WELL INSTALLATION AND SUBSURFACE SOIL SAMPLING

Subsurface soil samples will be collected during drilling under the same procedures as are described in the RI/FS Work Plan Revision 3. Well construction and well materials, as well as field screening for radionuclides and organic contaminants, will also be the same as specified in the Work Plan.

After well construction and development, water samples will be collected and analyzed as part of the current quarterly sampling program. Some wells may be completed in time to be included in the third quarterly sampling scheduled to begin the week of October 17, 1988. Most of the wells will be available for the fourth quarterly sampling, which is scheduled to begin in January of 1989. Wells that are not completed by the end of the fourth sampling will be sampled as they are completed as if they were included in the fourth quarterly sampling. The 24 wells installed as part of this program will be sampled again in April 1989, regardless of the time they were completed, so that there are two samples from each well. Two samples are the minimum number required to have any confidence in the accuracy of the results of the sample.

6.0 SOIL BORINGS AROUND PLANT 6

All borings will be drilled using hollow stem augers. Continuous split spoon samples will be collected in each boring. The general rule for installing a boring will be to drill and sample to a depth of 20 feet or the first water bearing unit. If a water bearing sand is encountered, the boring will be drilled until either a clay or a total depth of 20 feet is reached. There will be a strict limit on the depth of a hollow stem auger boring in order to prevent the possibility of a boring penetrating the till and draining contaminated water to the sand and gravel aquifer.

Figure 1 shows the location of the eight borings that will be drilled around Plant 6. These borings will indicate the extent of the contamination in the vicinity of Plant 6. Previous investigations have found contamination under the building at the pickeling area and at the south end of the building where a former sump leak occurred and was repaired. In the area south of Plant 6, borings are being placed to determine the extent of residual contamination from the sump leak. Contamination was known to have reached the sewer south of the plant, but there was no attempt to determine the extent of the contamination at the time. If these borings indicate a significant area of elevated uranium concentrations, an additional 1000-series well will be installed south of Plant 6 ar north of the parking lots, as indicated in Figure 2.

DOCUMENT CHANGE REQUEST NO. 14

6.1 Borings that Encounter Water

All borings that encounter water will be completed as a two-inch diameter piezometer constructed of PVC. The PVC screen will be installed to extend over the thickness of the water bearing unit. A gravel pack will be placed around the screen, and the boring will be sealed with Volclay grout in the same way that wells are completed. The piezometer will be protected with a steel protective housing similar to the ones used for the RI/FS wells.

The piezometer will allow water levels to be collected to interpret the local perched water table in the glacial till. The piezometers will also permit future sampling for uranium analyses. Our experience to date with wells in the till in the Production and Waste Storage Areas indicates that these wells generally do not yield sufficient quantities of water to allow for an extensive analytical program with each sampling event. Therefore, the following logic will be used to determine what analyses will be performed on samples from each piezometer. Uranium will be of first priority, since it is the most likely contaminant to be found. One sample will be collected for total and isotopic uranium. If there is either visible staining, a sheen on the water in the piezometer, or HNu readings to suggest that organic contaminants are present, a volatile organic compounds (VOC) sample will be collected for analysis.

Borings that do not encounter water will be back-filled with Volclay grout. All cuttings will be drummed at the boring location. Disposition of the cuttings will be based on analytical results of samples from that boring.

6.2 Soil Sample Intervals in Borings

Samples will be collected and described by a geologist in accordance with the procedures in the RI/FS Work Plan Revision 3. Samples will be sent for analysis for total uranium for the 0.0 to

0.5 foot, 2.0 to 2.5 foot, and 5.0 to 5.5 foot intervals, as well as at five foot intervals until either water or the end of the boring is reached. All split spoon samples will be archived in order to be available for later analysis to refine the vertical extent of contamination in any given boring.

No soil samples will be taken from below the water table for chemical analysis. There is no rationale for taking soil samples from below the water table for chemical analysis. The results from such samples simply indicate something about the ground water contamination. It is far more useful to properly collect a water sample in order to evaluate a ground water problem.

7.0 GROUND WATER QUALITY SAMPLING

Ground water quality samples will be collected from each of the 24 wells. The timing of the sampling will vary to support the data evaluation that must be completed in order to determine whether or not any or all of the five contingent wells will be installed. Water samples will be collected from the three 2000-series wells installed near Plant 6 as soon as the wells are developed. These samples will be submitted for total uranium and the general ground water parameters as specified in the RI/FS Work Plan. The data from these three well samples will be used along with the information gathered during drilling the wells and borings to determine whether or not the additional cluster east of Plant 6 is necessary, as well as whether or not the 1000-series well south of Plant 6 is necessary. Similarly, ground water samples will be taken from the three 4000-series wells that will be installed along the eastern side of the Production area. The samples will be analyzed for total uranium and general water quality parameters as specified in the RI/FS Work Plan. Data from these analyses will be used to determine whether or not an additional 4000-series well at location 051 is necessary.

DOCUMENT CHANGE REQUEST NO. 14

All 24 wells will be completed in time to be included in the fourth quarterly water sampling as specified in the RI/FS Work Plan. The fourth quarterly sampling will begin in early January 1989 and be completed in early February 1989. Unless unfavorable weather significantly delays the drilling, all 24 wells will be installed and developed by the end of January. All of the 24 wells will be sampled a second time two months after the initial sampling to provide at least two data points for each well. In both samplings, the analysis will be the same as that specified for the fourth quarterly sampling in the RI/FS Work Plan Revision 3.

8.0 SCHEDULE

The following assumptions have been made in order to develop a schedule for the installation and development of the 24 wells. The schedule is based on an extremely aggressive program. The work is assumed to be authorized by the end of October 1988, allowing drilling to begin on the first of November. The earliest finish date for the 24 wells is January 28. With the contingency wells, the program is probably going to end in late February. Four drilling machines will be used to install the wells, and two additional rigs will be used for well development. During December and January, a total of six drilling rigs will be in operation at the same time. One soils auger rig will be in use for the eight borings around Plant 6. These borings will be made in late November or early December 1988. If the drilling starts on time and is not extremely delayed by winter weather, all of the wells will be included in fourth quarterly water sampling, which will begin in the early January. The second water samples will be collected in April and will complete the field activities for the installation of the 24 wells.

DOCUMENT CHANGE REQUEST NO. 14

ADDITIONAL 24 WELLS

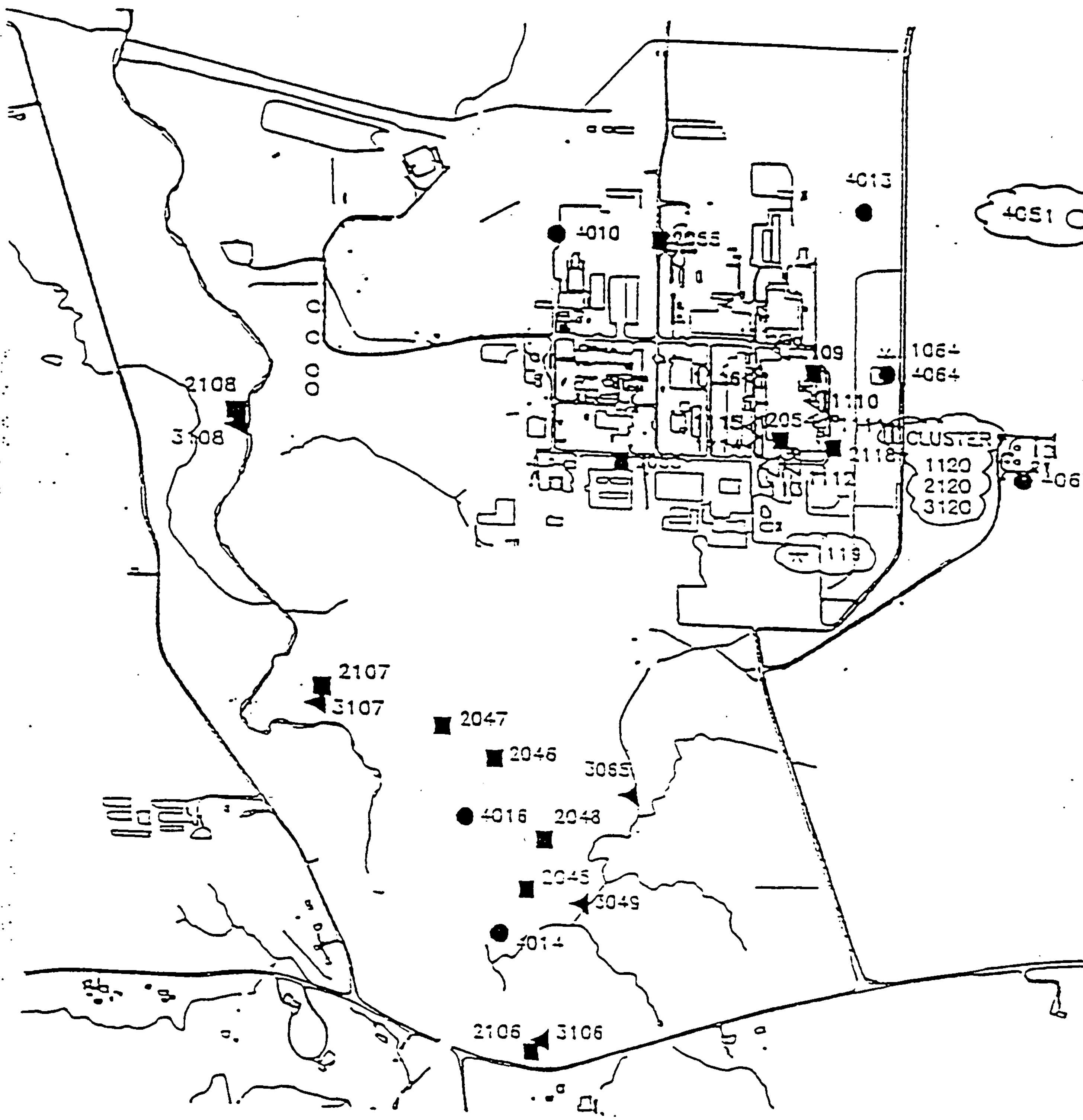
Table 1

Well Number/Series	Reason
Argonne A/2053 B/2054 Argonne C/2055	Monitor upper sand and gravel Argonne aquifer just down gradient of the waste pit area. Also, shallow wells in these areas show elevated uranium concentrations.
2109	Down gradient of Plant 6.
2118	Southeast of Plant 6.
4013 4064 4067	Monitor deep sand and gravel aquifer down gradient of the waste pit area and between the production area and the deep pumping to east.
1064	Monitor till northeast of Plant 6.
2018 3018	Monitor sand and gravel aquifer just up gradient of the site and west of Site the contaminated wells.
2107 3107	Monitor ground water that may be infiltrating along Paddy's Run and flowing southeast.
2046 2047	Monitor top of S&G aquifer beneath contaminated area.
4016	Monitor deep sand and gravel aquifer to determine the vertical extent of contamination.
2048 2045 3065 3049 4014	Evaluate the vertical extent of contamination in a known contaminated area.
2106 3106	Evaluate the area directly south of known contamination.
4010	Determine whether or not elevated concentrations of uranium are in the deep part of the aquifer downgradient of the Waste Storage Area.

CONTINGENCY WELLS

Table 2

Well Number/Series	Reason
1000-, 2000-, 3000- Cluster East of Plant 6	To determine the down gradient extent of a plume if one is found adjacent to Plant 6.
1000-Series South of Plant 6	To determine the southern extent of the plume if one is found south of Plant 6.
4051	To determine the eastern extent of the plume if one is found in Wells 4013, 4064, or 4067.



PROPOSED 24 ADDITIONAL
ON SITE WELLS
AND 5 CONTINGENCY WELLS

FIGURE 2

◁ BORING

- ✳ 1000 SERIES
- ■ 2000 SERIES
- ◀ 3000 SERIES
- ● 4000 SERIES
- ⬭ CONTINGENCY WE

DOCUMENT CHANGE REQUEST NO. 14

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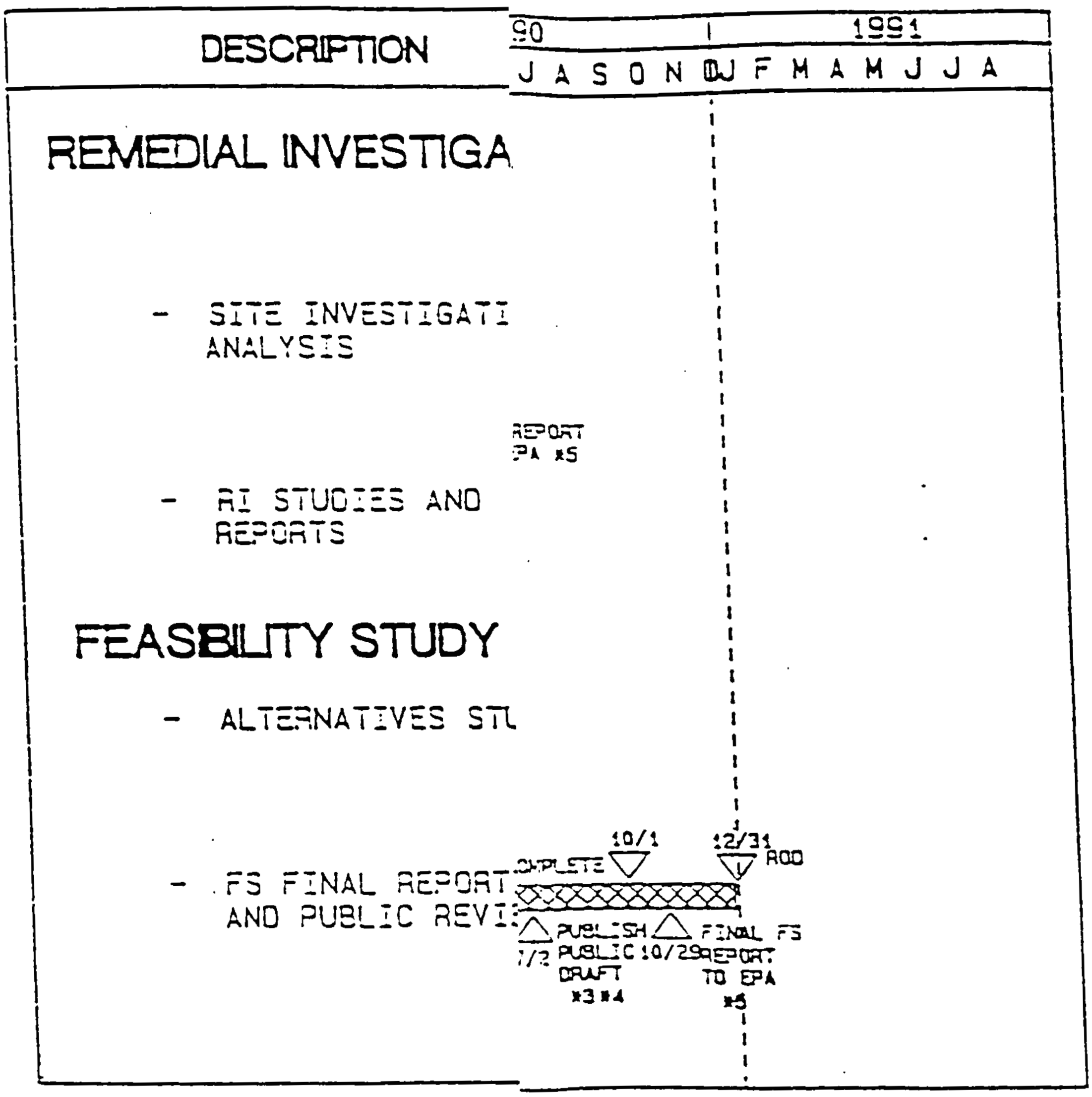

LEGEN

MILESTONE-PLANNED ▽
MILESTONE-ACTUAL ▼
SCHEDULE CHANGE ▨

REVISION STATUS		
REV	DATE	REFERENCE
0	6/25/87	BASELINE SCHEDULE
1	2/11/88	WORK PLAN, REV.2
2	10/18/88	24 ADDED WELLS

PAGE 1 OF 1

~~52~~
54

DOCUMENT REVISION LOG SHEET

Place in front of section 6 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
15	QAPP Vol. V	6.0	7	3.1

sample withdrawal. If the recovery rate is fairly rapid, and if time allows, evacuation of more than one volume of water is recommended.

- As soon as the well recovers, samples will be collected in accordance with the stability and volatility of the parameters to be tested and the Water Quality Field Collection Report (Figure 6-1) will be completed. For instance, samples for HSL volatile organic compounds, pH, specific conductance, and temperature will be collected first. Parameters which are not sensitive to pH or volatilization should be drawn last.

- For wells that cannot be pumped or bailed dry, at least three well volumes of water will be removed before collecting samples.

- Care will be taken to avoid excessive pumping of a monitoring well. Excessive pumping can lead to an increase or decrease in the concentrations of a contaminant at the sampling point of interest.

- A stainless steel submersible pump will be used to purge the monitoring wells prior to sample collection. A water-level measurement will be initially taken to determine the depth to ground water in the casing. The submersible pump will be lowered to a depth of five to ten feet below the water level, always above the well screen. The well will be initially pruged from this depth so that fresh water from the screened interval will move upward through the casing and completely flush the well. The pumping rate will be less than 20 gallons per minute (gpm) and will continue until field pH, temperautre, and specific conductance readings hav estabilized.

- The purge pump and lines will be decontaminated between wells using procedures as specified below.

- If drawdown is significant, the submersible pump will be lowered during purging to keep the pump five to then feet below the water level in the casing and the pumping rate will be reduced.

- Once the well has been purged and allowed to recharge and stabilize, samples will be collected through the stainless steel sampling valve. In the case where samples are being collected to be analyzied for TOC, TOX, or volatile organics, samples will be collected using either a positive gas displacement stainless steel and/or Teflon bladder pump or a teflon bailer.

- During sampling, the pump will be operated continuously and the flow rate reduced to one liter per minute for the collection of volatile organic compound samples.

DOCUMENT REVISION LOG SHEET

Place in front of section 3 of Sampling Plan, Volume I, Rev. 3

Document Change Request	Document	Section	Page	Rev.
16	Sampling Plan	3.0	6	3.1
	Sampling Plan	3.0	9	3.1

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DOCUMENT CHANGE REQUEST NO.

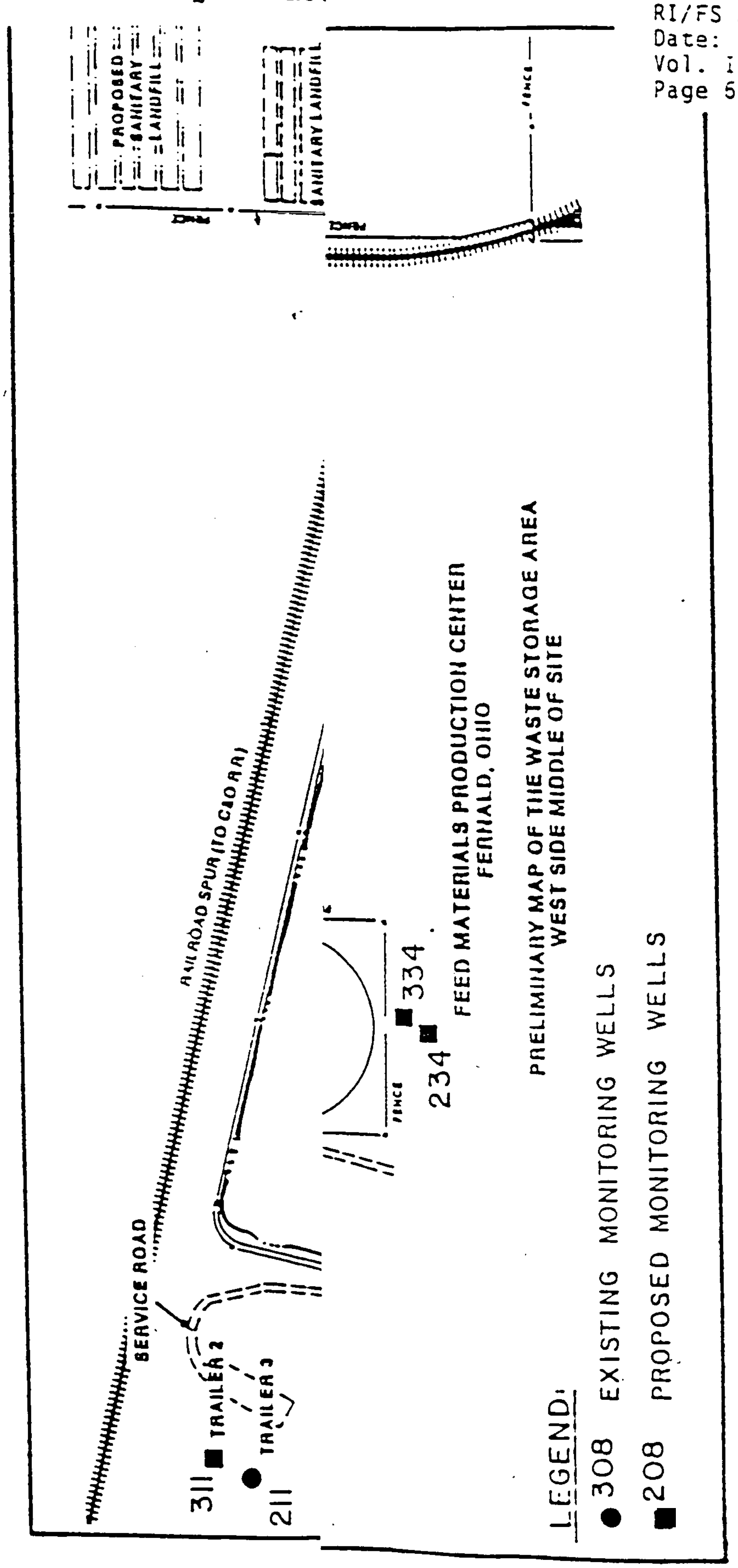

FIGURE 3-4
200-SERIES AND 300-SERIES WELLS - WASTE STORAGE AREA

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59

Column	Wells
Existing Wells – 100 Series	112, 113, 115, 119, 120, 121, 122
Existing Wells – 200 Series	204, 211, 213, 214, 215, 216, 218, 219, 220, 221, 222, 257, 258, 259, [illegible], [illegible], 271
Existing Wells – 300 Series	301, 303, 305, 308, 309, 310, 313, 314, 316, 318, 320
Existing Wells – 400 Series	401, 408, 415
Monitor ground water in [illegible] near waste areas	104, 108, 110, 111, 118, 124, 125, 127, 128, 129, 130, 131, 132, 133, 134, 135, 137, 138, 139, 141, 142, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184
Provide [illegible] wells	104, 108, 210, 124, 125, 127, 128, 129, 130, 131, 132, 133, 134, 135, 139, 141, 142, 145, 146, 147, 148, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184
Ground [illegible] surface / Examine flow and quality	208, 209, 210, 224, 227, 234, 237, 242, 243, 244, 249, 251, 252, 254, 255, 256, 354
[illegible] sand and gravel / Examine flow and quality	204, 311, 315, 324, 334, 337, 343, 344, 251, 254, 256, 257, 258, 259, 270, 271, 384
[illegible] sand and gravel / Examine vertical flow component	204, 208, 209, 210, 311, 315, 224, 324, 234, 334, 237, 337, 243, 244, 344, 251, 254, 256, 257, 258, 259, 270, 371
[illegible] sand and gravel / Characterize ground water	251, 254, 257, 371
[illegible] production area / Examine potential flow [illegible]	210, 237, 242, 251, 252, 254, 254, 257, 258, 371
[illegible] flow component / Provide additional data [illegible]	208, 224, 324, 234, 334, 244, 344, 249, 255, 258, 369, 370
[illegible] flow component / Examine regional flow	208, 311, 315, 224, 324, 234, 324, 243, 244, 344, 249, 251, 252, 253, 254, 354, 256, 257, 258, 259, 270
Patterns / Provide background	111, 311, 224, 324, 243, 243, 252, 253, 255, 256
[illegible] / Examine effects of [illegible]	257
[illegible] / Examine effects of	116, 145, 146, 147, 148, 249
[illegible] / Examine effects of storm	315, 249, 165, 255
Water [illegible] / Examine ground water	109, 209, 114, 116, 243, 343, 244, 344
Quality near [illegible] / Examine flow patterns	109, 209, 114, 116, 243, 343, 244, 344
Near [illegible] / Examine production area	210, 233, 333, 242, 251, 252, 253, 254, 257, 258
As [illegible] / Examine ground water quality at [illegible] boundary and off-site	315, 243, 244, 251, 252, 258, 256, 257, 269, 270, 371

TABLE 3-1
PLACEMENT RATIONALE FOR PLANNED ON-SITE MONITORING WELL LOCATIONS

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of Work Plan, Rev. 3

Document Change Request	Document	Section	Page	Rev.
16	Work Plan	4.0	28	3.1
	Work Plan	4.0	31	3.1

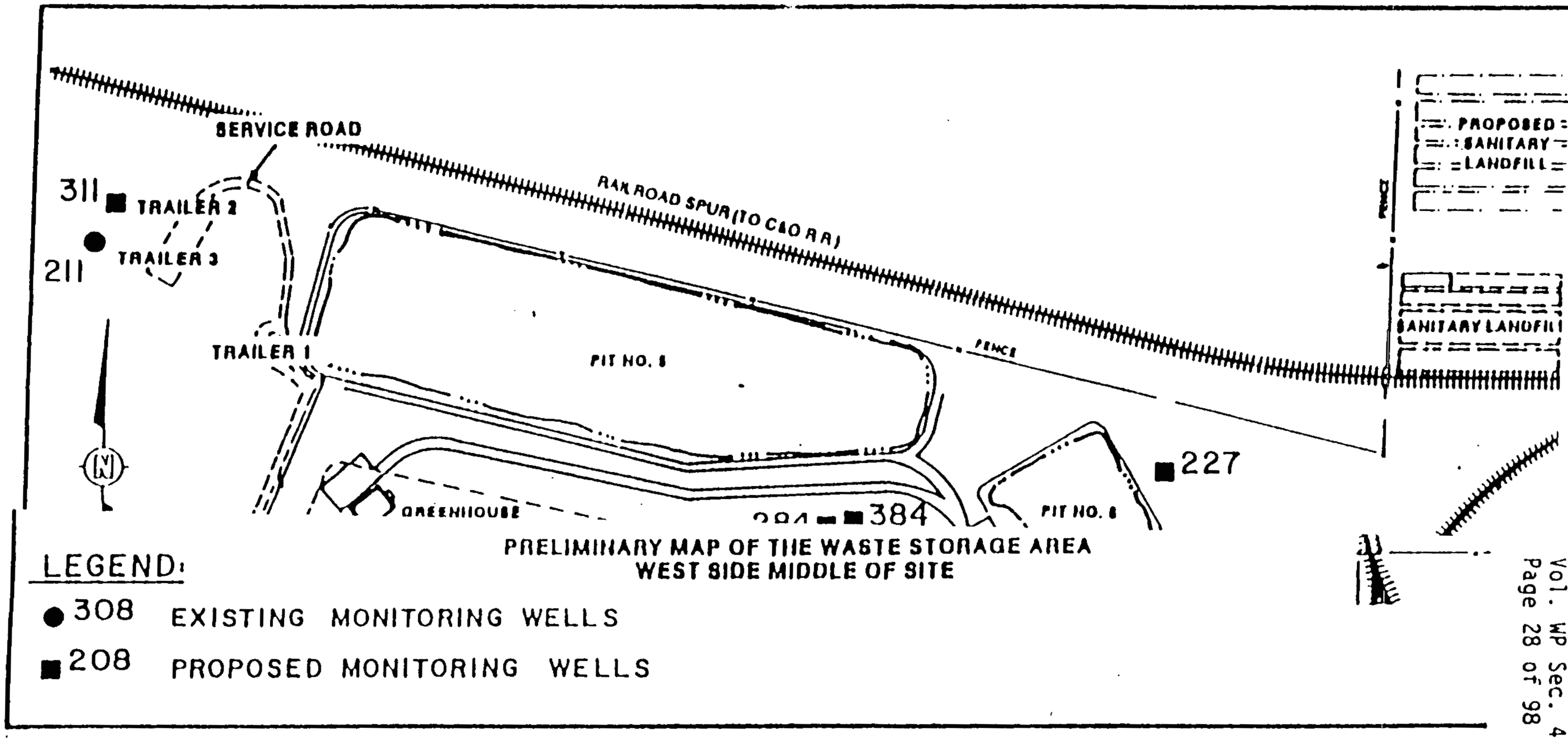

FIGURE 4-7
200-SERIES AND 300-SERIES WELLS - WASTE STORAGE AREA

400 - SERIES
DP 11/22/88

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Existing Wells: 100 Series	Existing Wells: 200 Series	Existing Wells: 300 Series	Existing Wells: 400 Series	Monitor ground water in fill near waste areas	Provide [illegible] of wells around potential source	Examine flow and quality in upper sand and gravel	Examine flow and quality in lower sand and gravel	Examine vertical flow component in sand and gravel	Characterize ground water east of the production area	Examine potential flow under and eastward flow component	Provide additional data on southern flow component	Examine regional flow [illegible]	Provide background [illegible]	Examine effects of [illegible]	Examine effects of [illegible]	Examine effects of storm [illegible]	Examine ground water quality near [illegible]	Examine flow patterns near [illegible]	Examine production area as potential source	Examine ground water quality at FMPC boundary and off-site
		301	401																	
		303																		
	204			104	104		304	304												
		305																		
		308	408	108	108	208		208			208	208								
		309				209		209									109	109		
		310		110	210	210		210		210							209	209	210	
	211			111			311	311				311	111							
112													311							
113	213	313																		
	214	314															114	114		
115	215		415				315	315			315	315				315				315
	216	316													116		116	116		
	218	318		118																
119	219																			
120	220	320																		
121	221																			
122	222																			
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TABLE 4-2
PLACEMENT RATIONALE FOR PLANNED ON-SITE MONITORING WELL LOCATIONS

DOCUMENT REVISION LOG SHEET

Place in front of section 5 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
17	QAPP Vol. V	5.6	50	3.1

FERNALD RI/FS

DOCUMENT CHANGE REQUEST NO. 17

FIELD PERMEABILITY TESTS

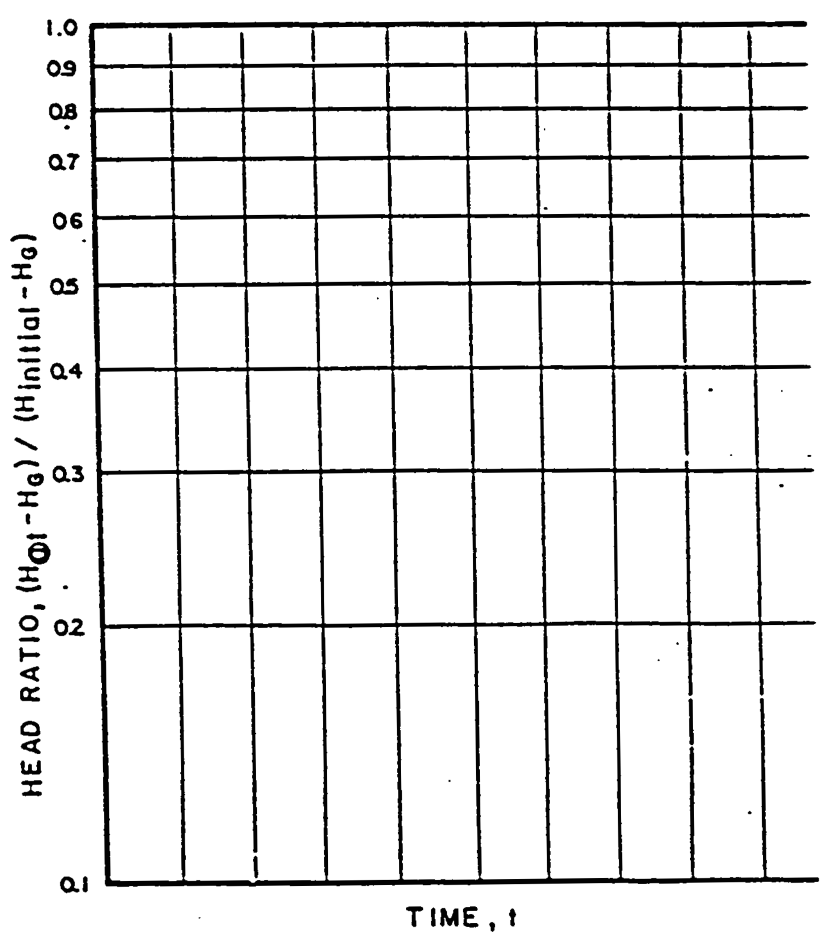
FALLING HEAD *

PROJECT ____________________ TESTED BY ____________ DATE ____________
PROJECT NO. ____________________ CALCULATED BY ____________ DATE ____________
BORING NO. ____________________ CHECKED BY ____________ DATE ____________

RADIUS OF TEST BORING, R ____________________ PERMEABILITY, K ____________
HEIGHT OF CASING (REF. LEVEL) ABOVE GROUND SURFACE, H_C ____________________
DEPTH TO BOTTOM OF TEST POCKET, L_1 ____________________
DEPTH TO TOP OF TEST POCKET, L_2 ____________________
DEPTH TO GROUNDWATER TABLE FROM TOP OF CASING, H_G ____________________

*CASED HOLE, UNCASED OR PERFORATED EXTENSION OF LENGTH, $L_1 - L_2$.

ELAPSED TIME t SEC.	DEPTH TO WATER IN CASING H Meters



$$K = \frac{R^2}{2(L_1 - L_2)(t_2 - t_1)} \ln\left[\frac{L_1 - L_2}{R}\right] \ln\left[\frac{H_1 - H_G}{H_2 - H_G}\right]$$

NOTE: THE EQUATION ASSUMES THE HORIZONTAL AND VERTICAL PERMEABILITIES ARE EQUAL.

H_1 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_1
H_2 = DEPTH TO WATER IN CASING FROM TOP OF CASING AT TIME, t_2

DOCUMENT REVISION LOG SHEET

Place in front of section I of SAMPLING PLAN Volume I Rev. 3

Document Change Request	Document	Section	Page	Rev.
19	SAMPLING PLAN Vol. I	I.1.3	12	3.1

The second phase of the DQO process was to translate the remaining 10 informational needs identified in Table I-1 into meaningful field data collection efforts that would be consistent with both the currently available database (to achieve cost-effectiveness while avoiding redundancy) and site-specific conditions. The result was the development of seven sampling plans, as specified in the table and described in the following sections. The seven sampling plans represent a responsive scope of field investigations, reflective of the current understanding of the FMPC, and associated environmental concerns. Additional data collection and evaluation efforts now underway may contribute to refinements in the sampling plans. The progressive findings of the field activities proposed in the plans may also reveal a need to increase the scope of the data collection efforts.

I.1.3 MEASUREMENT TECHNIQUES

The sampling plans provide specific guidance on the field methods to be utilized for the collection, preservation, and handling of various types of samples from each environmental medium. The final phase of the DQO process was to select and document the appropriate field and laboratory methods for the radiological, chemical, and physical analysis of the samples. This phase of the process provides that individual data types are adequate for their intended purposes.

With few exceptions (as discussed below), all samples collected as part of the sampling plans reported herein will be analyzed by either a CLP-certified laboratory (presently have a U.S. EPA contract) or by a laboratory that participates in CLP activities (presently analyzes performance evaluation samples). All radiological samples will be analyzed at a radiological testing laboratory at a level of control consistent with CLP protocols (as detailed in the QAPP). The decision to produce Type IV and Type V data will provide flexibility in utilizing the data (for example, to support the risk assessment and the eventual Record of Decision).

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DOCUMENT REVISION LOG SHEET

Place in front of section 12 of QAPP Volume V Rev. 3

Document Change Request	Document	Section	Page	Rev.
20	QAPP Vol. V	12.0	1	3.1

12.0 QUALITY ASSURANCE AUDITS

To verify compliance with QAPP requirements, the QA officer and other technically qualified personnel (if required) will perform planned and documented audits of project activities. These audits will consist, as appropriate, of an evaluation of QA procedures and the effectiveness of their implementation, an evaluation of work areas and activities, and a review of project documentation. Audits will be performed in accordance with written checklists and, as appropriate, technical specialists. Audit results will be formally documented and sent to project director and supramanagement.

Audits may include, but not be limited to, the following areas:

- o Field operation work procedures and records;
- o Laboratory testing and records;
- o Equipment calibration and records;
- o Identification and control of samples;
- o Numerical analyses;
- o Computer program documentation and verification;
- o Transmittal of information; and
- o Record control and retention.

Audits for this project will, as appropriate, cover laboratory activities, field operations and documentation, and final reports. Auditing will be performed in accordance with the applicable section(s) of the Advanced Sciences, Inc. (ASI) Quality Assurance Manual. Internal laboratory audits are also discussed in Laboratory-Specific Attachments.

An individual audit plan shall be developed to provide a basis for each audit. This plan shall identify the audit scope, activities to be audited, audit personnel, any applicable documents, and the schedule. The plan shall be consistent with the project scope of work schedule, and requirements.

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DOCUMENT REVISION LOG SHEET

Place in front of section 4 of WORK PLAN Rev. 3

Document Change Request	Document	Section	Page	Rev.
21	WORK PLAN	4.2	NA	3.1

DCR No. 21 deals with requests for additional wells.

2431

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ORIGINAL

DOCUMENT CHANGE REQUEST NO. 21

PAGE 1 OF 8

RI/FS DOCUMENT CHANGE REQUEST

This form is used to initiate and update RI/FS plans and procedures, only.

SAFETY	
YES ☐	NO ☒
INVOLVED	

REQUEST NO:	21
Completed by:	DP
Revision/ Issue Date:	3.1 2/27/89
DO NOT WRITE IN THIS BLOCK	

REQUESTOR David Ponke PHONE NO.: 738-3100 DATE November 22, 1988
DOCUMENT TITLE Work Plan DOCUMENT NUMBER N/A
SECTION/PARAGRAPH/PAGE NO.: Section 4.2.1.3 Pages 23-41 of 98; Section 4.2.4 pages 41-45 of
ISSUE DATE January 1987 LATEST REVISION DATE March 1988

JUSTIFICATION

Justification for additional wells in the southern plume is provided in the attached "installation plan for additional wells in the southern plume" dated November 1988.

CONTENT OF CHANGE

Increase the number of monitoring wells to be installed off site by 10. Revise schedule to provide for the installation of the 10 additional monitoring wells.

CANCELLATION INSTRUCTIONS
CANCEL DOCUMENT NO.: N/A
Reason for cancellation:

REQUIRED APPROVALS

R T Wilk 12-5-88	N/A HER 1/11/89
ASI PROJECT DIRECTOR/DATE	WMCO PROJECT MGR./DATE
David Ponke 11/22/88	N/A HER 1/11/89
ASI QA OFFICER/DATE	WMCO IMPACT ASSESS. MGR./DATE
Robert M [illegible] 12/5/88	H.E. Richardson 1/11/89
IT PROJECT DIR./DATE	WMCO QA OFFICER/DATE
MA DP 12/6/88	Mary E. Stow 2/27/89
IT QA OFFICER/DATE	DOE COTR/DATE

TO BE COMPLETED BY DOE

A. PRIOR EPA NOTIFICATION REQUIRED ? YES ✓ NO ____
B. PRIOR EPA APPROVAL REQUIRED ? YES ✓ NO ____
C. IMMEDIATE IMPLEMENTATION. YES ✓ NO ____

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72

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~~2432~~

DOCUMENT CHANGE REQUEST NO. 21

INSTALLATION PLAN FOR ADDITIONAL WELLS IN THE SOUTHERN PLUME

FOR THE

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

FERNALD, OHIO

NOVEMBER 1988

~~71~~
73

DOCUMENT CHANGE REQUEST NO. 21

INSTALLATION PLAN FOR ADDITIONAL WELLS
SOUTHERN PLUME FOR THE RI/FS

1.0 INTRODUCTION

The presence of elevated levels of uranium in the Great Miami Aquifer at off-site locations to the south of the Feed Materials Production Center (FMPC) has been known for some time. Both the source(s) and the extent of this uranium plume were raised as investigative issues in the Remedial Investigation/Feasibility Study (RI/FS) Work Plan. The completed phase of well installation and monitoring and initial data analysis have provided valuable insight into these issues. In particular, the available data support the expected finding that the principal source of the plume is or was centered in the vicinity of the storm water outfall ditch, the fly ash piles, and the southfield area. The lateral extent of the plume also appears to have been bounded by the recently installed off-site wells, with the possible exception that a secondary plume exists as a result of vertical leakage along Paddy's Run.

In accordance with the phased RI/FS approach, the data from Rounds 1 and 2 of the quarterly ground water monitoring program have been evaluated to determine the need for additional wells to further resolve the south plume issues. The interim results of the ongoing ground water modeling effort have been used as additional input to this evaluation. As a result of this evaluation, a proposal for additional on-site wells was recently issued to the U.S. Environmental Protection Agency (U.S. EPA) to better pinpoint the past and/or current sources of uranium in ground water to the south of the FMPC.

The purpose of this memorandum is to propose, with justification, a series of off-site wells to the south that will further substantiate that both the bounds and the point of maximum uranium concentration of the southern plume have been delineated for purposes of the RI/FS. A variation on this program was previously discussed with the U.S. EPA at an interagency working session on October 28, 1988. The changes to the previously discussed program are due to more recent findings of the RI/FS continuing data analysis program.

2.0 FINDINGS TO DATE

Figure 1 presents the levels of total uranium detected in ground water in the southern wells during the first two rounds of quarterly monitoring under the RI/FS and previous monitoring programs. A cursory evaluation of this data indicates that the uranium plume is centered within 2,000 feet of the southern boundary of the FMPC and is bounded by other wells installed to the east and south of the impacted area. These monitoring results are generally consistent with the local ground water flow patterns, which are controlled by local ground water pumping and a steep potentiometric gradient to the south. A relatively narrow, north-south trending trough that occurs in the bedrock in this area creates the steep gradient. The locations of highest observed uranium levels are also generally consistent with preliminary modeling results which were based on the premise that the most significant releases of uranium occurred prior to 1970.

The highest levels of uranium are observed to be in the 1000-Series wells which are screened near the top of the sand and gravel aquifer. An exception is at Well Location 62 which may be explained by the heavy pumpage of the associated well at depths corresponding to a 3000-Series well -- pumpage that could locally draw uranium into deeper portions of the aquifer. The capture zone resulting from this pumpage is also being evaluated as a controlling factor in the southern migration of the plume.

Although these simplified explanations remain plausible, several complicating issues require further evaluation through the proposed well program. These include:

- An easterly component of ground water flow merges with the regional southern flow pattern in the vicinity of the observed off-site plume. The aforementioned interpretation assumes that the southerly flow component continues to dominate and control uranium migration. Confirmation that the plume is not trending to the east is necessary to substantiate that wells at Locations 93 and 94 (Figure 1) demarcate the limits of the plume to the east and southeast.

- The continued, consistent presence of relatively high levels of uranium in the pumping well at Location 62 brings into question that the point of maximum concentration of the uranium plume is represented by the existing wells in the area. Preliminary modeling results indicate that the true center of the plume could lie slightly to the east and south of the existing location of highest uranium readings. The issue is important in the development of remedial action alternatives and in the evaluation of the effects on the pumping well.

- Two additional issues related to the pumping well are whether significant amounts of uranium are being drawn in from the west (due, for example, to releases from Paddy's Run), and whether the downward movement of uranium caused by the pumping stresses creates a more extensive area of elevated uranium at the 3000-Series level than is currently being monitored.

- Significant changes in geochemical conditions are thought to exist in the aquifer just south of the observed plume. A question arises as to whether the geochemical conditions, rather than the pumping center, are the principal factor limiting the southern migration of the plume. The possibility also remains that the plume has simply not yet reached points further to the south and is not being fully controlled by either geochemical processes or pumping.

- A possibility exists that a secondary plume originating in Paddy's Run lies south of the current monitoring well network. This is an important consideration due to the presence of private wells at residences further south of Paddy's Run. The possibility of a secondary plume is somewhat evidenced by readings on the order of 10 ug/l of total uranium in a 3000-Series well that was previously monitored (and since abandoned) along Paddy's Run to the west of Location 62. This level was reported in 1985 at Well Location TW-2 (Figure 1). The observation that the deeper wells exhibit higher uranium values than shallow wells at the same location is an important deviation from the characteristics of the previously discussed southern plume. One explanation is that uranium from historic releases is now located deeper in the aquifer due to continuing recharge from Paddy's Run.

3.0 PROPOSED WELL PROGRAM

To address the aforementioned issues, a series of ten additional monitoring wells at six locations is proposed at off-site locations to the south of the FMPC. The specific locations and depths of the wells are shown in Figure 1 and are justified as follows:

Well Location 1: 2000-Series well located between and south of Well Locations 93 and 94 to confirm that the southern plume does not have an eastward component resulting from the local hydrogeologic setting. The proposed 2000-Series level is consistent with the principal depth of uranium detection in areas to the west.

Well Location 2: 2000- and 3000-Series wells located just to the north-west of the pumping center (Well 3062) to establish the degree of uranium contribution to the pumping wells from the northwest.

Well Location 3: 2000- and 3000-Series wells located along Paddy's Run south of the previous location of

Well TW-2 where elevated levels of uranium were detected in the deeper zone. This location will also provide an intermediate monitoring point along Paddy's Run between the previously installed on-site wells and the proposed wells at Location 4 (see below).

Well Location 4: 2000- and 3000-Series wells located at a point south of Paddy's Run and just north of several private residences. These wells would lie within the preferential downgradient flow path for ground water flowing from the observed uranium plume to the north. Consequently, this location serves the dual purpose of monitoring potential ground water impacts associated with recharge from Paddy's Run, as well as providing an additional monitoring point further downgradient from the primary southern plume.

Well Location 5: 2000- and 3000-Series wells located at the point predicted by the analytical solute transport model to be the approximate center of the uranium plume. These wells will help confirm the overall strength of the plume, as well as provide data on the relative contributions of flow and uranium to the pumping wells from the southeast. The latter evaluation will also indicate the degree of plume control achieved by the pumping wells.

Well Location 6: 2000-Series wells located south of the predicted center of the plume, but north of the principal zone of geochemical change. This well will provide additional evidence on the extent of uranium migration and could resolve the issue of what process has controlled (or is controlling) the southern movement of the plume.

Each of the proposed wells will also provide data on the local potentiometric gradients created by pumping well 3062 and the bedrock trough for purposes of the hydrogeologic evaluation and ground water model calibration.

4.0 WELL INSTALLATION AND SUBSURFACE SOIL SAMPLING

Subsurface soil samples will be collected during drilling under the same procedures as are described in the RI/FS Work Plan Revision 3. Well construction and well materials, as well as field screening for radionuclides and organic contaminants, will also be the same as specified in the Work Plan.

DOCUMENT CHANGE REQUEST NO. 21

5.0 GROUND WATER QUALITY SAMPLING

Ground water quality samples will be collected from each of the 10 wells. These samples will be submitted for total uranium and the general ground water parameters as specified in the RI/FS Work Plan.

The ten wells will be sampled two times, May and July 1989, to provide at least two data points for each well. In both samplings, the analysis will be the same as that specified for the fourth quarterly sampling program in the RI/FS Work Plan Revision 3.

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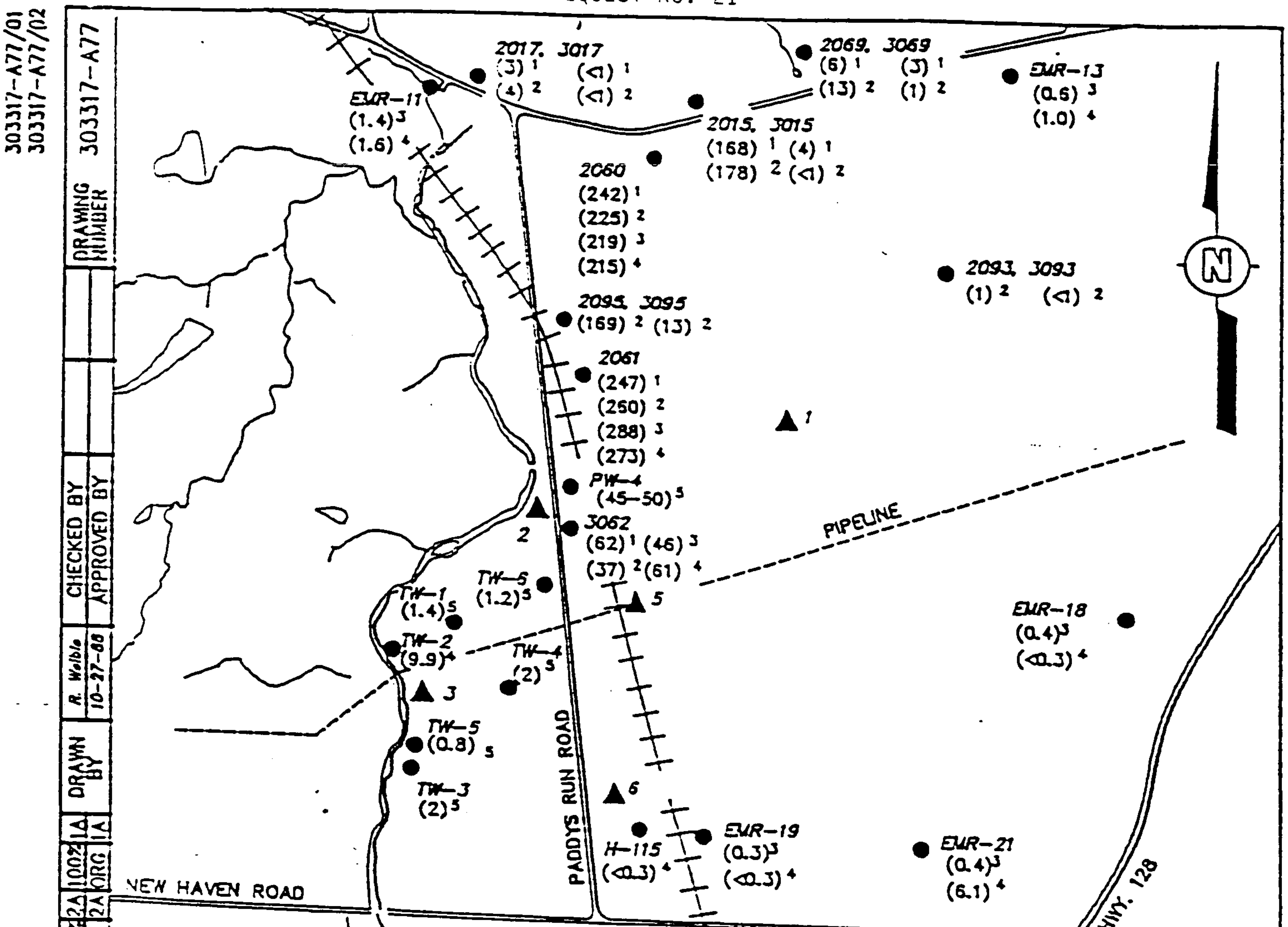
DOCUMENT CHANGE REQUEST NO. 21



LEGEND

- ●3062 EXISTING WELLS
- (62) 1 RI/FS ROUND 1 URANIUM CONCENTRATION: μg/l
- (37) 2 RI/FS ROUND 2 URANIUM CONCENTRATION: μg/l
- (46) 3 WMCO ENVIRONMENTAL MONITORING REPORT AVERAGE 1986 URANIUM CONCENTRATION μg/l CALCULATED USING 1pCi=1.4925 μg/l
- (61) 4 IT LITIGATION URANIUM CONCENTRATION μg/l CALCULATED USING 1pCi=1.4925 μg/l
- (2) 5 TOTAL URANIUM DATA RECEIVED FROM ALBRIGHT AND WILSON 4/11/86. CONCENTRATION IN ppb (OR μg/l)
- ▲6 PROPOSED WELL CLUSTER: 2000 AND/OR 3000 SERIES WELLS

NOTE:

MONITORING WELLS MAY HAVE BEEN REMOVED.

SCALE

0 500 1000 1500

FIGURE 1

SOUTH PLUME MONITORING WELLS

PREPARED FOR

FERNALD RI/FS
U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

2431 ~~2432~~

DOCUMENT REVISION LOG SHEET

Place in front of section I of SAMPLING PLAN Volume I Rev. 3

Document Change Request	Document	Section	Page	Rev.
22	SAMPLING PLAN Vol. I	I.3	18	3.1

assigned identifying the sample. The following unique numbering system will be assigned:

Sample Number	Description
00000 - 00999	Ecological
01000 - 02999	Surface Water
03000 - 04999	Ground Water
05000 - 06999	Surface Soils
07000 - 08999	Subsurface Soils -- On-Site
09000 - 09999	Sediment
10000 - 10999	Subsurface Soils -- Off-Site
11000 - 14999	Radiological Measurements Mode Readings)
15000 - 18999	Production Area Soils
19000 - 19999	Production Area Ground Water
20000 - 20279	Building 69 Investigation
20280 - 20314	Kerosene Tank
20315 - 20349	Building 69 Investigation
20350 - 20384	Storm Water Retention Basin
20385 - 20454	Acute & Chronic Testing
20455 - 20489	Health & Safety Air Samples
45000 - 45119	Elevated Radiation Readings
99000 - 99100	Background Radiation Readings
100000 - 999999	FIDLER Walkover Survey, SPA-3 Walkover Survey, and Elevated Radiation Readings
20490 - 44999	Spares
45120 - 98999	Spares
99101 - 99999	Spares

2431 1 of 4

ATTACHMENT 1 ~~2432~~ 2

DOCUMENT CHANGE REQUEST NO. 23

September 8, 1988

Mr. Dennis Carr
DOE/Westinghouse Materials
Company of Ohio
P.O. Box 398704
Cincinnati, OH 45239

SUBJECT: Revision of the Well Numbering System

Enclosed is the revision to the well numbering system.

If you have any questions, please contact me.

Sincerely,

Robert G. Lenyk
Office Manager

RGL:jf

Enclosure

cc/with enclosure: R. Conner, WMCO
D. Wilde, ASI
J. Loving, ASI
K. Sinner, ASI
R. Galbraith, IT
G. Gaillot, IT

10845 HAMILTON CLEVES ROAD • P.O. BOX 475 • ROSS, OHIO 45061 • (513) 738-3100
2620 SAN MATEO NE, SUITE D • ALBUQUERQUE, NEW MEXICO 87110 • (505) 883-0959
2000 NORTH 15TH STREET, SUITE 407 • ARLINGTON, VA 22201 • (703) 243-4900
7308 S. ALTON WAY, SUITE K • ENGLEWOOD, CO. 80112 • (303) 779-0314
107-F JEFFERSON AVE. • OAK RIDGE, TN 37830 • (615) 483-1274
Advanced Sciences, Inc.

DOCUMENT CHANGE REQUEST NO. 23

REVISION OF THE WELL NUMBERING SYSTEM

Two revisions to the well numbering system for the RI/FS are being made. The first revision is to make the three digit designation a four digit designation. The second change is to assign depth and location designator well numbers to the existing wells that are identified by some other name, such as OS-1 or State 16.

Increase in Identifier Digits

The current practice is to give wells a series designation such as 100, 200, or 300, and a two-digit location such as 14, 64, or 89. The series number provides the depth designation of the well. For example, all 200-series wells are screened across the water table. All 100-series wells are in the till.

The location designation provides the a link between well series. The location designation means that all wells with the same last two digits were drilled in the same location. Thus, if a list of wells such as 215, 346, 315, 115 is provided, the reader instantly knows that three of the wells were drilled to different depths at one location and one well was drilled at another location to the same depth as the deepest well at the first location.

One limitation of this system is that there can be no more than 99 locations. There are only a few remaining location numbers left available in the present three-digit numbering system. This is insufficient to include all off-site wells and the anticipated additional wells that are likely before the RI/FS investigation is completed. The solution to this situation is to increase the number of digits in the location number from two to three. The effect is to shift the series number from the hundreds to the thousands column. Thus, former 100-series wells will become 1000-series, 200-series will become 2000-series, and so forth. Specifically, Well 115 will be 1015, Well 215 will be 2015, Well 315 will be 3015, and Well 415 will be 4015. This allows for the addition of 900 well location numbers, which should be adequate for the investigation and create minimum confusion in the transmission. There will be well numbers beginning with 1100, 2100, and 3100 in the near future that could create some short-term confusion.

DOCUMENT CHANGE REQUEST NO. 23

Assigning Additional Location Numbers

The current practice is to use well owner's names, Miami Conservancy District well names, or names that were established during the NLO Litigation Study as the identifier for wells that are off-site and were not funded by the DOE. This practice does not allow for the same simple well construction identification as the RI/FS well numbering system. These names are also of variable length and require special handling by the RI/FS Data Base Management System. Because of this, data from these wells may not be included in a particular search request. Table 1 lists the wells currently being used in the RI/FS and the new four-digit well designation that well be used in the future in the RI/FS. The old names are still in the computer system and searches can be made by individual name so that historical data is not lost. In the future, a data request for a map with all uranium values in 2000-series wells for a given sampling period will include the off-site wells. Similarly, maps will appear with the four-digit number so that an observer will know by the well number that the data he is looking at is from a well that samples a specific interval.

Implementation

These changes will become effective on September 9, 1988. This is between quarterly water sampling events and after the completion of the current off-site drilling program. Thus, the changes at this time will have a minimum effect on the day-to-day operations of the RI/FS investigation.

DOCUMENT CHANGE REQUEST NO. 23

TABLE 1
RE-NAMED WELLS

NEW NAME		PREVIOUS NAME
1124		Cone House
1053		Argonne A-S
3053		Argonne A-D
1054		Argonne B-S
3054		Argonne B-D
1055		Argonne C-S
3055		Argonne C-D
4023*	Corrected number	BU-13
2026		BU-101
2036*	Corrected number	12-5
1040		RB
2050		Pallet Co.
2056		State 8
2057		State 16
1058		DH
1059		1A
2060		OS-1
1060		OS-1A
2061		OS-2
3062		OS-3
4101		P-1
4102		P-2
4103		P-3
3063		James Dill
3099		Robert James
3100		Charles Young
2121		BU-91
2122		BU-92
2123		12-3
2104		BPH
2105		State-10

2431 ~~2432~~

DRAFT

RI/FS DOCUMENT CHANGE REQUEST

This form is used to initiate and update RI/FS plans and procedures, only.

PAGE 1 OF 7

SAFETY	
YES ☐	NO ☒
INVOLVED	

REQUEST NO:	24
Completed by:	
Revision/ Issue Date:	
DO NOT WRITE IN THIS BLOCK	

REQUESTOR David Ponke PHONE NO.: 513-738-3100 DATE 12-19-88

DOCUMENT TITLE QAPP Rev. 3 DOCUMENT NUMBER NA

SECTION/PARAGRAPH/PAGE NO.: Section 16

ISSUE DATE January 1987 LATEST REVISION DATE March 1988

JUSTIFICATION: Clarification of Section 16 Due to Personnel Changes and Responsibilities.

CONTENT OF CHANGE

Per Attachment Sheets

CANCELLATION INSTRUCTIONS

CANCEL DOCUMENT NO.: NA

Reason for cancellation:

REQUIRED APPROVALS

RT Wilde 1-24-89	
ASI PROJECT DIRECTOR/DATE	WMCO PROJECT MGR./DATE
David Ponke 12/28/88	
ASI QA OFFICER/DATE	WMCO IMPACT ASSESS. MGR./DATE
Robert M. [illegible] 1/5/89	
IT PROJECT DIR./DATE	WMCO QA OFFICER/DATE
NA DP 12/28/88	
IT QA OFFICER/DATE	DOE COTR/DATE

TO BE COMPLETED BY DOE

A. PRIOR EPA NOTIFICATION REQUIRED ? YES _____ NO _____

B. PRIOR EPA APPROVAL REQUIRED ? YES _____ NO _____

C. IMMEDIATE IMPLEMENTATION. YES _____ NO _____

~~84~~ 86

16.0 NONCONFORMANCE/CORRECTIVE ACTION

Nonconforming items and activities are those which do not meet project requirements, procurement document criteria, or approved work procedures. Nonconformances include malfunctions, failures, deficiencies, and deviations. Nonconformances may be detected and identified by:

- Project Staff
  During the performance of project activities, including field investigation and testing, supervision of subcontractors, performance of field inspection, and preparation and verification of numerical analyses;

- Laboratory Staffs
  During the preparation for and performance of laboratory testing, calibration of equipment, and QC activities; or

- Project QA Officer
  During the performance of audits and other quality assurance activities.

Nonconformances are not variances (Section 15.3). Variances are approved and controlled changes to an approved plan or procedure. Variances are approved prior to implementing a change. Nonconformances are uncontrolled and unapproved deviations from approved plans and procedures.

Each nonconformance affecting quality will be documented by the personnel that identifies or creates it. For this purpose, a Nonconformance Report form (Figure 16-1), ITAS laboratory nonconformance memo form (examples are shown on Figures 13-1, 13-2, and 13-3 of the ITAS Quality Assurance Manual), or audit report will be used as appropriate. *

16.1 IT ANALYTICAL SERVICES NONCONFORMANCES

16.1.1 ITAS LABORATORY NONCONFORMANCES

Nonconformances identified within ITAS analytical laboratories will be reported in accordance with Section 13.0, "Nonconformances and Corrective Action", of the ITAS Quality Assurance Manual, except that laboratory nonconformances identified during ITAS-performed audits will be reported in accordance with Section 14.0, "Quality Assurance/Quality Control Audits", of the ITAS

FERNALD
RI/FS

NONCONFORMANCE REPORT

NR No. ____________

Page ____ of ____

Date: ____________

1. NONCONFORMANCE DESCRIPTION

Identified By: ______________________________ Date: ____________

2. PROPOSED CORRECTIVE ACTION, INCLUDING INITIATION AND COMPLETION DATES

To Be Performed By: ______________________________

3. APPROVAL FOR PROPOSED CORRECTIVE ACTION

______________________________ Date: ____________
Project Director

______________________________ Date: ____________
Project QA Officer

4. CORRECTIVE ACTION TAKEN (IF DIFFERENT FROM THAT PROPOSED)

5. CORRECTIVE ACTION COMPLETE

Performed By: ______________________________ Date: ____________

Verified By: ______________________________ Date: ____________

FORM005

CC:

- When the nonconformance description is completed, the initiator signs in the IDENTIFIED BY space if the initiator identified or created the nonconformance. If other than the initiator identified or created the nonconformance, the initiator lines through IDENTIFIED BY and adds "Reported By" and signs. The date that the initiator prepared the NR is recorded in the DATE space of Part 1.

- The initiator completes Part 2 of the NR by describing the proposed corrective action for resolving the nonconformance, after consulting with the initiator's supervisor, the Project Director, or the Project QA officer, if appropriate. Initiation and completion dates for the proposed corrective action are included whenever appropriate. The names of the person(s) and/or organizations proposed to perform the corrective action are entered in the TO BE PERFORMED BY space.

- The initiator forwards the NR to the Project QA officer.

- The Project QA officer evaluates Part 1 to determine that the condition or occurrence described represents a nonconformance. If he concurs that it is a valid nonconformance, he enters an NR number in the space provided near the top of the NR form and evaluates Parts 1 and 2 for adequacy and completeness. Any disagreements are resolved with the initiator, and as appropriate, the Project Director and/or the person(s) or organization(s) proposed to perform the corrective action.

- When the Project QA Officer is in agreement with Parts 1 and 2, he signs and dates Part 3.

- The Project QA Officer enters the pertinent information in an NR status log that shows, as a minimum, the NR number, corrective action scheduled completion date, transmittal and return date to and from the Project Director, issue date, corrective action actual completion date, and corrective action verification date.

- The Project QA officer makes a copy of the NR and transmits the original to the Project Director with a request to review and approve and return to the Project QA officer as soon as feasible. The transmittal date is recorded in the NR status log.

- When the signed NR is returned from the Project Director, the Project QA officer records the current date in the space provided near the top of the NR form and distributes copies of the NR to all affected parties, including the initiator, the person(s) or organization(s) responsible for performing corrective action, the Project Director, and the DOE COTR. The NR original is placed in the project files. Appropriate entries are made in the NR status log.

16.4 CORRECTIVE ACTION PERFORMANCE

Corrective action for nonconformances is performed and completed as follows:

- When the person(s) or organization(s) responsible for performing corrective action receive a copy of the "issued" NR, appropriate action is taken to initiate and complete the corrective by no later than the scheduled dates. If the scheduled dates are not met, the Project Director and Project QA officer are notified prior to those dates.

- When the corrective action is complete, the performing person(s) or organization(s) complete Part 4 of the NR by describing any corrective actions different from that proposed in Part 2. If the corrective action taken is the same as that proposed, "Same as proposed" is entered in Part 4.

- The person performing or responsible for the corrective action sign in the PERFORMED BY space of Part 5 on the original of the NR (if available) or on a copy, enters the date that Part 5 was signed, and forwards the signed NR to the Project QA officer.

- The Project QA officer will make appropriate entries in the NR status log when the signed NR is received.

16.5 CORRECTIVE ACTION VERIFICATION

Completion of corrective actions for nonconformances will be verified by the Project QA officer. Following verification, the Project QA officer will sign the original of the NR in Part 5 and make the appropriate entry in the NR status log.

[illegible]ALUATION OF RECURRING NONCONFORMANCES

As eac[illegible] NR is received, the Project QA officer will determine i[illegible] it describes a recurring nonconformance. For each recurrin[illegible] nonconformance, the Project QA officer will coordinate an e[illegible]uation to determine the cause and will initiate any act[illegible]on required for changes in project requirements or procedures to prevent further recurrences. The Project QA officer, with the assistance of the Project Director, as appropriate, will ensure that the evaluation and results are properly documented.

DOCUMENT REVISION LOG SHEET

Place in front of section 6 of the QAPP, Volume 5, Rev. 3

Document Change Request	Document	Section	Page	Rev.
25	QAPP, Vol. V	6.2	20	3.1

- Frequently change and calibrate membrane electrode to eliminate interference from gases other than oxygen.
- Rinse probe with distilled water between each measurement.
- Store the probe in a water-saturated air environment.

References

1. American Public Health Association, et al., 1985, Standard Methods for the Examination of Water and Wastewater, 16th Edition, Method 421F, pp. 422-426.

6.2.5 Alkalinity

Scope and Application

Alkalinity is a measure of the acid buffering capacity of a sample and is formally defined as the equivalent sum of bases that are titratable with a strong acid. The carbonate species, bicarbonate, HCO_3^-, and carbonate, CO_3^{-2}, are the dominant bases which contribute to alkalinity in most natural waters. Since alkalinity concentration is affected by changes in temperature, pH, and degassing, the alkalinity analysis should be performed in the field as soon as possible after collection. Uranium and other radionuclides form carbonate complexes; therefore, an accurate determination of carbonate concentration is necessary to quantify radionuclide mobility in ground water.

Summary of Method

Bicarbonate and carbonate concentrations are determined by electrometric titration. A strong acid of known concentration is added to a water sample while the pH of the sample is monitored. Using the acid volume needed to reach the end point, the concentration of bicarbonate and carbonate is calculated.

Apparatus

- pH meter that can be read to 0.01 units
- pH probe
- pH buffer solutions
  - pH 4.0
  - pH 7.0
- 50 milliliter (ml) buret
- Volumetric pipet (Class A)
- Magnetic stirrer and small teflon stir bar
- Buret stand and clamp
- 250 ml beaker or flask
- Standardized sulfuric or hydrochloric acid, approximately 0.02 normal

Calibration

Follow the manufacturer's instructions for calibration of the pH meter. Calibrate the meter daily before starting titrations.

Sample Measurement

- Fill buret with acid; open stopcock and drain out some acid to remove all air bubbles.
- Place a clean dry teflon stir bar into a clean dry 250 ml beaker.
- Pipet 50.0 ml of sample into the beaker.
- Place beaker onto center of stirring plate and gently place the clean, dry, pH probe into the beaker. Position buret over the beaker.
- Record the initial pH of the sample to the nearest 0.01 pH unit. Record to the nearest 0.01 ml the initial acid volume in the buret.
- Turn on stirring mechanism to a gentle or slow setting.

- Titrate acid into the sample. If the sample pH is not near an endpoint, i.e., pH greater than 9 or pH between 5 and 8, acid can be titrated in volumes sufficient enough to lower the pH by 0.2 to 0.5 units. However, when the pH of the sample is near an endpoint, i.e., between pH 8 and 9, or between pH 4 and 5, titrate dropwise, as very small additions of acid will cause large changes in sample pH.

- Turn off the stirring mechanism after allowing sufficient time for the sample to mix thoroughly.

- Record the acid volume and pH.

- Repeat titration of acid into the sample until the pH of the sample is in the range of 3.0 to 3.5.

Measure Practices

- Keep buret full between titrations. This will prevent a film from developing on the inside of the buret.

- Clean glassware and stir bar in a soap bath and rinse three times with deionized water. Rinse the pH probe with deionized water only.

References

1. American Public Health Association, American Water Works Association and Water Pollution Control Federation, 1985, "Standard Methods for the Examination of Water and Wastewater," (16th ed.); Washington, D.C., American Public Health Association, 1268 pp.

2. Skougstad, M.W., M.J. Fishman, L.C. Friedman, D.E. Erdmann, and S.S. Duncan, (eds.), 1979, "Methods for Determination of Inorganic Substances in Water and Fluvial Sediments: Techniques of Water - Resources Investigations of the U.S. Geological Survey," Book 5, Chapter A1, 626 pp.

3. U.S. Environmental Protection Agency, 1983, "Methods for Chemical Analysis of Water and Wastes," EPA-600/4-79-020, Cincinnati, Ohio, U.S. EPA, Environmental Monitoring and Support Laboratory, Office of Research Development, 460 pp.

6.26 Eh (redox Potential

Scope and Application
Eh (redox potential) is a measure of the aqueous electron concentration. Eh is controlled by reactions involving elements which are present in more than one oxidation state. The chemical behavior and mobility of many aqueous constituents are strongly influenced by the redox potential of surface or ground water. Physical, chemical, and biochemical processes in water will affect Eh.

Summary of Method
Eh is measured in the field by immersing a combination electrode into water. The electrode consists of a platinum redox and a silver/silver chloride reference electrode combined in one body. Eh measurement is based on potential difference between the constant voltage reference electrode and variable voltage of the platinum electrode. The voltage of the platinum electrode is dependent on the concentration of electrons in solution. For ground water, Eh must be measured using a flow box or similar device which prevents atmospheric contamination of the water sample.

Apparatus and Reagents

- pH/mV meter; Orion Research Model 407 A/F or equivalent
- Combination redox electrode; Orion Research Model 96-78 or equivalent
- Electrode filling solution; Orion Research Model 900001 or equivalent
- Deionized water for cleaning and decontamination
- Kimwipes or equivalent
- Zobell calibration solutions
  - Solution A:
    a. 4.22 grams potassium ferrocyanide
    b. 1.65 grams potassium ferricyanide
    c. Combine and dilute to 100 milliliters (ml) with deionized water
  - Solution B:
    a. 0.42 gram potassium ferrocyanide
    b. 1.65 grams potassium ferricyanide
    c. 2.09 grams potassium fluoride
    d. Combine and dilute to 100 ml with deionized water

Calibration

Turn selector dial on pH/mV meter to "battery check." The meter should read in the "battery OK" range, if not, charge or replace batteries before using. If battery is charged, turn selector dial to "mV," remove protective cap from redox electrode, and place electrode in Zobell A solution. The meter should read 200-300 mv. Record the reading, remove the electrode from the Zobell A solution, rinse the electrode with deionized water and dry with a Kimwipe. Place the electrode in Zobell B solution; the meter is given for each Zobell solution since the Eh of the solution is a function of temperature.

Sample Measurement

- Water temperature measurements must accompany the Eh measurement. Record the water temperature to the nearest tenth of a degree centigrade.
- Turn the selector dial on pH/mV meter to "mV" and remove the protective cap. from the redox electrode.
- Place electrode into the rubber stopper or gasket on the top of the flow box. Approximately half of the electrode should remain out of the flow box, since the level of the filling solution must be higher than the water level. Also, the small hole in the electrode body must breathe.d
- Turn on water flow, allow the box to fill, and make certain no air remains trapped at the top of the flow box.
- Reduce flow in the box to as low as possible while maintaining positive pressure in the flow box.
- Allow sufficient time for thermal equilibration and Eh stabilization before taking the reading. Gently move the probe, as if stirring the water, to speed up the stabilization of the Eh reading.
- Read the "mV" or millivolt scale of the pH/mV meter (blue scale on the Orion 407 A/F). After Eh has stabilized, record the value to the nearest millivolt. Make certain to include the sign of the reading, since positive or negative potentials are possible.
- Remove the redox electrode from the flow box and rinse with deionized water. Place the protective cap on the electrode tip, and turn the selector dial of the meter to "off."

- In measuring Eh of surface water, follow the same procedure. However, the flow box is not necessary. Approximately one half of the electrode must remain above the water surface; do not fully immerse the electrode.

Measurement Practice

- Remove salts or precipitates from the exterior of the redox electrode by rinsing with deionized water.

- Filling hole of the electrode can be sealed with scotch tape. Do not cover the smaller breathing hole; it must stay open for proper operation.

- If the platinum tip of the electrode becomes coated with any substance, cleaning is necessary. Cleaning with deionized water and Kimwipes. If this does not remove the coating or film, use a nonabrasive cleaner, deionized water and Kimwipes. If the coating or film is still present, contact the manufacturer. Do not use cleaners which contain petroleum products on the electrode.

- To change the filling solution, turn the electrode upside down briefly to moisten the O-ring, and push the sleeve into the cap to drain the electrode. Fill the electrode with new solution, slowly push the sleeve into the cap until some solution drains from the electrode. Add more filling solution, if necessary, and retape the filling hole.

- Store the redox electrode dry. Drain filling solution and rinse interior and exterior with deionized water before storing.

References

1. American Society for Testing and Materials, 1986, "Annual Book of ASTM Standards," Volume 11.01, Philadelphia, American Society for Testing and Materials, pp. 261-267.

2. Langmuir, D., 1971, "Eh-pH determination," In "Procedures in Sedimentary Petrology," ed. R. E. Carver; New York, John Wiley, pp 597-634.

3. Orion Research Incorporated, 1983, "Instruction Manual Platinum Redox Electrodes," Form IM9778/7801; Boston, Orion Research Incorporated, 13 pp.

6.3 SURFACE WATER SAMPLING

The procedures and practices described herein are applicable to the collection of water samples from streams, ponds, lakes, rivers, springs, and seeps. Basically, there are two different techniques for collecting surface water samples. They are:

- Grab sampling; and
- Composite sampling.

Whether the technique of sampling is grab or composite sampling, the following practices will be observed:

- The sample container will be clean and uncontaminated. Appropriately cleaned sample containers with or without preservatives are prepared by the laboratory prior to shipment to the field. Sample containers with preadded preservatives will be filled to the top without overflowing to prevent loss of the preservatives. Do not rinse sample containers.
- The point of sampling will be chosen with care so that a representative sample of the water to be tested is obtained. Choose the location of the sampling point with respect to the information desired and in conformity to local conditions.
- Avoid sampling when there is visible surface debris or when artificial turbulence is present in the stream.
- Do not use containers with preservatives to collect water samples directly from a body of water. Use a separate container (grab bottle) for sample collection and transfer the water sample into containers with preservatives.

DOCUMENT REVISION LOG SHEET

Place in front of section 5 of the QAPP, Volume 5, Rev. 3

Document Change Request	Document	Section	Page	Rev.
26	QAPP, Vol. V	5.1	6	3.1
	QAPP, Vol. V	5.1	23	3.1

- Increase HV (if HV potentiometer is at a minimum, it will take approximately 3 turns before any change is indicated). While increasing the HV, observe the log scale of the ratemeter. Increase HV until ratemeter indication occurs.

- Switch the WINDOW IN/OUT to IN.

- Turn the HV control until maximun reading occurs on the log scale. Increase HV until reading starts to drop off. Then decrease the HV for maximum reading.

- Turn RANGE selector switch to the X1K position.

- Press ZERO button. If meter does not read, switch to a lower range until a reading occurs.

- Carefully adjust the HV potentiometer until maximum reading is achieved on the range scale. The instrument is now peaked for daughters of uranium-238 on both the LOG and RANGE scales.

5.1.1.2 Daily Instrument Standardization

Following completion of the instrument setup procedure, establish a fixed source-detector geometry so that the source-to-detector distance is a matter of record and reproducible from one day to the next. Standardize the FIDLER as follows:

- Make five one-minute counts with the Am-241 source in its check position, find the average of these counts. Record each count on the "Instrument Checks" form (Figure 5.2).

- Over a period of ten (10) days, determine the standard deviation from the average of the five one-minute daily counts. Record this value (σ) and three times the value (3σ) in the instrument logbook.

  standard deviation $\sigma = \left[\frac{(\Sigma x^2) - (\Sigma x)^2}{n(n-1)}\right]^{0.5}$

- A control chart will be prepared using information from the previous two steps. This chart will be prepared at the beginning of the site characterization and will be used each day to record the FIDLER's response to the

Am-241 source. On a piece of linear graph paper, place consecutive calendar dates on the x-axis. Define a range along the y-axis which includes the average FIDLER source count ± 3 times the standard deviation. Draw three horizontal lines which intersect the y-axis at these three points.

This procedure is referenced in the manufacturer's operation manual. Various other manufacturers' instructions for operation of the large-volume scintillation detector may be used.

Large-Volume Scintillation Detector Operational and Field Measurement Procedure

Set up the detector and perform the field measurement according to the following instructions:

- Check proper operation of the detector and its associated ratemeter/scaler according to the manufacturer's instructions.
- Perform correlation of the detector according to Section 5.1.3.2 each time a measurement is taken and record the results on the Gamma-Ray Exposure Rate Survey form (Figure 5-2).
- Perform daily source checks using a 0.1 μCi Cesium-137 check source and record the response on the Instrument Checks from (Figure 5-2).
- Perform daily background checks at the field office and record the response on the Instrument Checks form (Figure 5-2).
- For walkover surveys, proceed to the assigned grid area and reset the scaler on the ratemeter/scaler.
- Subdivide the 100-foot by 100-foot grid into 16 squares, each 25 feet by 25 feet.
- At one corner of the grid, start the scaler and timer and walk at a steady rate (approximately two feet per second) over the subgrid, beginning along one side and covering the entire grid in a rectilinear fashion until all areas have been surveyed.
- The scintillation detector should be suspended by a rope or strap and swung from side-to-side in a serpentine fashion. Each 25-foot by 25-foot subgrid should be surveyed in approximately two minutes.
- During the walkover, survey meter count rate may be monitored with earphones, if necessary. Any location with an elevated count rate (indicated by a higher

pitch in the earphones) in localized areas will be marked by dropping a weighted flag, and the survey will continue at the same pace.

DOCUMENT REVISION LOG SHEET

Place in front of section 15 of the QAPP, Volume 5, Rev. 3

Document Change Request	Document	Section	Page	Rev.
28	QAPP, Vol. V	15.0	All	3.1

15.0 DOCUMENT CONTROL

Project specific documents and drawings must be reviewed, approved, distributed, and revised as necessary.

15.1 Review and Approval of Documents and Drawings

Prior to use, the following documents and drawings must be reviewed and approved by the personnel identified:

- Quality Assurance Project Plan
  - Project QA Officer
  - ASI Project Director
  - WMCO QA Officer
  - DOE Contracting Officer's Technical Representative
  - IT Technical Manager (Review Only)

- Other Project Specific Documents (such as the Work Plan, Sampling Plan, etc.)
  - Project QA Officer
  - IT Technical Manager
  - ASI Project Director
  - DOE Contracting Officer's Technical Representative
  - WMCO QA Officer (Review Only)

- Drawings,including computer graphics and maps
  - Draftperson/Preparer
  - Checker
  - IT Technical Manager
  - ASI Project Director

Approval of these documents and drawings will be denoted by a signature and date. All documents and drawings will be reviewed and approved by the designated ASI and IT personnel before they are submitted to DOE for their review and approval. Requests for a copy of a document or a design drawing before it has gone through the complete review and approval process will merit the document or drawing to be marked "Preliminary."

15.2 Distribution

Documents and drawings will be distributed as requested to ASI, IT, WMCO, and DOE personnel. The Project QA Officer will control distribution of all quality-related documents, including the QAPP, Work Plan, and Sampling Plan. The Project Director will control distribution of all other documents and drawings. When a document or drawing is no longer needed, it will be destroyed or returned to the issuing group. Each copy of the QAPP, Work Plan, Sampling Plan, Health and Safety Plan, and Community Relations Plan will be identified with a document control number. The Project QA Officer will maintain a status log showing the name, control number, and mailing address of each controlled copyholder. The Project Director will also maintain a log for all other documents and drawings.

15.3 Revision of Documents and Drawings

Whenever a document or drawing cited in Section 15.1 is revised, a new review and approval of the revision will be required in accordance with the requirements of the original document or drawing.

Revisions will be issued to all holders of the original document or drawing. For the QAPP, Work Plan, Sampling Plan, Health and Safety Plan, and Community Relations Plan, each copyholder will sign a revision receipt verifying that the revision has been received and properly placed in the document. The receipt will be returned to the Project QA Officer. The Project Director, will control revisions of all other documents or drawings. Revision receipts will be returned to the Project Director.

Revisions to documents will be denoted by adding the revision number and revision date to the document title page (if reissued), revised signature page (if reissued), and each page that has been revised. Revisions to design drawings will be denoted by including the consecutive revision number and revision date in the appropriate block on the drawing and revised signature block.

Revisions to the QAPP, Work Plan, Sampling Plan, Health and Safety Plan, and Community Relations Plan will be accomplished by either a general revision in which all pages are replaced, or a limited revision in which only certain pages are replaced. For a general revision, all pages will be identified with the general revision number (e.g., 4, 5, 6, etc.) and the revision date. For a limited revision, each revised page will be pink in color and identified with the current general revision number and sequential suffix (e.g., Rev. 4.1, 4.2, 5.1, etc.) and the revision date. When necessitated by the change, additional pages will retain the original page number with a sequential suffix (e.g., page 4.1 of 6). Each limited revision will be transmitted by a revision log sheet that lists all revised pages for that revision. The log sheet is to be filed in the front of the revised document. Each revised page in both general and limited revisions will have a vertical line in the right hand margin adjacent to the revised material. Document title pages and signature pages are not required for limited revisions.

15.4 Initiating Changes to Documents

Changes to approved plans and procedures are likely to be necessary during the course of project performance as a result of new information or events that occur during performance. Changes to previously approved plans and procedures must be approved before the change is implemented.

15.4.1 Variances

A variance is an approved variation from a previously approved project specific procedure, such as the QAPP, Work Plan, Sampling Plan, etc and does not impact the quality of the work. Variances are recorded on the VR form shown in Figure 15-1 and must be approved by the Project Director and the Project QA Officer before they are implemented. The approval can be oral, when necessary, provided that written approval is obtained within 5 working days.

Variances do not normally result in revisions to project-specific documents. They are a means of accomplishing on-the-spot changes to project specific procedures when the change is necessary for work to proceed. The change is a one-time change that is valid only for the specific activity described in the VR.

Variance Request forms are initiated as follows:

- o The person identifying the need for the variance (the requestor) completes the VR form shown in Figure 15-1 through the REQUESTED BY entry, except for the variance number, which is supplied by the Project QA Officer.

- o The requestor obtains the signatures of the Project Director and the Project QA Officer. When necessary, such as when communicating by telephone, the Project Director or the Project QA Officer can orally give their approval to the requestor. In this instance, the requestor notes on the VR, in an area other than in the approval signature spaces, that oral approval has been granted, along with the approvers names and the date and time that approval was granted. Written approval must be obtained by the requestor within 5 working days. When obtaining the approval of the Project QA Officer, the requestor also obtains the VR number and enters it on the VR.

- o When approvals have been obtained, the change described on the VR can be implemented.

- o The original of the VR is provided to the Project QA Officer for appropriate distribution and forwarding to the project files. The Project QA Officer also evaluates the VR to determine whether or not a revision to the project-specific document is required, and, if appropriate, issues a DCR within 10 working days.

Document Change Request No. 28

FMPC RI/FS

VR No. ________

VARIANCE REQUEST

Page ____ of ____

Date: ________

VARIANCE (INCLUDE JUSTIFICATION)

APPLICABLE DOCUMENT(S) AND SECTION NO. (S)

CC:

REQUESTED BY: ____________________ Date: ________

Approved By: ____________________ Date: ________
Project Director

____________________ Date: ________
Project Quality Assurance Officer

FORM005

The Project QA Officer is responsible for maintaining a log that shows for each issued VR, the number, date of issue, requestor, effected document and section, and subject matter.

15.4.2 Document Change Requests

A DCR is a means of initiating a revision to a previously approved project-specific procedure, such as the QAPP, Work Plan, Sampling Plan, etc. DCRs are recorded on the DCR form shown in Figure 15-2. Review and approval of the DCR's shall be in accordance with the requirements of the original document before they are implemented. For DCRs that involve changes to analytical laboratory activities, review by the responsible laboratory director is also required. The Project Director or the Project QA Officer may request oral approval from the other signatories when necessitated by circumstances. If the other signatories orally approve and consent for the DCR to be signed for them, the Project Director or Project QA Officer may sign their <u>own</u> name in the other person's signature space and write "for" before the person's printed title below the signature space.

DCRs always result in revisions to project-specific documents, as opposed to VRs, which normally do not result in revisions.

DCRs are initiated as follows:

- The requestor (normally the person who identifies the need for the change) completes the DCR form up to the EFFECTIVE DATE OF CHANGE.

- o The requestor forwards the DCR to the Project QA Officer for evaluation.

- o If he concurs with the DCR, the Project QA Officer enters a number in the REQUEST NO. space and also signs and dates the DCR in the appropriate space. If he does not concur, he resolves the disagreement with the requestor.

- o The Project QA Officer enters the pertinent information in a DCR status and tracking log that shows the DCR number, requestor, request date, subject matter, affected document and section number(s), transmittal and return date from each signatory, distribution date to each document holder, and issue date of revised pages to the document.

- o The Project QA Officer makes a copy of the DCR and forwards the original to the Project Director with a request to review, approve and return to the Project QA Officer. The date is recorded in the DCR status and tracking log.

- o When the signed DCR is returned from the Project Director, the Project QA Officer makes the appropriate entry in the DCR status and tracking log, and repeats the forwarding process until all required signatures have been obtained. If any signatory refuses to sign the DCR, that signatory is responsible for communicating to the Project QA Officer the reasons for not signing. The Project QA Officer coordinates the resolution of the disagreement of the DCR, consulting with the Project Director as necessary. In the event that a

DOCUMENT CHANGE REQUEST

This form is used to initiate permanent changes to controlled distribution project-specific procedures, such as the QAPP, Work Plan, and Sampling Plan.

REQUEST NO. ____
Issue Date: ____
Page ____ of ____
Do Not Write In This Block

REQUESTOR: ________________ PHONE NO.: ________ DATE: ________

DOCUMENT TITLE: ________________________________

SECTION/PARAGRAPH/PAGE NO.: ________________ DOCUMENT NUMBER: ________

ISSUE DATE: ________________ LATEST REVISION DATE: ________

JUSTIFICATION:

CONTENT OF CHANGE:

EFFECTIVE DATE OF CHANGE:

☐ When all approvals have been obtained ________________
Effective Date

☐ Other (Specify): ________________________________

REQUIRED APPROVALS:

Project Director	Date		
Project QA Officer	Date	WMCO QA Officer	Date
Technical Manager	Date	DOE COTR	Date

TO BE COMPLETED BY DOE

A. Prior EPA notification required?	☐ Yes	☐ No
B. Prior EPA approval required?	☐ Yes	☐ No
C. Immediate implementation?	☐ Yes	☐ No

decision is made to not proceed with the issue of the DCR, the Project QA Officer notifies the requestor and all signatories who have previously signed the DCR of this decision. An appropriate entry to this effect is made in the DCR status and tracking log.

- When all required signatures have been obtained, the project QA Officer issues the DCR to all holders of controlled copies of the affected document(s). The change described by the DCR is to be implemented on the date specified in the EFFECTIVE DATE OF CHANGE space on the DCR.

- The effective date of change and issuance of the DCR is dependent on DOE addressing the section at the bottom of the DCR for EPA notification, EPA approval, or immediate implementation.

Each controlled document copyholder who receives an approved DCR is responsible for inserting a copy of the DCR in the front (or other appropriate location) of the affected document(s). Until revised document pages are issued, the DCR serves as the controlled document copy holder's official notification that the document has been changed as described in the DCR.

Subsequent to issuing a DCR, the Project QA Officer will, as soon as feasible, issue revised document pages incorporating the change described in the DCR. Upon receipt of the revised pages, at the controlled document copyholder's option, the DCR may be discarded or retained. If retained, a notation will be made on the DCR that the change has been incorporated in a revision.

15.5 Computer Graphics Development

The following apply to all computer generated graphics produced from the Fernald database for use in the Remedial Investigation/Feasibility Study. This specifically includes visual displays generated using SAS, SAS Graph, CPS-PC, Autocad, or Freelance software.

15.5.1 Distributed Data

File Transfers - All data obtained from the database for display in graphic form is to be downloaded to a local microcomputer using Kermit File Transfer Protocol. If a location identification is to be used, the coordinates must be transferred simultaneously with the other data and accordance with 15.5.2.

Local Files - Neither the data read to a local computer from the database or the date of data file creation may be altered in any way. This includes data read into a flat file, SAS dataset, an Autocad file, or a Lotus 1-2-3 file. Each individual graphics producer is responsible for maintaining a record of the data filename and the graphic filename used for computer generated graphics and maps.

15.5.2 Location Coordinates/Elevations

Location identification in all graphics will be by State Planar Coordinates. This applies to all sample collection locations and all well locations. Elevation data will be reported relative to Mean Sea Level.

All elevation or coordinates data will be derived from the survey data maintained as part of the Project record.

15.5.3 Labeling

15.5.3.1 General

Graphics shall be titled so as to clearly identify the parameter or parameters displayed. Reporting units must be included on each. Standard two-dimensional (X-Y) or three-dimensional plots must have a scale showing the range of values being displayed.

All graphics which contain data that has not been completely verified shall include the label,

"Preliminary Data: Not for Distribution or Publication"

also labels for,

"Validation Level I" and "Validation Level II"

Validation Level I	All data transferred electronically will be manually verified against signed, hard copy reports.
Validation Level II	Result of technical analysis of all data to date.

Graphics produced during the development of software programs to be used for demonstration purposes should be labeled according to Section 15.5.3.1 above and should also include the label "developmental".

15.5.3.2 <u>Three-Dimensional Plots</u>

In addition to the preceding requirements, these plots must include a north arrow showing two-dimensional rotation. They must also indicate degrees of rotation from the horizontal.

15.5.3.3 <u>Maps</u>

Maps must also show the following:

a. File name;
b. Last date of generation and dates of preceding versions;
c. Preparer and checker initials by each generation/revision date;
d. North arrow and scaler bar.

Maps approved in accordance with 15.1 will be read into plot files with the file extension ".plt". These maps can be made available for use in the on-site map production center.

The map production center display case will contain a hard copy version of each computer generated map.

Example Format:

a. File name;
b. Paper size;
c. File size;
d. Layers included;
e. Description, including any parameters overlaid;
f. All revisions and reasons for change, initialed by preparer and checker;
g. Sign-off by the technical Manager and Project Director for all versions/revisions.

The map production center will also contain a hard copy record for all revisions to the basic map file used with overlays. All revisions or updates to the basic file will be documented, giving date of revision, nature of revision, reason for revision, and person incorporating the revision. An example of a "revision" in this case would be the extension of the area shown in the basic map incorporating the addition of digitized data. The movement of an object relative to the original digitized data file is an example of a change which would not qualify as a revision.

Maps employing data not obtained directly from the database will be labeled with the source of the data.

15.5.4 Trial Runs To Determine Data Placement

Draft graphics initially produced to ascertain data placement, such as where the software employed might cause values to be printed illegibly and placement adjustment may be required to allow readability are exempted from the requirements of 15.5.1, 15.5.2, and 15.5.3. Under no circumstances are such materials to leave the site of generation. In addition, they must be marked "Data Placement Trial Run."

DOCUMENT REVISION LOG SHEET

Place in front of section 3 of Sampling Plan, Volume I, Rev. 3

Document Change Request	Document	Section	Page	Rev.
29	Sampling Plan	3.10	32	3.1

Water quality samples collected from ground water monitoring wells will be shipped to off site laboratory locations. Proper handling and containerization will assure the integrity of the samples throughout the shipping process. All samples will be shipped following the procedures and chain-of-custody guidelines described in the QAPP.

3.9 SAMPLE IDENTIFICATION

Ground water samples will be identified by the monitoring well number and a sample number. Details of the sample numbering system were provided in the Introduction to the Sampling Plan.

3.10 SAMPLE ANALYSIS

A total of 157 wells has been identified for sampling. During Phase I activities, samples will be collected quarterly from each of these wells for one year. All samples will be analyzed in the field for pH, temperature, conductivity, and dissolved oxygen. During one round of sampling from 2000-, 3000-, and 4000-series wells will be analyzed for Eh in the field.

Since the selection of each new well was specifically justified within the context of the existing monitoring well network (as discussed in Section 3.2), it is necessary to analyze all ground water samples for a full suite of radiological parameters and a more focused set of general water quality indicators to achieve the overall study objectives. All ground water samples will be analyzed for a set of radiological parameters that include radionuclides or materials handled at the FMPC. These parameters, which are consistent with those being tested under the ongoing RCRA monitoring program, include:

- Total Uranium
- Isotopic Uranium
- Isotopic Plutonium
- Radium-226
- Radium-228
- Neptunium-237
- Total Thorium
- Isotopic Thorium
- Technetium-99
- Cesium-137
- Strontium-90
- Ruthenium-106.

DOCUMENT REVISION LOG SHEET

Place in front of section 4 of Work Plan, Rev. 3

Document Change Request	Document	Section	Page	Rev.
29	Work Plan	4.2	39	3.1

Production Area and Waste Storage Area will be handled in a manner consistent with the U.S. EPA's direction.

Sample Analysis

A total of 150 wells have been identified for sampling. During Phase I activities, samples will be collected from each of these wells on four occasions. All samples will be analyzed in the field for pH, temperature, conductivity, and dissolved oxygen. During one round of sampling 2000-, 3000-, and 4000-series wells will be analyzed for Eh in the field.

Since the selection of each new well was specifically justified within the context of the existing monitoring well network, it is necessary to analyze all ground water samples for a full suite of radiological parameters and a more focused set of general water quality indicators to achieve the overall study objectives. All ground water samples will be analyzed for a set of radiological parameters that include radionuclides or materials handled at the FMPC. These parameters, which are consistent with those being tested under the ongoing RCRA monitoring program, include:

- Total Uranium
- Isotopic Uranium
- Isotopic Plutonium
- Radium-226
- Radium-228
- Neptunium-237
- Total Thorium
- Isotopic Thorium
- Technetium-99
- Cesium-137
- Strontium-90
- Ruthenium-106.

All samples will also be analyzed for the following parameters that are being used as indicators of drinking water quality under the ongoing RCRA program:

- pH
- Specific Conductance
- Chloride
- Iron
- Manganese
- Phenols (total)
- Sodium
- Sulfate
- Gross alpha
- Gross beta
- Alkalinity as $CaCO_3$
- Carbonate/Bicarbonate
- Copper
- Arsenic
- Barium
- Cadmium
- Chromium (Hexavalent; Total)
- Fluoride
- Lead
- Mercury
- Nitrate
- Selenium
- Silver
- Ammonia
- Total Organic Nitrogen
- Molybdenum

DCN # 33

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REMEDIAL INVESTIGATION
WORK PLAN ADDENDUM

PRODUCTION AND ADDITIONAL SUSPECT AREAS
WORK PLAN

FEED MATERIALS PRODUCTION CENTER

FERNALD, OHIO

OCTOBER 1989

~~122~~
124

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

1.1 PURPOSE 1-1
1.2 SCOPE 1-2

2.0 TECHNICAL APPROACH: PRODUCTION AREA 2-1

2.1 OVERVIEW 2-1
2.2 SYSTEMATIC SOIL BORING PROGRAM 2-2
2.3 FOCUSED SOIL BORING PROGRAM 2-11
2.4 MONITOR WELLS 2-12

3.0 PRODUCTION AREA SECTORS 3-1

3.1 OVERVIEW 3-1
3.2 SECTOR 1 - TESTING PROGRAM 3-6
3.3 SECTOR 2 - TESTING PROGRAM 3-10
3.4 SECTOR 3 - TESTING PROGRAM 3-17
3.5 SECTOR 4 - TESTING PROGRAM 3-21
3.6 SECTOR 5 - TESTING PROGRAM 3-23
3.7 SECTOR 6 - TESTING PROGRAM 3-27
3.8 WATER TOWER AREA SAMPLING 3-30

4.0 SPECIAL FACILITIES WITHIN THE PRODUCTION AREA 4-1

4.1 UNDERGROUND STORAGE TANKS 4-1
4.2 BELOW-GRADE PIPING 4-1
4.3 LINE FROM CLEARWELL TO MH-175 4-2
4.4 BURIED DRUM AREA SOUTHWEST OF THE LABORATORY 4-9

5.0 SUSPECT AREAS OUTSIDE THE PRODUCTION AREA 5-1

5.1 SOUTHFIELD AREA 5-1
5.2 RUBBLE PILES AND DRUM STORAGE AREAS 5-8
5.3 FLAGPOLE AREA 5-9
5.4 FIRE TRAINING AREA 5-11
5.5 WASTE WATER TREATMENT PLANT 5-12
5.6 LABORATORY WASTE PITS 5-13

APPENDIX A - PASA Health and Safety Plan
APPENDIX B - Work Plan for Investigation of Drum Baling Area and Nearby Burial Trench

TABLE OF CONTENTS (Continued)

LIST OF TABLES:

Table 3-1	2000-Series Wells	3-4
Table 3-2	Analytical Parameters	3-5
Table 3-3	Sector 1 Analysis Schedule	3-11
Table 3-4	Sector 2 Analysis Schedule	3-16
Table 3-5	Sector 3 Analysis Schedule	3-20
Table 3-6	Sector 4 Analysis Schedule	3-24
Table 3-7	Sector 5 Analysis Schedule	3-28
Table 3-8	Sector 6 Analysis Schedule	3-31
Table 4-1	Piping for Storm Water Sewer System	4-3

LIST OF FIGURES:

Figure 2-1	Boring Logic Diagram	2-3
Figure 2-2	General Installation Diagram	2-5
Figure 2-3	Flush Piezometer Completion	2-6
Figure 2-4	Standard Piezometer Completion	2-7
Figure 2-5	Well Installation Logic Diagram	2-14
Figure 3-1	Location Map (back pocket)	back pocket
Figure 3-2	Sector 1 Boring Locations	3-7
Figure 3-3	Sector 2 Boring Locations	3-13
Figure 3-4	Sector 3 Boring Locations	3-18
Figure 3-5	Sector 4 Boring Locations	3-22
Figure 3-6	Sector 5 Boring Locations	3-26
Figure 3-7	Sector 6 Boring Locations	3-29
Figure 4-1	Storm Sewers (back pocket)	back pocket
Figure 4-2	Underground Sanitary Sewers (back pocket)	back pocket
Figure 5-1	South Field Area	5-3

1.0 INTRODUCTION

Chapter 1 presents the purpose of the Production and Additional Suspect Areas Work Plan. The overall technical approach supporting this strategy for the Production Area is the subject of Chapter 2.0. Specific testing requirements, e.g., the number and location of sampling points and the corresponding analytical parameters, are addressed in Chapter 3.0. The testing of the special facilities within the Production Area and the suspect areas outside of the Production Area will be addressed on an individual unit basis as required by the specific site conditions and testing methods. Separate sampling and analysis plans have been developed for each special facility and suspect area and are presented in Chapters 4.0 and 5.0, respectively.

1.1 PURPOSE

On July 18, 1986, a Federal Facility Compliance Agreement (FFCA) was jointly signed by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (U.S. EPA) pertaining to environmental impacts associated with DOE's Feed Materials Production Center (FMPC). In response, a sitewide Remedial Investigation and Feasibility Study (RI/FS) is in progress to thoroughly and adequately investigate any such impacts so that appropriate remedial response actions can be formulated, assessed, and implemented.

One requirement of the FFCA was the development and execution of a ". . . sampling and analysis program to characterize . . . all materials emitted, discharge, released, or potentially released into the environment." Sampling and analysis plans have been developed and approved as part of the sitewide RI/FS Work Plan for all areas and environmental media outside of the active production facilities of the FMPC. In the case of the Production Area, however, only a general scope of work was presented in the approved RI/FS Work Plan. The Production and Additional Suspect Areas Work Plan presented here is to fulfill this requirement for a sampling plan to address areas within the Production Area.

The overall objective of the work to be performed under this Production and Additional Suspect Areas Work Plan is to determine if a release of hazardous and/or radioactive materials has occurred, or has a reasonable potential for occurring, from the production facilities and suspect areas both within the Production Area and throughout the FMPC. For purposes of this testing program, the term "suspect area" represents any localized area of the FMPC that could potentially contribute to environmental contamination as a result of specific activities, previous production operations, or past disposal practices. Any such areas accounted for by other RI activities or previous investigations are excluded from the facilities testing program. Specific objectives of the facilities testing program are the following:

- To define the nature and extent of current ground water contamination associated with production facilities and identified suspect areas;
- To evaluate the potential for ground water contamination by defining the lateral and vertical extent of radionuclide and hazardous substance contamination of surface and subsurface soils;
- To confirm that problems do not exist in those areas of the Production Area not associated with production facilities and suspect areas and to adequately define any problems that are found; and
- To gain a refined understanding of the hydrogeologic system and ground water flow patterns throughout the till underlying the Production Area.

1.2 SCOPE

The Production and Additional Suspect Areas Work Plan described herein actually represents a compendium of individual testing plans for various facilities and suspect areas associated with the FMPC. For purposes of the Production and Additional Suspect Areas Work Plan, the relevant units of the FMPC have been separated into the following three groupings:

- Production Area - The Production Area grouping includes those facilities, suspect areas, and land areas within the inner fence of the FMPC. Active production facilities are included in this grouping. In particular, the following types of facilities and suspect areas are incorporated into the overall investigation of the Production Area:

    - Raw product and waste container storage and transfer facilities
    - Oil burner area (north of boiler plant)
    - Graphite burner area
    - Area southwest of laboratory
    - Metal scrap pile area
    - Polychlorinated biphenyls (PCB) transformer/hydraulic oil area
    - Waste solvent drum storage area behind laboratory
    - Abandoned drum areas
    - Plant 1 shot blaster area
    - South interior end of Plant 6

    The drum baling area and the nearby burial trench, although identified as suspect areas within the Production Area, have already been investigated in relation to recent construction activities and will not be specifically addressed in this Production and Additional Suspect Areas Work Plan. The work Plan for the drum baling area investigation is provided as Appendix B.

- Special Facilities Within Production Area - Four types of special facilities represent exceptions to the Production Area grouping. Included in the special facilities grouping are the underground storage tanks, below-grade piping, the main effluent line from the clear well to Manhole 175, and a former drum storage area behind the laboratory. A differentiation of these facilities is necessary to best accommodate the technical requirements of the respective testing programs. In particular, each of these four facility types is associated with testing techniques that are considerably different from those proposed for the Production Area as a whole.

- Suspect Areas Outside Production Area - Several of the identified suspect areas are physically located outside of the Production Area. Included in this grouping are: the fire training area, an area north and east of the fire training area, area south of the laboratory where laboratory hoods were buried, the southfield area, several rubble mounds and abandoned drum locations, and an area in the vicinity of the flagpole near the entrance to the administrative building. Although many of these areas have already been surficially investigated as part of the radiation measurement and soil sampling programs, more definitive investigations of the nature and extent of any associated releases and impacts will be conducted under the facilities testing program.

For purposes of technical flexibility and management control, the Production Area grouping will be divided into six sectors for investigation. The sectioning of the Production Area has considered the types of past and present operations performed, the types of materials handled and their respective chemical forms and solubility, and any other conditions or activities that would dictate a need for special testing methods. The underlying goal is to create sectors with common conditions that would result in the most effective scoping and sequencing of testing programs. The recommended approach is to proceed with the investigation of the six sectors in a sequential manner. The order of investigation will be based on the probability that contamination is present in the till and ground water underlying each sector as well as the potential public health and environmental impacts associated with any such contamination. The selection and prioritization of the sectors were based in large part on the findings of a special task force of Westinghouse Materials Company of Ohio (WMCO) personnel assembled for the purpose of identifying areas requiring special consideration in the development of sampling strategies.

The investigation of each sector within the Production Area will include three types of activities. In the first, soil borings will be systematically installed on a grid pattern throughout each sector to confirm whether uranium or nitrates are present at elevated levels in the till. The objective of this activity is to provide assurance that problems do not exist in those areas not previously identified as suspect areas. The second activity will also involve the installation of soil borings but, in this case, at selected locations based on known or suspected points of environmental release or contamination. This activity will be performed for the purpose of better defining the nature and extent of any contamination associated with a past or current point of release. The third activity will be the installation of 2000-Series monitor wells into the sand and gravel aquifer at selected locations. Priority will be given to locations downgradient from the most critical facilities and suspect areas associated with potential releases of soluble forms of uranium. Such wells will serve to monitor the ground water pathway that could link materials initially released to the subsurface environment of the Production Area with off-site receptors.

2.0 TECHNICAL APPROACH: PRODUCTION AREA

Section 1.2 introduced a three-step investigative program to be implemented for each of the six sectors within the Production Area. This program includes a systematic soil boring program to be conducted along a predefined grid, a focused soil boring program to augment the scope of the investigation near known or suspected problem areas, and a monitor well program to evaluate any related effects on the regional sand and gravel aquifer. Both the objectives of this strategy and the investigative methods to be employed will be essentially the same from sector to sector. The purpose of Chapter 2.0 is to provide a detailed description of the objectives and methodologies common to all sectors for each of the three steps in the investigative process. Sector-specific information on the number and locations of borings and wells, the parameters for which the samples will be analyzed, and any special testing requirements will be the subject of Chapter 3.0.

2.1 OVERVIEW

The proposed drilling program is designed to identify any contamination of perched water within the production buildings. Generally the buildings were constructed on concrete columns that rest on concrete footings. The foundations do not include subsurface walls that would block or direct the flow of contaminants, or serve as preferential sinks of contaminated water in highly permeable backfill material. Therefore the perched water found in a boring on the outside of a building and the water found in a boring on the inside of the building may well be part of the same perched water system. Water level elevations and chemical similarities will be evaluated to determine continuity of individual water bodies. If a removal action is required in an area, the final proof of the dimensions of a perched water unit will be shown by the response of the water levels in the piezometers to the removal action.

2.2 SYSTEMATIC SOIL BORING PROGRAM

A 250-by-250-foot grid will be established across all sectors of the Production Area for purposes of the systematic soil boring program. Except for those conditions noted below, borings will be placed at all points of intersection of the grid. Ninety-three borings will result from the selected grid spacing.

Systematic boring locations that fall inside buildings will be evaluated on a case-by-case basis. In general, borings inside buildings will be limited to those associated with the focused sampling of suspected problem areas. Each grid boring that would otherwise fall within a building will be replaced, however, by a boring located just outside of the nearest wall along the same grid line, unless an adjacent grid boring is already in close proximity to the building wall. If a grid point falls within a diked containment area, the boring will be installed immediately outside of the area. Grid borings will be installed through paved and gravel-covered areas unless conditions warrant a slight shifting of locations, e.g., along shoulders of roads rather than through the pavement. If a grid point falls in close proximity to a suspect area being investigated under a focused program, the borings being placed for the suspect area will take precedence over the systematic boring.
The logic diagram for the soil boring program is presented in Figure 2-1. All borings will be advanced using an eight-inch hollow-stem auger. Unless dictated otherwise by available

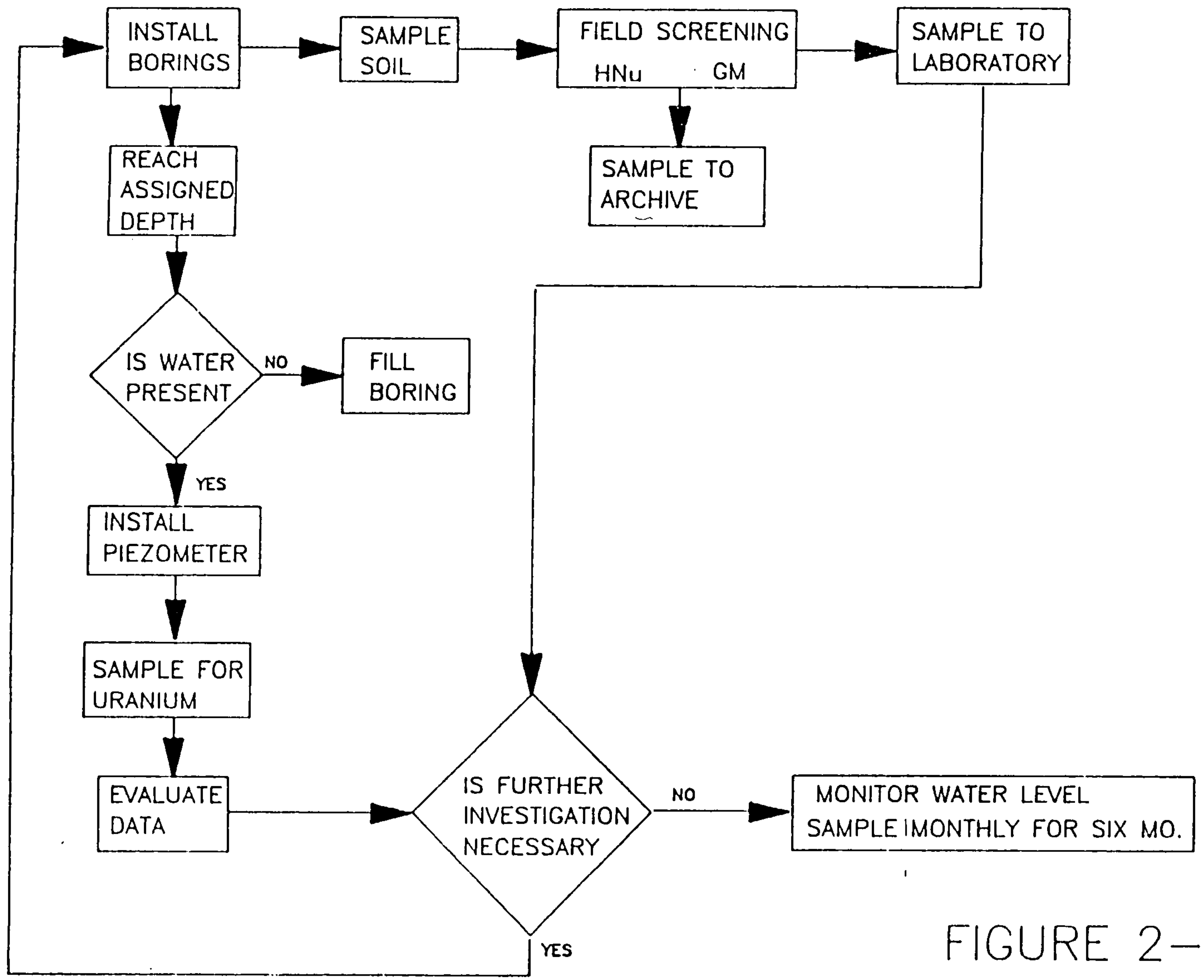


FIGURE 2-1
BORING LOGIC DIAGRAM

information on the subject area, each boring will be advanced to a depth of 20 feet or to the first water-bearing zone. If a water-bearing zone is encountered at a depth shallower than 20 feet, the boring will be advanced until a clay layer is reached or until the total depth of the boring reaches 20 feet. The 20-foot depth will be a strict limit on each hollow-stem auger boring to prevent the boring from penetrating the till and draining perched water downward into the sand and gravel aquifer.

Borings that do not encounter water will be backfilled with Volclay grout. Borings that encounter water will be completed as two-inch-diameter piezometers constructed of PVC. The piezometers will allow water levels to be monitored to interpret the local perched water table. Water levels will be taken monthly for six months as part of the overall water level measurement program being conducted under the RI/FS. The piezometers will also be adequate for the collection of ground water samples for laboratory analysis.
Screen length will vary from two to ten feet to be determined in the field for each boring. Factors that will influence the screen length will be the depth of the boring, the apparent thickness of the saturated zone, and the need to provide an adequate surface seal. All screen will be 2-inch inside diameter, 0.02-inch machine slotted Schedule 40 PVC. In some instances where future pumping is expected, 4-inch diameter rather than 2-inch diameter screen and casing will be used.

Records of the materials encountered in the borings will be maintained in the same manner as used in the installation of monitor wells in the RI/FS. The same Visual Classification of Soils and Piezometer Installation Sheet will be used. Figure 2-2 is a diagram showing the typical construction for piezometers installed in this program.

Because some of the piezometer may be finished in a flush mounted well enclosure, revised installation diagrams have been developed for this work and are presented in Figures 2-3 and 2-4.

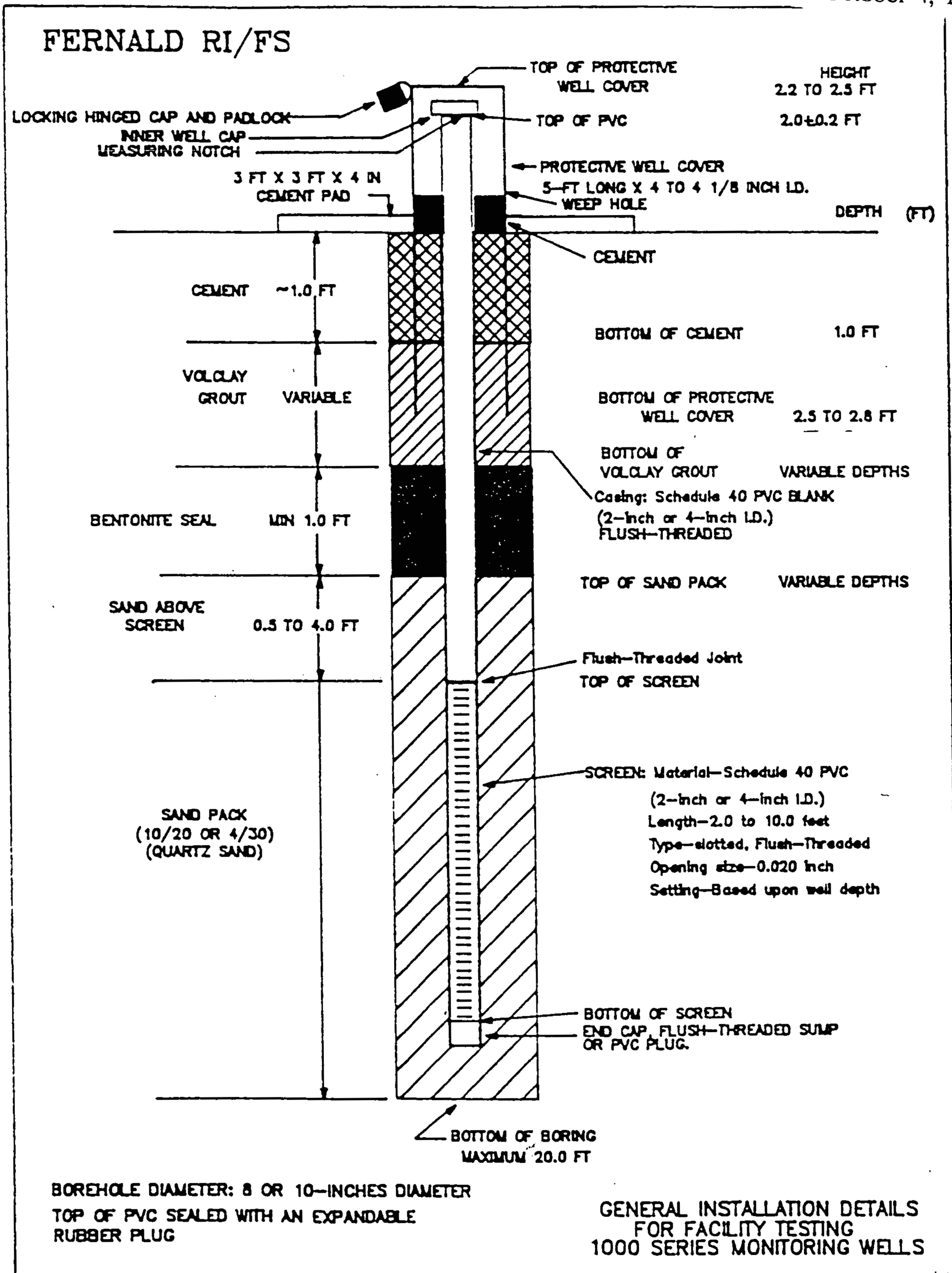
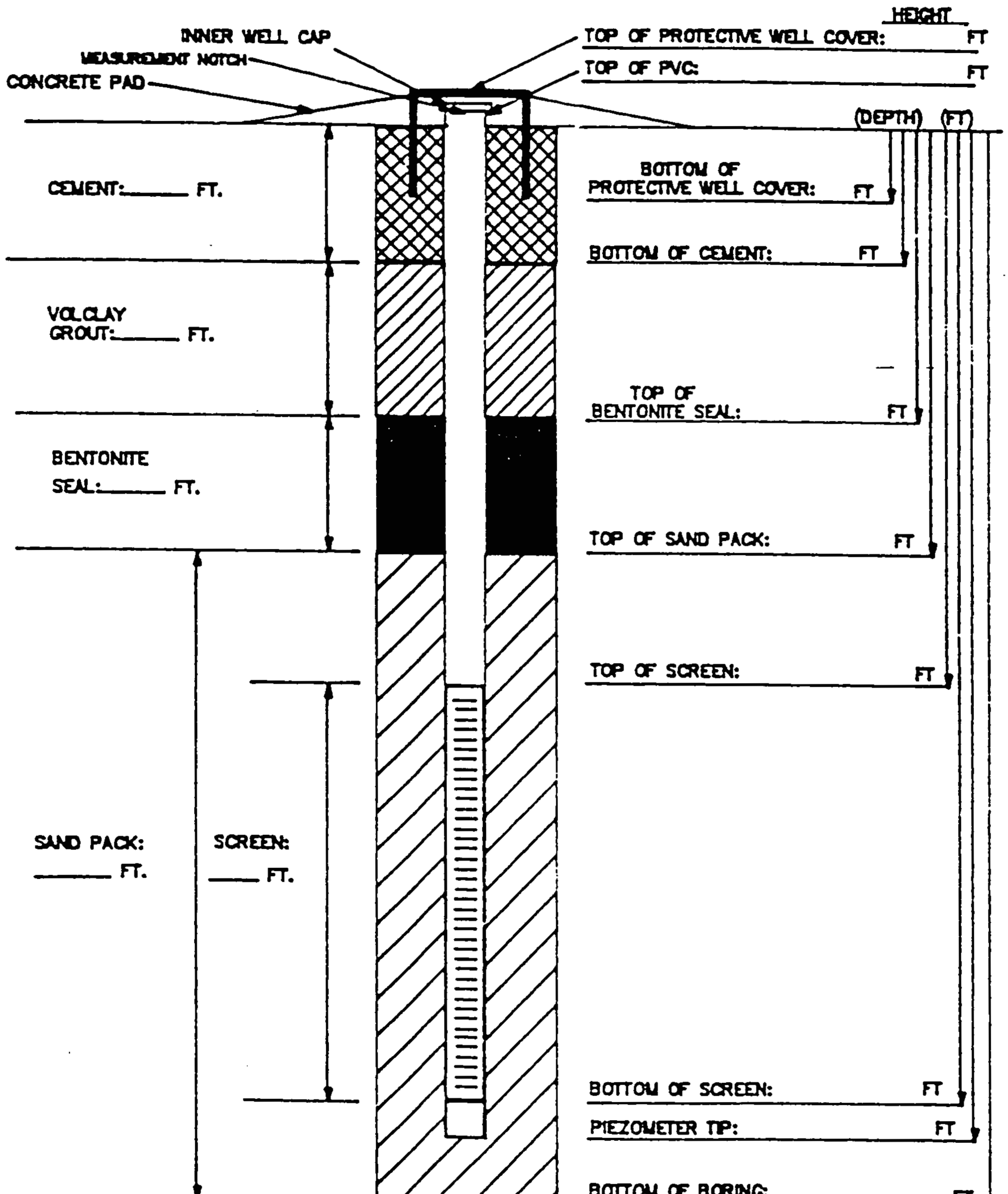


FIGURE 2-2 GENERAL INSTALLATION DIAGRAM

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO. ____________

INSTALLATION DATE: ____________



BOREHOLE DIAMETER: ____________ INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY:
BENTONITE PELLETS (5-GALLON BUCKETS):
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT:
AMOUNT OF WATER USED:
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:
5) TOP OF PVC IS SECURED WITH EXPANDABLE RUBBER PLUG AND PADLOCK.
6) PARENTHESIS INDICATE DEPTH BELOW GROUND LEVEL.

TASK: GEOLOGIST/ENGINEER:

FIGURE 2-3 FLUSH PIEZOMETER COMPLETION

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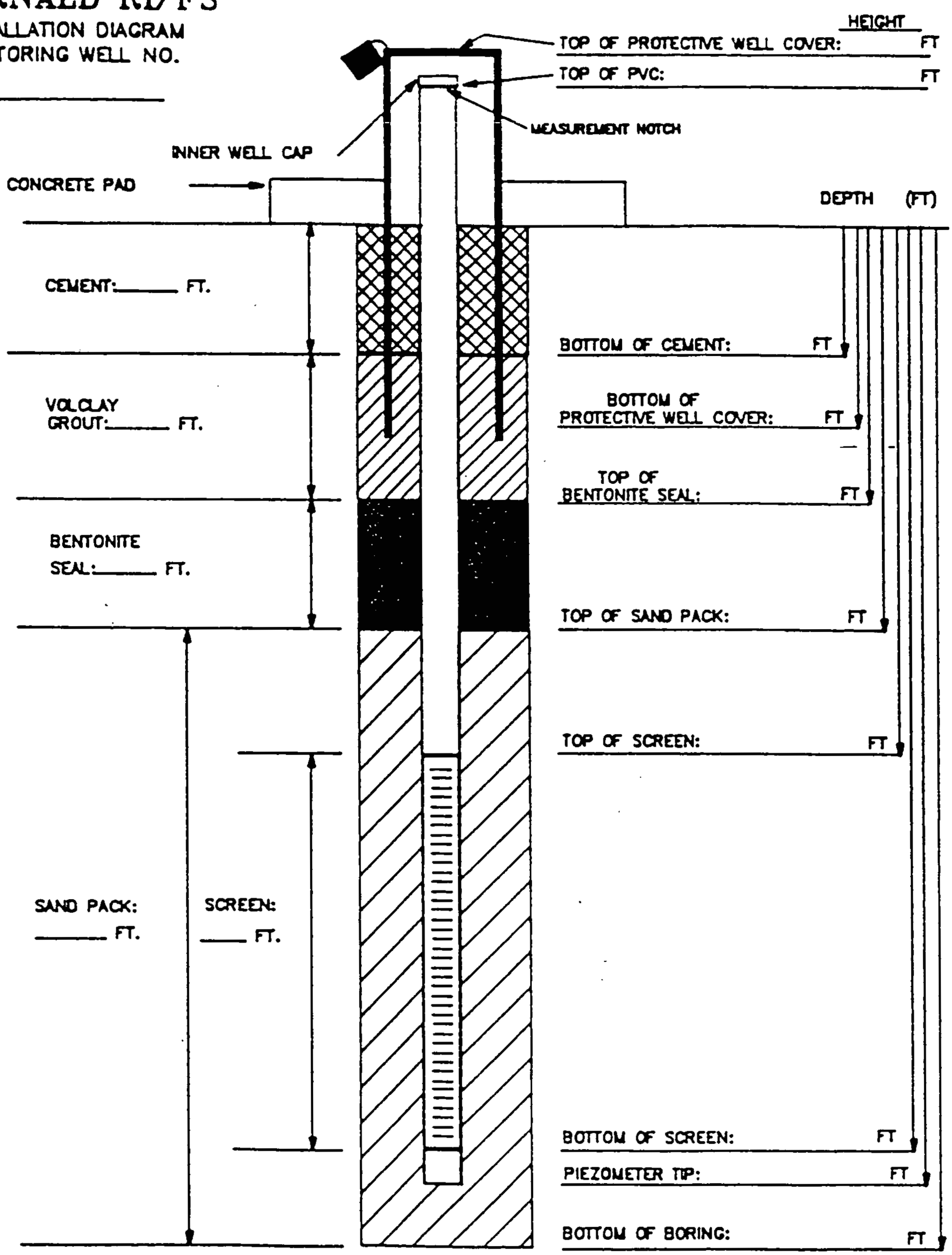
INSTALLATION DATE: ______

FERNALD RI/FS

INSTALLATION DIAGRAM
MONITORING WELL NO.

______



BOREHOLE DIAMETER:______ INCHES

MATERIALS USED:
SAND TYPE AND QUANTITY:
BENTONITE PELLETS (5-GALLON BUCKETS):
BAGS OF VOLCLAY GROUT:
AMOUNT OF CEMENT:
AMOUNT OF WATER USED:
OTHER:

NOTES:
1) RISER PIPE IS 2-INCH SCHEDULE 40 PVC PIPE, FLUSH-THREADED JOINTS.
2) SCREEN IS 2-INCH I.D. SCHEDULE 40 PVC PIPE WITH 0.020-INCH SLOTS.
3) LOWER END OF SCREEN IS CAPPED WITH AN END CAP OR THREADED SUMP.
4) WATER DEPTH/DATE:

TASK: GEOLOGIST/ENGINEER:

FIGURE 2-4 STANDARD PIEZOMETER COMPLETION

During the preparation and negotiation of the Work Plan for the sitewide RI/FS, the DOE prepared a technical position paper that disputed, from a data objectives standpoint, the need for stainless steel risers and screens for the monitor wells. This position was rejected by the U.S. EPA due to the fact that the FFCA required DOE "...to characterize any plumes of contamination at the site utilizing monitor wells constructed of teflon or stainless steel 316." For the following reasons, we do not consider that this requirement is programmatically transferable or technically justified for the piezometers proposed under the subject plan:

- The piezometers are not intended as monitor wells -- rather, the intent is to perform a one-time sampling of the perched groundwater to confirm the presence or absence of radiological or chemical materials. If organic materials are found which are incompatible with or affected by PVC, and which require long-term monitoring, the boring will be redrilled and the PVC replaced with stainless steel using an appropriate length of screen to form a monitor well.

- The time frame of the monitoring program does not substantiate the use of stainless steel. On the one hand, the time frame anticipated for use of the piezometers is insufficient for any degradation of the PVC by chemicals in the water or soils to occur. On the other hand, the shallow depth of the piezometer and the purging requirements reduce the contact time between the sample and the PVC to the extent that chemical exchange will be of no concern. Again, a substitution to stainless steel will take place if warranted by the results of the initial sampling and the need for long-term monitoring.

Samples will be collected from each piezometer for total uranium and total thorium and nitrates at the time of installation and at a minimum of one more occasion under different seasonal conditions. All sampling procedures and protocols will be the same as those specified in the RI/FS Work Plan (Revision 3) dated March 1988.

Continuous split-spoon samples will be collected throughout the full depth of each boring using an 18-inch long split-spoon sampler. Each sample will undergo radiological and volatile organic screening and will be characterized by a geologist in accordance with the procedures in the RI/FS Work Plan (Revision 3). Samples from the following depth increments will be sent to the WMCO laboratory for total uranium and total thorium analysis: 0.0 to 0.5 feet, 2.0 to 2.5 feet, 5.0 to 5.5 feet, and at each successive 5.0-foot increment until perched water or the bottom of the boring is reached. If any soil samples exceed the field screening criteria of a sustained reading greater than 5 ppm on the HNU for at least 10 seconds, the sample that exhibits the highest reading from each boring will be transferred to an appropriate laboratory for full Hazardous Substances List (HSL) testing. HNu screening is not the sole criteria for selecting a sample for HSL analysis. HSL analyses are also called for in areas where organics have been used or stored. This approach, to directly sample and analyze in areas of suspected contamination while basing the selection of samples for analysis on screening in areas with less likelihood of contamination, is completely consistent with the approved procedures in the overall RI/FS Work Plan.

Soil samples will not be collected for laboratory analyses from below the water table. Analysis of a soil sample collected from below the water table is still an analysis that is dominated by the constituents in the ground water. Each deeper sample is injected with ground water that is within the augers and therefore defining the lower limit of contamination by sampling soils below the water table is not feasible. The plan calls for 6-inch sample intervals spread over roughly 243 borings. The plan further allows for additional borings if any contamination is found in the initial boring program. This will provide the data necessary to define the vertical and lateral extent of contamination in the unsaturated soils. The data from soil and water analyses will be combined with field observations based on screening instruments, soil color, and texture, as well as historic operations in an area to determine if further investigation of the area is warranted.

Piezometers in the saturated zones in the till will provide the lateral extent of contamination within the till. A comparison of the quality of water in the till with the quality of water in the underlying aquifer will indicate the extent of vertical migration. It is possible to install multiple piezometer clusters in the till to refine the vertical distribution of any contaminant; however, the risk that such a program would pose in penetrating the till and providing a new pathway to the underlying aquifer outweighs the value of such a program. Once the extent of contamination in the shallowest saturated zone is defined and evaluated, a further refinement of the vertical extent of contamination in deeper perched zones in the till may be warranted.

All cuttings will be drummed at the boring. Disposition of the drummed cuttings will be in accordance with DOE and WMCO requirements based on results of the analysis of samples from that boring. As with any program being conducted under the RI/FS, the results will be analyzed to determine the need for additional borings or other field activities if contamination of the soils or perched ground water is observed. The definition of the source of observed contamination will be an important investigative issue. Further investigation to define sources of any contamination identified in this investigation will be presented in the form of an addendum to the Work Plan.

2.3 FOCUSED SOIL BORING PROGRAM

The focused soil boring program involves the advancement and sampling of additional borings specifically sited due to the suspected presence of environmental contamination. The focused program for each sector is presented in Chapter 3.0 and represents a baseline program intended to document the nature and general magnitude of environmental releases and contamination associated with the Production Area. If contamination is found, the program may be expanded to better define the source and extent of any problem in accordance with the overall phased approach of the RI/FS. The expansion of the program will be presented as an additional addendum to the Work Plan.

As will be discussed in more detail in Chapter 3.0, the number and specific locations of borings in each selected area will vary considerably, depending on local site conditions and the potential magnitude of the suspected problem. It is expected that the scope of the focused soil boring program at a given location will range from a single boring in a suspect drainage ditch to numerous borings spanning and surrounding major suspected release zones. The focused boring program will be extended to the interior of buildings if a high probability exists that an environmental problem will be found beneath the building. The logic of the focused boring program and the procedures to be utilized are essentially identical to those discussed for the systematic boring program (Figure 2-1). One exception is that analytical parameters over and above total uranium and nitrates may be selected for soil and ground water samples from certain locations depending on the type of chemicals handled or stored at those locations. Specific sample analysis programs are presented in Chapter 3.0.

The FMPC Facility Task Force, comprised of long-term environmental management and production operations personnel, evaluated all existing FMPC production facilities for their potential for impact to the environment. The Task Force considered all existing sumps and wastewater treatment facilities within this survey. The results of the investigation were documented in the Facility Task Force Report. This report directly supported the development of the focused boring program. Sumps and waste water treatment operations considered to have a significant potential based on the Facility Task Force Report for release are taken into consideration and are discussed in Section 3.0.

2.4 MONITOR WELLS

The ground water flow system in the sand and gravel aquifer is the critical pathway through which contamination underlying the Production Area could reach off-site receptors. RI/FS data collected to date indicate that elevated levels of uranium exist in the sand and gravel aquifer under the waste storage area that lies hydraulically upgradient from the Production Area. Uranium levels of approximately 2 to 3 micrograms per liter (ug/l) have also been detected in wells to the east, downgradient of the Production Area. What remains to be determined is the relative contribution of any releases from the Production Area to the observed uranium in the underlying aquifer when compared to the contribution from the waste storage area. Pinpointing any critical sources of ground water contamination within the Production Area is a related goal.

Discharges from the till to surface drainages are covered in the sitewide RI/FS under the surface water and sediment program and will be addressed in Operable Unit 5, Environmental Media. This investigation will provide data regarding the sources of contamination and migration within the till to sumps.

For purposes of the testing program within the Production Area, 2000-Series monitor wells will be installed downgradient from those facilities and suspect areas considered to have the highest potential for the release of uranium or other radionuclides or chemicals to the sand and gravel aquifer. Specific locations for the proposed wells are presented in Chapter 3.0. In general, significantly fewer wells than borings are required since the wells are monitoring a regional, continuous aquifer in which any contaminants released from a particular facility or area would be adverted and dispersed. Borings that encounter water will be completed as piezometers which will provide in effect a monitor well network in the till. Water level and analytical data from the piezometers will be used to determine the extent of migration of contaminants within the till. Additional 2000-series monitor wells may be required and sited on the basis of the analysis of the data from the piezometers.

A logic diagram for the monitor well program is given in Figure 2-5. All 2000-Series wells installed as part of the facilities testing program will be constructed using the procedures and specifications given in the RI/FS Work Plan (Revision 3) and supporting Quality Assurance Project Plan (QAPP). Soil samples will be collected during the installation of monitor wells according to the same procedures used throughout the RI/FS program. The detailed sampling program for these wells is presented in Section 3.0. The wells will become part of the FMPC monitor wells network and will be sampled on two occasions

- Tributyl phosphate, (TBP) and full HSL organics from borings 1182 and 1183 adjacent to the kerosene storage tanks north of Plant 2/3.

These analyses will be conducted on the top two samples from each boring. Deeper samples will be analyzed for total uranium. Table 3-4 summarizes the number of analyses to be performed.

TABLE 3-4

SECTOR 2 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	TOTAL TH / TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
			NUMBER OF ANALYSES						
		SOIL SAMPLES							
SYSTEMATIC	13		78						
	2	PLANT 8	8	4					
	1	RAFFINATE BUILDING	4	2					
FOCUSED	28		168						
	3	EAST END PLANT 8	12	6					
	2	SOUTHEAST PLANT 2/3	8	4			4		4
	10	PLANT 8	40	20					
	9	RAFFINATE BUILDING	36	18					
	2	NORTH OF PLANT 2/3	8	4	12				12
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	35		35					35	
WELLS	2			2	2				
TOTALS	107		397	62	14		4	35	16

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3.4 SECTOR 3 - TESTING PROGRAM

Sector 3, located in the southwest corner of the Production Area, consists principally of the pilot plant and the laboratory. Each of these facilities is associated with a wide variety of related operations and material types. The pilot plant was originally used for the pilot testing of plant operations prior to start-up and continues today as the center for process optimization studies. In terms of potential environmental release and contamination, it singly represents the most complex unit at the FMPC due to the multitude of processes performed and radioactive materials and chemicals handled. Some thorium storage also occurs near the pilot plant.

The proposed investigation of Sector 3 includes 6 systematic soil borings, 22 focused soil borings, and one 2000-Series well. Each is shown in Figure 3-4. The single well will be added to the cluster Wells 1053 and 3053. It is positioned in sufficient proximity to the eastern side of the pilot plant to serve as a downgradient well for the facility. The water table gradient in 2000-series wells in the area of the Pilot Plant is to the east northeast, therefore, the location of this well serves to both complete the cluster and provide a monitoring point down gradient of the Pilot Plant. If there is contamination in the till under or near the Pilot Plant, an additional 2000-series well will be considered and its location will be based on the location of contamination in the till as well as the water table in the till. A single contingence well site is located west of the Pilot Plant.

With reference to Figure 3-4, approximately one-half of the proposed focused borings are positioned either within drainages or in close proximity to above-grade tanks near the pilot plant. Within the pilot plant, a series of eight borings will be advanced through the building floor. Several additional borings will be located in two areas immediately west of the laboratory. In the area where waste solvent drums were stored at the west end of the laboratory the top two samples will be analyzed for full HSL including PCBs/pesticides even if there is no elevated reading on the HNu. Samples will also be collected for full radiological analysis. The only soil boring proposed for the interior portions of the laboratory will be located adjacent to the main sump.

The top two soil samples from borings within and adjacent to the pilot plant will be analyzed for the full radiological analysis. The top two soil samples from borings 1249, 1252, and 1260 will be analyzed for extended HSL analyses. Soil samples that register on the HNu will be forwarded to the laboratory for full HSL analysis. All ground water samples from the pilot plant area, including samples from the new Well 2053, will be analyzed for the full set of radiological parameters and the full HSL parameters including PCB's. If piezometers are installed in the vicinity of the pilot plant, at least one ground water sample will also undergo full HSL analysis. This sample will be selected in the piezometer with the highest HNu reading or if the HNu fails to detect anything the most down gradient piezometer will be sampled. In the vicinity of the laboratory, the top two soil samples from boring 1266 will be analyzed for the full set of HSL parameters. For all other borings, the top two soil samples will be tested for the full set of radiological parameters. Total uranium will be measured in other samples. Table 3-5 summarizes the borings and analyses for Sector 3.

the pilot plant. Within the pilot plant, a series of eight borings will be advanced through the building floor. Several additional borings will be located in two areas immediately west of the laboratory. In the area where waste solvent drums were stored at the west end of the laboratory the top two samples will be analyzed for full HSL including PCBs/pesticides even if there is no elevated reading on the HNu. Samples will also be collected for full radiological analysis. The only soil boring proposed for the interior portions of the laboratory will be located adjacent to the main sump.

The top two soil samples from borings within and adjacent to the pilot plant will be analyzed for the full radiological analysis. The top two soil samples from borings 1249, 1252, and 1260 will be analyzed for extended HSL analyses. Soil samples that register on the HNu will be forwarded to the laboratory for full HSL analysis. All ground water samples from the pilot plant area, including samples from the new Well 2053, will be analyzed for the full set of radiological parameters and the full HSL parameters including PCB's. If piezometers are installed in the vicinity of the pilot plant, at least one ground water sample will also undergo full HSL analysis. This sample will be selected in the piezometer with the highest HNu reading or if the HNu fails to detect anything the most down gradient piezometer will be sampled. In the vicinity of the laboratory, the top two soil samples from boring 1266 will be analyzed for the full set of HSL parameters. For all other borings, the top two soil samples will be tested for the full set of radiological parameters. Total uranium will be measured in other samples. Table 3-5 summarizes the borings and analyses for Sector 3.

TABLE 3-5

SECTOR 3 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH	TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
		SOIL SAMPLES								
SYSTEMATIC	4		24							
	1	PILOT PLANT	4	2						
	1	LABORATORY	4	2						
FOCUSED	16	PILOT PLANT	64	32	3					
	1	SOUTH WEST OF LAB.	4		2					
	5	LABORATORY AREA	20	10						
		WATER SAMPLES								
PIEZOMETERS (50% OF BORINGS)	15		15		1			15		
WELLS	1			1			1			
TOTALS	43		135	47	6		1	15		

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RI/FS WP
PASA Addendum
REV 1
October 4, 1989

3.5 SECTOR 4 - TESTING PROGRAM

Sector 4 is located in the northeast corner of the Production Area. It includes a wide variety of facilities, including the Special Products Plant (Plant 9), the D&D facility, the former drum baling area, the maintenance building, the metal scrap pile, and buildings 64 and 65 which are the principal warehouses for the drummed thorium inventory. The drum baling area and the nearby trench located within Sector 4 have been investigated and are not included in the proposed testing program. Appendix B contains the work plan for investigating the drum baling area.

In general, the operations in Sector 4 involved insoluble forms of uranium. A particular aspect of Plant 9 was the handling of slightly enriched uranium products and thorium. Machine oils and solvents are a special concern in the vicinity of the maintenance building.

As depicted in Figure 3-5, a total of 59 soil borings are proposed throughout Sector 4. These include 26 systematic borings and 33 focused borings. The focused borings directly correspond to individual facilities. In particular, four borings will be placed in the principal quadrants around each of the following:

- A sump in the tank farm in the southwest corner of Sector 4;
- The area that includes both the abandoned oil burner and the graphite burner;
- The metal scrap pile area; and
- Building 64/65 warehouses.

Near the maintenance shop, three borings will be located within the principal drainages. Two borings will also be located within the D&D facility. At Plant 9, borings will be advanced in drainageways and near above-grade tanks. Five borings will also be installed within Plant 9. Specific locations include the main entrance way, in the area of the Zirnlo process, and near sumps.

In addition to total uranium, the following samples will undergo special analyses:

- The top two samples from borings 1318, 1310 through 1315, 1319 and 1321 through 1326 within and adjacent to Plant 9 will undergo full radiological analysis;

- For borings 1292, 1294, 1296 and 1297 near Building 64/65, the top two samples from each boring will be analyzed for full radiological analysis;

- The top two soil samples from borings 1316, 1217, 1307, 1308, and 1327 near the maintenance building will undergo a full HSL analysis, including PCBs; and

- The top two samples from borings 1283, 1287, 1288 and 1363 around the oil burner and graphite furnace areas will be analyzed for full HSL and PCBs including dioxin and furan analysis. It may be necessary to collect additional material using hand augers adjacent to the boring to collect sufficient material for all these analyses.

Table 3-6 summarizes the borings and analyses for Sector 4.

3.6 SECTOR 5 - TESTING PROGRAM

Sector 5, located in the northwest quadrant of the Production Area, includes the Sampling Plant (Plant 1) and the associated drum storage pad. The activities in this

TABLE 3-6

SECTOR 4 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	TOTAL TH	TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE / TRIBUTAL PHOSPHATE
		SOIL SAMPLES							
SYSTEMATIC	20		120						
	2	OIL & GRAPHITE BURNER	8		4		4		
	1	BUILDING 64/65	4	2					
	1	PLANT 9	4	2					
	2	MAINTENANCE	8		4		4		
FOCUSED	11		66						
	2	OIL & GRAPHITE BURNER	8			8			
	3	BUILDING 64/65	12	6					
	3	MAINTENANCE	12		6		6		
	14	PLANT 9	56	28					
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	30		30					30	
WELLS									
TOTALS	89		328	38	14	8	14	30	

154 ~~152~~

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sector have generally been limited to the sampling and analysis of incoming materials and the storage of residues and other materials awaiting off-site shipment. An area surrounding the abandoned shot blaster in Plant 1 was previously identified as a suspect area due to the potential for residual lead contamination.

The proposed testing program for Sector 5, is illustrated in Figure 3-6. The systematic boring program will be utilized for the evaluation of the drum storage pad and adjacent areas. There are 24 systematic and nine focused soil borings proposed. Four of the focused borings are located near the uranyl nitrate storage tanks. Two other borings are positioned within drainages. The two borings will be located inside and outside of the building that encloses the lead shot blaster. A single 2000-Series well is also proposed for Sector 1. The principal purpose of this well is to complete the three-well cluster at Location 55 to effectively monitor any releases from the Plant 1 drum storage pad. A single contingency well is sited on the west side of the drum storage pad. The data from the borings and piezometers will be analyzed to determine if additional 2000-series wells should be installed in the area. All samples collected in Sector 5 will be analyzed for total uranium and total thorium. In addition, the top two samples from the westernmost boring near the thorium storage area will be analyzed for full radiological analysis. The top two soil samples from borings 1345 and 1346 near the drum shot blaster will be analyzed for the HSL metals. Table 3-7 summarizes the analyses for Sector 5.

TABLE 3-7

SECTOR 5 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES: TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
		SOIL SAMPLES							
SYSTEMATIC	24		144						
FOCUSED	6		36						
	1	THORIUM STORAGE	4	2					
	2	SHOT BLASTER	8		4				
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	16		16					16	
WELLS	1			1	1				
TOTALS	49		208	3	5			16	

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3.7 SECTOR 6 - TESTING PROGRAM

Sector 6 is located in the southeast corner of the Production Area. This sector includes the main substation and the garage (Figure 3-7), neither of which is directly involved with production operations and uranium handling. The principal concerns are the potential presence of PCB-laden dielectric oils in the transformer area and petroleum tanks buried near the garage. The latter case is being investigated under the underground storage tank (UST) program and doesn't need to be considered in this plan.

One piezometer will be installed next to the underground tanks adjacent to the garage. The six soil samples from this boring will be analyzed for HSL organics. This piezometer will be used in the testing of these tanks. A water sample from the piezometer will be analyzed for HSL volatile and semivolatile organic compounds.

The substation will be investigated by a series of ten 18-inch deep soil borings made with hand augers in any areas of visible soil staining. The six-inch surface soil sample from each sampling location within the substation will be analyzed for PCBs. The remaining samples for the intervals 6 to 12 and 12 to 18 inches will be archived for possible later analysis. In the event that there are no stained areas to bias the boring location, the borings will be made on a systematic grid. Three systematic borings are located in Section 6. Table 3-8 summarizes the analyses for Sector 6.

TABLE 3-8

SECTOR 6 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
			NUMBER OF ANALYSES						
		SOIL SAMPLES							
SYSTEMATIC	3		18						
FOCUSED	1	FUEL TANKS	6		6				
HAND AUGER	10						10		
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	1		1		1			1	
WELLS									
TOTALS	14		25		7		10	1	

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[redacted]

3.8 WATER TOWER AREA SAMPLING

In 1988 the two water towers were sandblasted in preparation for painting. Sampling is required to determine if surface contamination by lead is present as a result of the sandblasting. Four surface samples will be collected in the area of the base of each water tower. A second sample will be collected at each of these eight locations at a depth of six to twelve inches. All sixteen samples will be analyses by ICP for metals including lead. A comparison will be made between the surface and subsurface sample to determine if the residues from the sandblasting have been removed. Given the poor permeability of the soils and the fact that the lead should have been bound in the paint this will be a valid determination of the impact of the sandblasting. In the event that high levels of lead are found in both the surface and subsurface samples an additional sampling program will have to be developed.

[redacted]

4.0 SPECIAL FACILITIES WITHIN THE PRODUCTION AREA

Four types of special facilities represent exceptions to the general investigation program within the Production Area. These special facilities are the underground tanks, below-grade piping, the main effluent line from the clearwell to Manhole-175, and the abandoned drum buried area southwest of the laboratory. Individual testing plans for the examination of each of these special facilities are presented in this chapter of the Production and Additional Suspect Areas Work Plan.

4.1 UNDERGROUND STORAGE TANKS

The current WMCO plan calls for the removal, or closure in place of all but four underground storage tanks, in accordance with U.S. EPA and Ohio Fire Marshal regulations. Three of the remaining underground tanks are for diesel fuels and gasoline and will be tested using the Petro Tite method. The fourth tank is located in Plant 9. This 5,000-gallon tank is better described as a steel-lined sump than as a tank. It is oriented with its long axis vertical. The top of the tank is open, with removable floor plates covering the open end of the tank. This tank cannot be tested using the Petro Tite method, as there is no way to impose a head greater than the top of the tank. An alternate testing method is under consideration for this unusual tank arrangement. Borings are being placed on two-sides of the tank in the Sector 4 investigation.

4.2 BELOW-GRADE PIPING

The intent of the investigation of the below grade lines is to determine if there is infiltration into the system or the possibility that the lines have leaked to the environment. To that end, the boring program presented in Section 3 of this plan will determine the presence or absence of water bearing zones within the till that would influence infiltration to the below grade lines.

The below-grade lines of the FMPC are a combination of gravity and pressure lines and are described in the Spill Prevention Control and Countermeasure (SPCC) Plan. Several maps and drawings showing the locations and engineering specifications of the below-grade lines are available through DOE. Lengths of the buried lines in the storm sewer system which drain to MH-34 were approximated from FMPC Drawings Nos. 22X-5500P-00537 and 22X-7000P-00068 and are shown in Table 4-1. Figure 4-1 and Figure 4-2 (located in pockets in the back) show the roadways and underground piping for the site. It is anticipated that the combination of the systematic and focused borings for Sectors 1 through 6 will determine whether or not these lines are the source of any environmental problems. The intent is to review the results of these boring programs along with the piping maps and determine whether or not specific testing is required. Such testing will be presented as an addendum to the Work Plan.

4.3 LINE FROM CLEARWELL TO MH-175

Treated process wastewater was previously discharged through a process effluent line from the Clearwell to MH-175. The line now carries only excess surface water runoff

2431

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RI/FS WP
PASA Addendum
REV 1
October 4, 1989

Figure 3-1 (see back pocket)

[redacted]

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- Sector 2 (Plants 2/3, Plant 8, and General Sump) - Principal processes include uranium digestion in the refinery, uranium recovery and oxidation, and water/wastewater treatment;

- Sector 3 (Pilot Plant and Laboratory) - Principal activities include uranium reduction (UF_6 to UF_4), various types of pilot-scale operations, and sample testing and analysis;

- Sector 4 (Plant 9, D&D Facility, Maintenance Building, and Metal Scrap Pile) - Principal activities include special uranium products casting, thorium processing, decontamination and decommissioning of equipment, equipment maintenance, and metal scrap storage;

- Sector 5 (Plant 1 and Drum Storage Pad) - Principal activities include materials sampling, analysis, and storage; and

- Sector 6 (Main Substation and Garage) - No processing activities involved; activities limited to the central distribution station for petroleum products, vehicle maintenance, and the plant electrical substation.

The numbering of the sectors reflects the prioritization placed on each sector in terms of its overall potential for environmental release and subsurface contamination. As such, the numbering also represents the proposed sequencing of the investigations. The selection of the metals production and fabrication facilities as the highest priority sector is the result of the recently documented problems underlying Plant 6 and the elevated levels of uranium observed in monitor well 1054. In the case of the remaining five sectors, the prioritization and sequencing better reflects a sectorwide evaluation of potential contamination, although the associated concerns are typically centered in one or two facilities within each sector.

[redacted]

The following sections will present the proposed testing program for each sector. The discussion will deal primarily with the focused soil boring program and monitor well program due to the site-specific justification for each proposed activity. Table 3-1 lists the wells that will be installed by sector and indicates the facility for which they are being installed. The systematic boring program is straightforward and requires no further explanation unless an exception to the grid-based program is particularly noteworthy.

All focused boring and well locations presented in the following sections are based on the input received from WMCO's facilities task force. The locations are approximate; refinement will likely be necessary in the field to allow for access underground utilities and to optimize the locations in relation to the study objectives.

The individual sector testing programs will call for a variety of analyses. Table 3.2 lists the analytical groups and the parameters that are included in each group. These groups are the same as those used in the RI/FS investigation.

[redacted]

TABLE 3-1

2000 - SERIES WELLS

SECTOR	FACILITY
1	Plant 6
1	Plant 6
1	Plant 6
2	Plant 2/3
2	Raffinate Processing
3	Pilot Plant

[redacted]

TABLE 3-2
ANALYTICAL PARAMETERS

ANALC'L GROUP	ANALYTICAL PARAMETERS	VOLUME, CONTAINER	PRESERVATION
WATER	HSL		
	• HSL Organics		
	– Volatiles	2-40 ml vial (with teflon septum cap)	Cool 4° C
	• Semivolaties	4 liter, amber glass (with teflon-lined cap)	Cool 4° C
	• HSL Inorganics		
	– Metals (plus Molybdenm)	2-1 liter, plastic	HNO_3, pH<2 filtered
	– Mercury	500 ml, glass	HNO_3, pH<2
	– Cyanide	1 liter, plastic	Cool 4° C NaOH, pH>12
	Full HSL is the above and:		
	• HSL Pesti-cides/PCB	4 liter, amber glass (with teflon-lined cap)	Cool 4° C None
	HSL+ is all the above and:		
	• Organophosphorus Pesticides		
	• Dioxin, Furans		
SOIL	Same as for Water	500 ml, glass wide-mouth jar with teflon lid liner	None
WATER	Full Radiological		
	• Total Uranium	4 liter plastic	HNO_3, pH<2
	• Isotopic Uranium		
	• Isotopic Plutonium		
	• Radium-226		
	• Radium-228		
	• Neptunium-237		
	• Total Thorium		
	• Isotopic Thorium		
	• Technetium-99		
	• Cesium-137		
	• Strontium-90		
	• Ruthenium-106		
SOIL	Same as Water	500 ml, glass or plastic container	None

[redacted]

3.2 <u>SECTOR 1 - TESTING PROGRAM</u>

Sector 1 consists of several facilities in the east-central portion of the Production Area. The principal facilities include the Green Salt Plant (Plant 4), the Metals Production Plant (Plant 5), the Metals Fabrication Plant (Plant 6), and the uranium hexachloride reduction facility, Plant 7. Plant 7 is currently used for product storage. Each of these plants is associated with uranium production, fabrication, and machining operations. From an environmental standpoint, the common denominator among these facilities is the predominance of insoluble, solid forms of uranium. Only small amounts of other chemicals are handled in this sector. Sector 1 would, therefore, represent a low environmental release potential on a sectorwide basis. One exception to this scenario is the presence of nitric acid pickling operations that result in the formation of uranyl nitrate. The investigation of Plant 6 was conducted because of the presence of these pickling operations.

The proposed Production Area testing program for Sector 1 is presented in Figure 3-2. In addition to 22 systematic borings along the 250 foot grid pattern, the investigation will include three 2000-Series monitor wells and 23 focused soil borings near facilities of particular concern. One monitor well will be added to the existing 1000-Series and 3000-Series wells at Location 54. As indicated in Figure 3-2, wells 2118 and 2109 will be located downgradient from the two known problem areas associated with Plant 6. These wells will be installed outside the eastern and southern exterior walls of the plant buildings as shown in Figure 3-2.

The two known areas of contamination associated with Plant 6 are believed to be associated with the two pickling areas in the plant. There is a known occurrence of uranium entering the storm sewer that runs along the south side of Plant 6 in the late 1970's. The apparent source of this uranium was the sump inside Plant 6 in the Chip Pickling Area. Reportedly, when the sump was repaired and sealed the leakage of uranium into the sewer stopped. The biased and grid borings along the southern portion of Plant 6 are to investigate the area affected by this leakage.

The second area was discovered in July of 1988 during the modernization of the pickling area in the north central part of the plant. Water containing uranyl nitrate apparently entered the perched ground water either through spillage or overflow of the sump, or because the floor was used as a conveyance mechanism under the belief that the acid bricks prevented leakage. Ground water is currently being drained from the area through a hole in the wall of a below grade sump near the process equipment room. The square pattern of focused borings in the north central part of Plant 6 is expected to encompass the impacted area. Thorium operations in Plant 6 were limited to an area near the eastern entrance in the center of the plant. Consequently, the monitor well located near this entrance is in close proximity to the site of the thorium operations. The placement of well 2054 was selected because both the 1000- and 3000- series wells at that location contained elevated levels of uranium. This 2000-series well would help determine if the uranium in the 3000-series was entering the area laterally from other sources or vertically from contamination in the till.

If elevated levels of uranium are found in any of the 2000 series wells to be installed around Plant 6, an upgradient well will be installed to determine if the source is Plant 6 or further upgradient. Figure 3-2 shows the location of the two upgradient contingency wells. The decision to install a contingency well will be made on the basis of results from the initial samples from the 2000 series wells. The results from sampling the contingency well will be used to evaluate whether the source is indeed in Plant 6 or further upgradient. In either case, a new work plan to complete the investigation of that area will be written and submitted as an addendum before any further investigation is conducted.

Two of the 23 focused borings are located in the drainage in Sector 1. The drainage consists of a linear shallow depression along the roadway in which rainwater collects and is directed to the storm water sewer system. It is for this reason that the drainage is a candidate for sampling. No unusual activity or known spill is involved. In Plants 4 and 5, single borings will be advanced through the building floors near subgrade sumps. Building 55, the Slag Recycling Plant, was used for slag milling and involved only the dry processing of magnesium fluoride. The nature of this operation is not conducive to the release of soluble forms of uranium, and thus no focused borings are necessary in relation to this portion of Sector 1. Borings along the drainage east of Building 55 will test for the accumulation of fugitive dust releases from this operation. Three groupings of borings will be installed in Plant 6. Eight borings will be placed in the cardinal directions Figure 3-2 around a pickling operation where elevated levels of uranium have been found in the underlying soils and perched ground water. Several additional borings will be placed near adjacent transfer lines, and a systematic boring will be utilized to monitor conditions near the southern end of Plant 6. A set of three borings will be installed around a sump suspected to have leaked in the chip pickling area. Two borings will be installed on opposite sides of a salt storage facility where ground staining has been observed.

Due to the nature of the operations in Sector 1, the analytical parameter of concern is uranium. One exception is that the top two samples from soil borings 1164 and 1165, near the salt storage facility, will be analyzed for HSL organics and PCBs due to the possible presence of used machining or cutting oils. Table 3-3 lists the borings and types of analysis.

3.3 SECTOR 2 - TESTING PROGRAM

The facilities included in Sector 2 lie immediately to the west of Sector 1. Included in Sector 2 are the Refinery (Plant 2/3), the Recovery Plant (Plant 8), and the General Sump. This sector is distinguished by acid-based chemical processing operations, resulting in the handling of the vast majority of the uranium in soluble forms within the FMPC. The hot raffinate process used for the extraction of K-65 ores during the early years of plant operation is also located in Sector 2, thereby creating the potential for historic radium releases. The processing and storage of thorium materials are associated with Plant 8. Inorganic chemicals such as lime and sodium chloride are typically used in the water and wastewater treatment operations, and various chemicals, principly nitric acid and sodium hydroxide, are stored in above-grade tanks within the area.

[redacted]

TABLE 3-3

SECTOR 1 ANALYSIS SCHEDULE

BORINGS TYPE OR LOCATION	NUMBER OF BORINGS	SPECIAL AREA	NUMBER OF ANALYSES						
			TOTAL TH TOTAL U	FULL RAD	FULL HSL	HSL +	PCB's	NITRATE	TRIBUTAL PHOSPHATE
		SOIL SAMPLES							
SYSTEMATIC	22		132						
FOCUSED	21		126						
	2	SALT STORAGE	8		4		4		
		WATER SAMPLES							
PIEZOMETERS (50% OF BORINGS)	23		23					23	
WELLS	3			3	3				
TOTALS	71		289	3	7		4	23	

3-12

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2431

RI/FS WP
PASA Addendum
REV 1
October 4, 1989

The overall conditions in Plant 2/3, in particular the dominance of uranyl nitrate and concentrated acidic solutions, represent the greatest potential in comparison with other sectors for the release of uranium and other radionuclides to the environment. Figure 3-3 summarizes the proposed testing program for Sector 2. Systematic soil borings will be advanced at 16 locations. Wells 2006 and 2007 will also be installed in Sector 2. These wells will be located on the downgradient eastern side of both Plant 2/3 and the hot raffinate process building. Note that these same wells will serve a dual purpose as upgradient wells for Sector 1 and, in particular, Plant 6. These wells are suitable as upgradient wells for Plant 6 because the facilities that lie between the wells and Plant 6 handle materials that are in a dry form of insoluble uranium compounds. If ground water contamination is found to be associated with these facilities, further investigation will be necessary to determine if an intermediate source of contamination to the aquifer exists. The plan does show the location of contingency wells on the upgradient side of Plant 6. If the wells on the downgradient side of Plant 6 show contamination, these wells will be installed in order to confirm that the problem is at Plant 6 and not from further upgradient.

The general sump principally consists of aboveground tanks. The sump processes waste water with relatively low levels of uranium as compared to the liquids handled in the Raffinate Area and Plant 2/3 where uranium is digested. Wells 2006 and 2007 have thus been placed downgradient of the facilities that pose the greatest risk to the environment. If these wells show contamination, then additional wells will be considered for the area. In addition, the presence of overhead piping prevents the installation of a well on the east side of the general sump. The well would have to be placed on the east side of the north-south roadway where a grid boring is already located. Data from that grid boring will be used to determine if it is necessary to add a 2000-series well in the area.A total of 54 focused soil borings will be installed throughout Sector 2 as shown in Figure 3-3. This large number of borings is indicative of the multitude of potential release points in the general area of the refinery. Seven of these borings are located within drainages and two are located along the transfer line from the raffinate building to the K-65 silos. Six borings are located at the lowest point of drainage from storage pads. As indicated in Figure 3-3, approximately 20 borings are positioned near various types of above-grade storage tanks and associated sumps. Many of these latter boring locations are also part of boring sequences to be systematically placed along the exterior walls of Plant 2/3, the raffinate process building, and the metal dissolver building. Borings 1178 through 1180 are placed around the metals dissolver building. The top two soil samples and any water samples collected from these borings will be analyzed for uranium and tributyl phosphate. Four borings are also proposed around the exterior of a small maintenance shop near Plant 8. All soil samples collected for analysis from the nine borings in the vicinity of Plant 8 will be analyzed for thorium and uranium.

Focused borings through the floors of four buildings are proposed. Single borings near sumps are proposed in Plant 8 and in the General Sump building. In the hot raffinate building, borings will be advanced at two locations accessible to the drilling equipment. In Plant 2/3, ten borings will be advanced at equal distances along the central corridor. It is believed that sufficient access will be available only along this open corridor. If access is possible to the north or south of this corridor, a portion of the borings will be relocated to preferred locations. The metals dissolver building is considered to be inaccessible to drilling equipment.

All samples will be analyzed for total uranium. Because thorium was processed in the west end of Plant 8, soil samples collected from the three borings near the east end of Plant 8 will be analyzed for the full set of radionuclides parameters. The results of the on-site analyses for total uranium will be used as a guide to select other soil samples for full radiological analysis. All ground water samples from the two wells will be analyzed for the full set of radiological parameters and full HSL organics and inorganics.

Other special analyses to be performed on the soil and ground water samples from Sector 2 will vary by location. Special analyses include:

- Total HSL, including PCBs and TBP, from two locations in the tank and drum storage area to the southeast of Plant 2/3 at borings 1203 and 1206;

- Full radiological from all locations within and adjacent to Plant 8, including the associated drainageways; Figure 3-3 identifies borings 1231 - 1236, 1238, 1227, and 1228.

- Full radiological from all locations associated with the hot raffinate process building, including the transfer line borings 1211 through 1214 and 1218 through 1224; and

TABLE 4.1
PIPING FOR STORM WATER SEWER SYSTEM
FACILITIES TESTING PLAN - FMPC SITE

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors			
	MH-1	MH-6	1,300
	MH-4	MH-6	1,100
	MH-7	Lateral	500
	MH-8	MH-10	650
	MH-6	MH-10	200
	MH-10	MH-11	300
	MH-55	MH-56	400
	MH-54	MH-53	400
	MH-51	MH-62	750
	MH-52	MH-62	300
	MH-62	MH-53	200
	MH-53	MH-56	100
	MH-56	MH-57	500
	10	MH-57	400
	20	MH-58	300
	MH-57	MH-58	250
	MH-58	MH-21	450
	MH-50	MH-60	650
	12	MH-61	400
	10	MH-58	450
	12	MH-58	400
	MH-60	MH-61	250
	MH-61	MH-58	400
	MH-71	MH-72	350
	72	MH-72	150
	MH-72	MH-11	550

See footnote at end of table.

[redacted]

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TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	2	MH-11	300
	30	MH-12	800
	MH-11	MH-12	250
	MH-12	MH-21	100
	MH-47	MH-48	900
	64	MH-50	1,100
	9	MH-50	350
	MH-48	MH-50	900
	MH-42	MH-44	600
	MH-43	MH-45	650
	MH-44	MH-45	300
	9	MH-46	500
	MH-45	MH-46	500
	9	MH-46	400
	6	MH-18	300
	27	MH-18	200
	MH-46	MH-18	400
	MH-18	MH-19	500
	12	MH-19	300
	12	MH-20	300
	5	MH-19	400
	MH-19	MH-20	400
	MH-20	MH-21	250
	MH-24	MH-25	400
	MH-25	MH-26	250
	MH-26	MH-27	500
	6	MH-28	350
	5	MH-28	300

See footnote at end of table.

[redacted]

TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	MH-28	MH-29	300
	6	MH-29	300
	5	MH-29	250
	MH-29	MH-30	350
	MH-27	MH-30	400
	31	MH-27	200
	5	MH-30	450
	4	MH-31	350
	MH-31	MH-32	-400-
	MH-32	MH-33	300
	7	MH-33	250
	MH-30	MH-33	450
	MH-70	MH-60	350
	MH-69	MH-68	150
	MH-64	MH-65	150
	MH-65	MH-14	350
	MH-13	MH-14	550
	3	MH-67	300
	MH-67	MH-63	300
	3	MH-66	400
	MH-66	MH-14	350
	MH-14	MH-15	500
	13	MH-15	400
	54	MH-16	500
	MH-15	MH-16	250
	MH-16	MH-17	300
	MH-73	MH-74	300
	MH-74	MH-23	200

See footnote at end of table.

[redacted]

TABLE 4.1
(Continued)

TYPE OF PIPE	ORIGIN LOCATION/ LOCATION NUMBER[a]	TERMINATION LOCATION[a]	LENGTH (ft)
Collectors (Cont'd)			
	MH-21	MH-22	300
	MH-22	MH-23	400
	MH-23	MH-34	250
	MH-17	MH-34	150
	MH-33	MH-34	150
		Subtotal	34,800
Effluent			
	MH-34	MH-35	550
	MH-35	Storm water retention pond	700
		Subtotal	1,250
		Approximate Total	36,000

[a]Manhole numbers and other designations refer to FMPC Drawings Nos. 22X-5500P-00537 and 22X-7000P-00068.

[redacted]

[redacted]

Figure 4-1 (See Back Pocket)

[redacted]

[redacted]

Figure 4-2 (See Back Pocket)

[redacted]

Based on information obtained from FMPC personnel, the 0.5-mile-long line from the Clearwell to MH-175 is comprised of 8-, 12-, and 14-inch-diameter metal pipe with approximately six 45- and 90-degree elbows.

Due to the number of bends and the small diameter, internal inspection of the line by sight or television camera is not possible. Complete excavation and direct inspection of the line are not feasible due to its length. Within these operational constraints, acoustic emission tests will be utilized for the detection of leaks in the above-ground portions of the pipe or where it can be reached in manholes. To determine the presence of contaminants from past operation of the line, soil samples will be taken from as near to the invert of the pipe trench as possible at each bend or change in diameter of the line. Soil sampling will also be performed at locations where the acoustic emission tests indicate leaks and where repairs were previously made to the line. Selected soil samples will be analyzed for total uranium, based on portable instrument screening. A minimum of ten samples will be analyzed. Screening for volatile organics will also be performed using an HNu analyzer.

4.4 BURIED DRUM AREA SOUTHWEST OF THE LABORATORY

It is suspected that drummed wastes containing zirconium and thorium are buried in an area southwest of the laboratory. In an effort to confirm the presence and to delineate the extent of the drum burial area, two geophysical techniques will be used in the area. A magnetometer survey will first be conducted over the area to detect the general location of the drums. Fences and buildings are nearby and their presence may complicate the data interpretation. Therefore, a gravity survey will also be conducted across the area. The high density of the wastes may allow the buried drums to be differentiated from the native soils, although the mass of the nearby buildings could complicate the gravity data interpretation. The combination of these two geophysical techniques, however, has the highest potential for delineating the location of the buried drums if they are present.

If the geophysical methods are unsuccessful at delineating the area where the drums are buried, exploratory trenching will be used to confirm and refine the location of the drums. A single trench will initially be excavated across the center of the area in a north-south line to determine if drums are present. If drums are encountered, parallel trenches at 20-foot intervals will be excavated to determine the full extent of drum burial. If no drums are encountered, the spacing between follow-up trenches will be reduced by one-half. The drums will be exposed only sufficiently to verify their presence. This plan does not include provisions for excavating and removing drums.

Once the limits of the drum burial area are defined, four borings will be installed around the burial area to determine if the presence of the drums is having an adverse impact on the environment. Borings will be advanced using the same procedures as for other parts of the Production Area. Soil samples from the following intervals will be analyzed for the full radiological analysis: 0.0 to 0.5 feet, 2.0 to 2.5 feet, 5.0 to 5.5 feet, and at each 5-foot increment thereafter to a total depth of 20 feet.

5.0 SUSPECT AREAS OUTSIDE THE PRODUCTION AREA

The southfield area and two adjacent areas, several rubble mounds and drum storage areas, the fire training area, the laboratory equipment burial area, and a small area around the flagpole represent the identified suspect areas outside of the Production Area. This chapter presents the individual investigation plans for each of these areas. Figure 3-1 is a map showing the location and approximate boundaries of these areas.

5.1 SOUTHFIELD AREA

The southfield is an area where construction rubble, including the old administration building, was disposed of and graded to provide a level surface. Surface radiation measurements were made over the area as part of the Characterization Investigation Study (CIS). The surface measurements indicated elevated readings in the drainage ditch along the gravel roadway and in the drainage along the western side of the area. Twelve borings were also distributed over the adjacent fly ash disposal area and around the perimeter of the southfield during the CIS.

The exact boundaries of the southfield burial area are not known. It is assumed that material was dumped down the natural surface of a meander scar formed by Paddy's Run eroding into the till. As material was dumped, the fill would have extended outward in layers roughly parallel to the natural angle of repose. The south boundary of the southfield area is the steep slope rising from the floodplain of Paddy's Run just north of the running track. The western boundary is the approximate location of a small drainage which leads to Paddy's Run. It appears from the CIS data that the western third of the fill is predominantly fly ash. The eastern boundary is uncertain but probably lies immediately west of the roadway leading to the running track. The northern boundary is much less certain. Surface evidence indicates that the burial area may be restricted to the south of the east/west road in the area. Neither Boring 1046, just south of the road, nor Boring 1047, north of the road, encountered any fill material.

The CIS found lead, nickel, vanadium, and zinc in the fly ash. PCBs were also found along with uranium, thorium, and radium in the tens of parts per million (ppm) range. The CIS did not attempt to investigate the central part of the south field where the majority of the building rubble is thought to be located.

Because the fill is likely to contain large amounts of building rubble and concrete, it is unlikely that standard geotechnical equipment such as hollow-stem augers and split-spoon samples will be effective in sampling this material. A series of six test pits will, therefore, be excavated through the fill to characterize the fill and to provide samples for chemical and radiological analysis. The six test pits will be excavated in the locations shown in Figure 5-1. All of the pits will be oriented approximately north/south and the surface length of the pit will be 50 feet. The width and length of the trench bottom will vary with the fill consistency and thickness. The trenches will be excavated with a track-mounted backhoe with an 18- to 24-inch bucket. The pits will be mapped and described by a field geologist. These maps will include the locations of all soil sampling.

During excavation, samples will be collected with the backhoe for field screening with a pancake GM and an HNu. These samples will be collected at depth intervals offive feet at three equally-spaced locations along the length of the trench. The maximum thickness of the fill is estimated to be 20 feet. Therefore, the maximum number of samples for screening from any trench would be 12; that is, samples at 5, 10, 15, and 20 feet at three locations. The deepest sample will be from the native soils beneath the till. A portion of each sample will also be placed in a 500-milliliter (ml) wide-mouth jar and submitted for full radiological analysis.

If a reading is detected with the HNu, a sample will be collected for full HSL analysis, including HSL pesticides/PCBs as well as organophosphorus pesticide analyses. If more than one sample from a trench gives a sustained reading of 5 ppm for 10 seconds on the HNu, then the sample with the highest reading will be sent to the laboratory for HSL analysis. If all samples from a pit exhibit above-background HNu readings, then two samples with the highest readings and widest separations will be sent to the laboratory. If there is no field evidence of chemical contamination, then a single sample will be collected from the deepest part of the fill. A total of 6 to 12 samples will be submitted for HSL analyses.

A SPA-3 probe attached to a pole with a rate meter scale will be used to scan at least five vertical profiles along the length of the test pit on one side. The location and vertical and lateral extent of any zones with high counts will be delineated on the geologic map of the pit wall.

The corners of the test pit will be staked so they can be accurately surveyed. The depth of the pit will also be carefully measured using rods to determine the thickness of the fill. All measurements are to be made from the surface and all samples are to be collected with the backhoe. If the test pit sides are unstable, the pit depths and relative thicknesses of fill will be estimated by reference marks on the side of the backhoe boom. It is anticipated that the sides of the trench will be stable and measurements can be made from the surface. In the event that the sides are not stable, measurements which require standing near the edge of the pit will not be made.

After the test pit has been inspected, sampled, and described, it will be backfilled with the material which was excavated from the pit. The entire disturbed area will be covered with six inches of clean soil borrowed from elsewhere on the FMPC. The bucket of the backhoe will be steam cleaned at the excavation site after each trench is excavated and backfilled.

South Field Area 1: This flat area is underlain with flood plain deposits from Paddy's Run and is not covered with till. The area is bounded on the west at the tree line and extends to the east to include the fill for the culvert over the outfall ditch.

A surface walkover survey using SPA 3 and FIDLER instrumentation will be conducted in the flat open area between the South Field and Paddy's Run. The walkover survey will be conducted on 25 foot grids as was done in the original walkover survey for the RI/FS. Biased soil samples will also be collected in the survey area using the same selection procedures as in the RI/FS Work Plan.

Three pits in Area 1 are clearly located on a 1954 photograph. The location of the pits will be determined by triangulating from features that appear on the 1954 photograph and still exist today. A single auger boring will be drilled into the center of each pit in the same manner as the other borings in this plan. Samples will be screened as they are collected. Alternate six-inch samples over the length of the boring will be analyzed for the full set of radiological parameters. Any split spoon sample that has 5 ppm reading for 10 seconds on the HNu will be analyzed for full HSL, including PCBs.

South Field Area 2: The second area located north-northwest of the South Field Area is where a crane appeared to be piling dirt in roughly north south oriented piles in the 1954 photograph. It is unknown if this was simply a borrow pit where cover material was removed or if some burial activity was going on. This area is now partially covered by the tree farm. However, at least the middle portion of this suspect area is where trees were removed from the tree farm and planted along the entrance road to the FMPC, leaving an open area in which to conduct the investigation.

Since the area was graded for tree planting and disturbed again for the tree removal, it is not likely that a surface walkover survey will be useful in this area. A surface magnetometer survey will be conducted over this area along a series of six east/west traverses. Readings will be taken at ten-foot intervals along each of the traverses. Four of the traverses will be spread over the width of the open area. The remaining two traverses will be to the north and south of the first row of trees that bounds the clear area. Since these traverses are to be perpendicular to the alignment of the piles in the 1954 photograph, they should detect any buried metals.

Unless the magnetic survey produces an indication of specific areas where buried material may be present, a single trench will be excavated across the present clear area from east to west. This trench will be excavated to a depth of ten feet and sampled in the same manner as the trenches in the South Field. Since this trench will be perpendicular to the orientation of the suspected burial activity, it should be able to address or disprove the question of the presence of any burial activity. If the magnetic survey does detect buried metal, an excavation will be made to determine the nature of the material.

Northeast Area: A third area identified in the 1954 photograph is a strip of land extending east, along the north side of the gravel road, from the fire training area to the north access road. This area was reportedly used by construction contractors for staging equipment during construction of the FMPC. The area to be investigated is about 100 feet wide and is within the present tree farm.

A surface walkover survey will be conducted along the south edge of this area between the drainage ditch and the first row of trees. There is not sufficient room within the tree farm to conduct a meaningful walkover survey. A series of 25 foot grids will be laid out and surveyed using the same procedures and equipment as the walkover survey in the RI/FS. The need for biased soil samples will also be determined from the results of the walkover survey as was done in the site wide RI/FS.

A ground magnetic survey will be conducted along the edge of the drainage, along the south edge of the tree farm, and between the next three rows of trees to the north for a total of five traverses. Based on the number and frequency of anomalies identified by the magnetic survey, a hand auguring program may be developed to sample the soils. Soils will be analyzed for total uranium and screened with an HNu. If HNu readings are above background, a full HSL analysis will be performed on the sample with the highest reading from each site.

There is one small area in the northeast part of this investigation area that was identified as a possible burial site. If there is a magnetic anomaly in that area, a boring will be made with a hollow stem auger in the same manner as in the production area.

5.2 <u>RUBBLE PILES AND DRUM STORAGE AREAS</u>

As indicated in Figure 3-1, there are three locations where rubble has been placed on the land surface outside of the southfield area. One area is west of the K-65 Silos and forms the east bank of Paddy's Run. A single test pit will be excavated and sampled in this area. The excavation will begin 100 feet south of Monitor Well 1032 and extend southward for 50 feet. The excavation, sampling, data collection, and backfilling of this test pit will use the same procedures as for the test pits in the southfield area.

The second and third rubble areas are located approximately halfway between the K-65 Silos and the Production Area and in the northeast corner of the Waste Storage Area, respectively. Again, a single test pit will be excavated and sampled in each of these areas. It is suspected that these were areas where materials where dumped on the relatively level surface of the site; therefore, these are not likely to be a test pit more than a few feet deep. The orientation of the pit will be east/west.

In each rubble pile drum storage area, an inventory of empty drums will be made. The empty drums will be scanned with a SPA-3 to determine if the drums contain radiological contamination. The location of drums that appear not to be empty will also be recorded. The input for this investigation will include these inventories and an assessment as to the best course of action for dealing with these drum.

5.3 FLAGPOLE AREA

A large tank was reportedly buried in the area of the flagpole. The tank could contain radioactive wastes. Since this is an area where a great deal of public pedestrian traffic routinely passes, it is necessary to proceed with extra caution in this area before attempting any sampling of the subsurface. Consequently, two geophysical methods will be used to attempt to define the location and orientation of the buried tank prior to subsurface disturbance. Since the tank is reportedly made of steel, a surface magnetometer survey will be conducted to try to define a magnetic anomaly. Interference from the metal in the adjacent buildings and fences may prevent a meaningful interpretation of the data if the tank is close to the building. A gravity survey will also be conducted over the area since a tank, even if only partially filled with radioactive material, should have a significantly greater density than the adjacent soils. Again, the presence of the administration building may hamper the data interpretation; however, the combined results of the two surveys may lead to a definition of the size and orientation of the tank.

Four borings will be placed around the tank to determine if there is or has been leakage from the tank. The borings will be placed at the ends and on either side of the tank provided there is sufficient room between the tank and existing structures. The borings will be installed using the same procedures as for the borings in the Production Area, as described in Section 2.2 of this plan.

The wastes are thought to be radioactive material from the Manhattan Project. Since this is a buried vessel with unknown contents, both full HSL and full radiological analyses will be made. Beginning at the depth of five feet every other 6-inch sample will be analyzed for full HSL+. The remaining 6-inch samples will be analyzed for full radiological analysis. This alternating analysis will continue to the water table, if present. If water is present, a water sample from the piezometer will be analyzed for both full HSL+ and full radiological analysis. As with all other aspects of the investigation, the sampling will be expanded if there is evidence that the currently scoped effort is insufficient to characterize the nature and extent of contamination.

If ground water is encountered, the corresponding boring will be converted to a piezometer. The piezometer will be completed with a watertight protective cover installed flush with the ground surface. Water samples will be collected from all piezometers and analyzed for the full radiological analysis.

The purpose of this investigation is to determine if the presence of the tank and its unknown contents is presently causing any environmental degradation. There will be no attempt in this investigation to penetrate the tank or to determine the nature of the contents of the tank.

5.4 FIRE TRAINING AREA

The fire training area is located on the north side of the site outside the Production Area. It is used for training site firefighters responding to fires in buildings, oil fires, and fires around tanks. Three sites within the fire training area are to be investigated: a fire training building, an oil-fire pond, and a metal trough containing oil and water. Each of these areas is to be sampled for radiological and HSL analyses. The purpose of the investigation is to determine if oil and other materials used in the area have seeped into the subsurface environment.

Surface soil samples will be collected at six locations around the fire training building at the edge of the pavement. These samples will be analyzed for total uranium and full HSL+ analysis, including pesticides/PCBs, organo-phosphorous pesticides, dioxin and furnas.

Four test borings will also be drilled around the perimeter of the oil fire pond using hollow-stem augers, as described in Section 2.2. Samples will be screened with an HNu for volatile organics. The sample with the highest reading from each boring will be sent to the laboratory for full HSL+ analysis. If the HNU does not detect anything in any of the samples, then the sample from the 2.0-to 2.5-foot interval will be sent to the laboratory. Piezometers will be installed in borings which encounter ground water. Water samples will be collected from each piezometer for full radiological and HSL+ analysis.

Four borings will also be installed around the oil-filled trough. Borings will be placed near the ends and at the midpoints along the sides of the trough. Sampling procedures and decision points will be the same as those for the oil-fire pond.

5.5 WASTE WATER TREATMENT PLANT

The drying beds and the trickling filters at the waste water treatment plant are being considered a new suspect area. The sludge drying beds are periodically cleaned out and the sludge is reprocessed to recover any uranium that may be present. Four borings will be installed at the center point of each side of the sludge drying bed area as shown in Figure 3-1. Samples will be collected for full radiological analysis at the eight standard depths intervals as specified in Section 2 of the Work Plan. If water is encountered, it will be analyzed for full radiological and full HSL analysis.

Two borings will be installed next to each of the trickling filters. Samples from the eight standard sample intervals will be analyzed for full radiological analysis. If groundwater is encountered, the water will be sampled for full radiological and full HSL+ analysis.

In addition to the borings in the Waste Water Treatment Plant area, ten archived surface soil samples will be selected for mercury analysis. These will be the ten samples that showed the highest uranium values. These sample results will be used to evaluate the possibility that mercury containing wastes were burned in the old incinerator.

5.6 LABORATORY WASTE PITS

The laboratory waste pits were open on the 1962 and 1964 photographs and grassed over in the 1968 photograph. The pits will be located by triangulation from fence corners that still exist today and appear on the 1962 and 1964 photographs. It appears that the location of these pits is at the south edge of the parking area at the construction site for the new pilot plant. It is possible that the pits are currently located under some construction trailers. Once the pits are located, a single boring will be drilled into each pit to determine if scrap metal is present. If metal is present, the boring will be advanced and a sample of soil taken from the location of the pit for full HSL+ and full radiological analysis.

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RI/FS WP
PASA Addendum
REV 1
October 4, 1989

APPENDIX A

Production and Additional Suspect Areas Health and Safety Plan

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INTRODUCTION

The following Health and Safety Plan for the Facilities Testing task is to be considered an addendum to the Fernald Remedial Investigation and Feasibility Study (RI/FS) Health and Safety Plan. The Facilities Testing Health and Safety Plan is designed to set health and safety parameters for situations and conditions that will be unique to the Facilities Testing task for the RI/FS. All work during the Facilities Testing task will be in accordance with the health and safety requirements of the Unites States Department of Energy, the United States Department of Labor (OSHA), the National Fire Protection Association (NFPA), Westinghouse Materials Company of Ohio (WMCO), Advanced Sciences, Incorporated, and International Technology Corporation.

GENERAL SAFETY

All work locations (drill sites) will be inspected by the site health and safety officer prior to the initiation of work. All sites will be inspected for physical hazards, such as overhead electrical lines and piping, chemical storage tanks, chemical hazards, and nuisance dusts. All work sites will be monitored for both radiological and chemical hazards prior to the initiation of work. WMCO will be consulted to aid in identifying work site hazards. WMCO radiation work permits will be utilized to document radiological hazards and define safety criteria. WMCO excavation/penetration permits will be completed prior to beginning any boring or trenching operation.

A trenching operation planned for one of the sites will be conducted per the procedure in Attachment A plus any additional WMCO requirements. At a minimum, all WMCO health and safety policies and procedures will be followed. Attachment B documents WMCO's health and safety requirements that are unique to the Facilities Testing task. Tailgate safety meetings will be conducted on a daily basis prior to initiation of work to communicate hazards and safety requirements for the work site.

Work sites will be visited by a Field Health and Safety Representative at least once per day. Sites encountering radioactive or chemical contamination will be visited more frequently. Full-time safety coverage will be implemented when conditions dictate. The lead geologist at each drilling site will be responsible for ensuring that health and safety procedures are followed and requirements are met. Two-way

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radios will permit communication with the field health and safety officer. Each field crew will also have a fire extinguisher, a first aid kit, and an eye-wash bottle available at each site.

EXTERNAL RADIATION PROTECTION

External radiation exposures to drilling teams will be maintained as low as reasonably achievable (ALARA). Radiation sources, primarily uranium in processing plants, will be removed from the immediate work area when possible, or will be shielded to minimize worker exposure. The number of workers in radiation areas will be minimized in order to reduce total man-Rem received during drilling in radiation areas. WMCO Radiation Work Permits and associated monitoring will be utilized to establish and document worker stay times and job controls at each site. Radiation Work Permits will be required prior to starting work at each individual drill site or cluster of borings. A WMCO thermoluminescent dosimeter (TLD) will be worn by each worker who enters the FMPC production area. The dosimeter measures the amount of radiation a worker is exposed to while working at the FMPC. Dosimeters are processed on a monthly basis, and the results are forwarded to the RI/FS Project Health and Safety Officer, who reviews the data.

INTERNAL RADIATION PROTECTION

When radioactive contamination is suspected or detected at each drill site, general air sampling and/or breathing zone sampling will be conducted to measure and document activity concentrations of long-lived radionuclides (primarily uranium) in the air. Respiratory protection will be utilized when air concentrations are anticipated or are measured to reach 10% of the applicable maximum permissible concentration (MPC) Guides.

Respiratory protection will be donned whenever radioactivity is encountered during routine monitoring of soil during auguring operations. Half-face air purifying respirators will be adequate for most cases where airborne radioactivity is encountered or anticipated during drilling operations. Full-face air purifying respirators will be required if airborne levels approach five times the MPC. WMCO respirators will be used by the Facilities Testing Crew when needed. Crew members will be medically qualified, fit tested, and trained in respirator use by WMCO.

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PROTECTIVE CLOTHING

Minimum dress for drilling in the FMPC process area will be equivalent to EPA Level D criteria. Protective clothing will consists of WMCO-issued coveralls, WMCO-issued steel toed boots, safety glasses, hard hats, and leather-palmed gloves. If radioactive or chemical contamination is anticipated or is detected during monitoring of soil during drilling operations, EPA Level C criteria will be required. Level C criteria includes, in addition to Level D requirements, tyvek or saranex suits, shoe covers, nitrile gloves, glove liners, and half-face air purifying respirators. Tyvek suits will be used for radioactive contamination and saranex for organic chemical contamination.

CONTAMINATION CONTROL

An exclusion or contamination control zone will be established around each drill rig site. Each zone's entrance/exit will be supplied with a Geiger-Mueller type detector. If radioactive contamination is detected in soil during auguring, workers exiting the zone will be required to monitor themselves for gross levels of radioactive contamination. If contamination levels exceed 1000 counts-per-minute above background during the monitoring of a worker, the WMCO health physics department or the RI/FS Health and Safety Officer will be notified immediately for decontamination instructions.

In addition to using the exclusion zone, all workers will shower, change out their clothing, and use the WMCO hand and foot monitors prior to exiting the FMPC facility. WMCO hand and foot monitors are set to detect the limits recommended in ANSI draft standard N13.12 for Thorium-232 (Attachment C). If Level C protective clothing is used, it will be doffed and bagged before exiting the exclusion zone. Used respirators will also be bagged separately.

If radioactive contamination is detected at a drilling site, the drill rig and associated equipment will be monitored for gross levels of contamination before moving to another drill site within the process area. Equipment exceeding 1000 dpm alpha/100 cm^2 removable and 5000 dpm alpha/100 cm^2 fixed will be decontaminated before moving to the next drill site. WMCO will conduct all decontaminations at its decontamination facility.

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Prior to exiting the site, all equipment will be monitored by WMCO for radioactive contamination. Release levels for unrestricted use at WMCO are 200 dpm alpha/100 cm^2 removable and 1000 dpm alpha/100 cm^2 fixed, slightly more restrictive than the Thorium-232 guidelines set in ANSI N13.12.

CHEMICAL PROTECTION

Each work site will be both visually inspected for chemical hazards and monitored prior to the beginning of work. WMCO will also be contacted to learn of any unique chemical hazard present at the work sites. Each work site will be monitored with a photo-ionization detector for the presence of organic and some inorganic vapors.

Each drill site will also be monitored with an Exotox instrument capable of analyzing for combustible gas, O_2 levels, H_2S and CO. During drilling operations, routine monitoring of the soil will be performed using the HNu detector. Soil that appears to contain moisture will be monitored for suspect chemical contamination. Detectable organic or inorganic vapors will trigger Level C protective clothing. If the contaminant can be identified in the field (usually by Draeger Tubes), air purifying respirators will be used when air concentrations reach 50% of the TLV. Air-supplied respirators will be necessary when air concentrations exceed two times the TLV.

TRAINING

All personnel working in the FMPC process area during the Facilities Testing Task will meet the following training requirements.

1. OSHA 40-Hour Hazardous Waste Site Training

2. RI/FS Site-Specific Training

3. WMCO Radiation Worker Training

4. WMCO Respirator Training

5. OSHA 8-Hour Annual Refresher Training

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STANDARD PROCEDURE

SUBJECT: EXCAVATION AND TRENCHING	PROCEDURE NO. ITC 20[illegible] DATE July 7, 19[illegible] SUPERSEDES --- APPROVED [signature] David R. S[illegible]

CONTENTS

		PAGE
I.	PURPOSE	1
II.	REFERENCES	1
III.	ATTACHMENTS	1
IV.	DISCUSSION	2
V.	DEFINITIONS	2
VI.	PROCEDURE	5
	A. Pre-excavation Requirements	5
	1. Preparation for Excavation/Trenching	
	2. Notification	
	3. Permits	
	4. Employee Training and Indoctrination	
	B. Excavation/Trenching Work Practices	

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STANDARD PROCEDURE

PROCEDURE NO ITC PRO 95

DATE July 7, 1986

SUPERSEDES ---

APPROVED

David R. Smi

SUBJECT:

EXCAVATION AND TRENCHING

I. PURPOSE

To set forth minimum health and safety requirements and procedures for personnel who either design or direct the installation of shoring, sloping, and benching systems, or who work in and about trenches or excavations.

II. REFERENCES

A. Title 29, CFR, 1926(P); Federal OSHA Construction Safety Standards - Excavations, Trenching, and Shoring

B. Title 8, Article 6, California Administrative Code; Cal-OSHA Construction Safety Orders - Excavations, Trenches, Earthwork

C. ITC PRO 9532.4; Cal-OSHA Work Permit Requirements for Demolitions, Scaffolding, Excavations, and Trenching

III. ATTACHMENTS

A. ITC FORM 9532.9-1, "Trench/Excavation Project Notification Worksheet"

B. ITC FORM 9532.9-2, "Excavation and Trenching Project Notification Log"

C. Cal-OSHA FORM 691-b, "Scaffolding-Falsework-Excavation/Trenches Job Description Form #1"

D. State of California, Department of Industrial Relations, Division of Occupational Safety and Health; "Permit - Annual Excavation/Trenching"

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IV. DISCUSSION

Multiple hazards associated with working in and about trenches or excavations include: the potential of running soils, cave-ins, dislodged spoil, lack of quick access and egress, and those associated with performance of work in confined spaces. Federal OSHA reports that as many as 100 workers die each year in trenching and excavation operations. Nonfatal injuries occur with greater frequency. Causes of bodily injury, illness, or death include asphyxiation, internal injuries due to physical crushing, and toxic exposures.

This directive prescribes minimum requirements to protect employees potentially exposed to hazardous ground movement during excavation or trenching operations.

Specific requirements include project review by the Regional Health and Safety Office for any construction of trenches or excavations that are five feet or deeper and into which a person is required to descend, system design by an IT-defined "Design Engineer", installation of shoring systems or sloping and benching under the direction of a Project Supervisor, and constant supervision of all work performed in an excavation or trench.

V. DEFINITIONS

A. Accepted Engineering Requirements

Those requirements or practices which are compatible with standards required by a registered architect, a registered professional engineer, or other duly licensed or recognized authority.

B. Angle of Repose

The greatest angle above the horizontal plane at which a material will lie without sliding.

C. Benching

A method of excavation whereby the faces of an excavation or trench are widened progressively outward with respect to the bottom by a specific series of horizontal and vertical cuts to provide protection against the hazard of moving ground.

D. Competent Person (Federal OSHA, 29 CFR 1926.32(f))

A person, such as a supervisor or engineer, who is capable of identifying existing and predictable hazards in the excavation/

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trenching work area and who has the authority to take prompt corrective measures to eliminate them. Nomenclature for responsibilities equivalent to a Competent Person varies from state to state. For example, in California, the individual with excavation/trenching installation and supervision responsibilities is a "qualified person".

E. <u>Confined Space</u>

Enclosure having limited means for entry and exit, by reason of location, size, or numbers of openings; and unfavorable natural ventilation that could contain or produce dangerous air contaminants, flammable atmospheres, and/or oxygen deficiency.

F. <u>Design Engineer</u>

An individual, currently registered as a civil engineer in the applicable state, who, in all other respects, meets the requirements of a pertinent State OSHA Program, or Federal OSHA (see Qualified Person: V.K.) in terms of his or her ability to design shoring, sloping, benching, or alternate trench/excavation systems.

G. <u>Excavation</u>

Any manmade cavity or depression in the earth's surface, including its sides, walls, or faces, formed by earth removal and producing unsupported earth conditions by reasons of the excavation.

H. <u>Hard Compact Soil</u>

All earth materials not classified as running or unstable.

I. <u>Project Manager</u>

An individual who is responsible to coordinate and direct the activities of both the Design Engineer and Project Supervisor. The Project Manager is responsible to assure that all pre-excavation requirements are met: site preparation, Health and Safety Office notification, OSHA and/or IT internal project permitting, and employee training.

J. <u>Project Supervisor</u>

A person, such as a supervisor or engineer, who is familiar with the installation of shoring or sloping/benching systems and the attendant hazards of excavation or trenching operations. Project supervisors shall meet the particular requirements of State OSHA Programs, or where applicable, the requirements of a Federal OSHA Competent Person. Project Supervisors shall assure that excavation/trenching work practices are properly followed.

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K. Qualified Person (Federal OSHA, 29 CFR 1926.32(l))

A person, such as an engineer, who by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience has successfully demonstrated his or her ability to design shoring, sloping/benching or alternate systems that meet accepted engineering requirements.

L. Running Soil

Earth material where the angle of repose is approximately zero, as in the case of soil in a nearly liquid state, or dry, unpacked sand which flows freely under slight pressure. Running material also includes loose or disturbed earth that can only be contained with solid sheeting.

M. Shoring System

A temporary structure for the support of earth surfaces formed as a result of excavation work. This structure is formed with metal-wood or hydraulic shoring with sheeting, or use of a trench shield.

N. Sloping

A method of excavation whereby the faces of an excavation or trench are laid back to provide protection from moving ground.

O. Spoil

The earth material that is removed in the formation of an excavation.

P. Trench

An excavation made below the surface of the ground. In general, the depth is greater than the width at the bottom, but the width of a trench at the bottom is not greater than 15 feet.

Q. Trench Shield

A shoring system composed of steel plates and bracing, welded or bolted together, which support the walls of a trench from the ground level to the trench bottom and which can be moved along as work progresses.

R. Unstable Soil

Earth material, other than running, that because of its nature or the influence of related conditions, cannot be depended upon to remain in place without extra support, such as would be furnished by a system of shoring.

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VI. PROCEDURE

A. Pre-excavation Requirements

1. Preparation for Excavation/Trenching

a. All existing utility or other underground facilities shall be located before excavation work commences. If a utility company cannot be utilized, an appropriate device, such as a cable- avoiding tool or similar device, shall be used to locate gas lines, electrical lines, water lines, etc. All known owners of such facilities shall be advised of the proposed work at least two days (excluding Saturdays, Sundays, and holidays) prior to start of excavation work.

b. Trees, boulders, poles, and other surface encumbrances located at the excavation/trenching site shall be made safe or removed prior to beginning excavation/trenching.

2. Notification

a. Any project involving trenching or excavations that are five feet or deeper where a person is required to descend shall be reviewed and approved by the Regional Manager, Health and Safety, or his designee (ITC PRO 9021.1).

b. The "Trench/Excavation Project Notification Worksheet" (Attachment A) shall be completed by the Project Manager and submitted to the appropriate Regional Health and Safety Office in advance of any such project.

c. The Health and Safety Office shall review the "Trench/Excavation Project Notification Worksheet" and upon approval issue a unique IT Health and Safety Department permit number for the project. An "Excavation/Trenching Project Notification Log" (Attachment B) shall be maintained in each Regional Health and Safety Office.

d. California Specific Requirement: Regional Health and Safety Offices shall submit the appropriate pre-job notification to Cal-OSHA; the Cal-OSHA Form 691-b (Attachment C).

3. Permits

a. California Specific: Cal-OSHA requires the issuance of an excavation and/or trenching permit prior to the initiation of any work five feet or deeper into which a person may be required to descend (8 CAC 1539).

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Rather than obtaining such a permit for each and every job for which it might be necessary, an Annual Excavation/Trenching Permit (Attachment B) has been obtained by IT. This permit is good for any work location within the State of California. However, implicit in the issuance of the permit is Cal-OSHA notification of all excavation and trenching projects using Cal-OSHA Form 691-6 (Attachment C), and the use of safe work practices and conditions.

b. California Specific: A copy of the annual permit must be posted at every job site where an excavation/trenching permit is required.

The annual permit copy shall be dated and initialed, and then posted <u>only</u> for the duration of the reviewed job.

c. Outside of California: Project Managers shall consult the Regional Health and Safety Office to determine whether or not an OSHA excavation/trenching permit is required. Other State OSHA programs that may require permitting include: Alaska, Hawaii, Michigan, Oregon, and Washington.

4. <u>Employee Training and Indoctrination</u>

a. Formal Classroom Training

Employees assigned to design, supervise or work in or about excavations/trenches shall have completed formal classroom training which includes the following:

(1) Types of hazards associated with excavation/trenching operations;
(2) Safe work practices and techniques;
(3) Applicable Federal, state, and local regulations;
(4) International Technology Corporation excavation/trenching policies and procedures.

b. Tailgate Safety Meetings

Tailgate Safety Meetings detailing specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the Project Supervisor at the beginning of each shift for each job, and shall be documented in writing by use of ITC Form 9540-1, in accordance with ITC PRO 9540.1 (Tailgate Safety Meetings).

c. Retraining

Personnel shall be periodically retrained in the subject areas listed in "4.a" above. Proof of training and

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retraining shall be fully documented in writing. Records shall be maintained by the Corporate Training Department.

d. Supervisory Reinforcement

The training described above shall be complemented with effective, on-going, on-the-job training and one-on-one instruction by regional management, as part of standard employee supervision, and to the extent necessary to assure compliance with this directive, other IT Corporation policies and procedures, and good health and safety practices.

8. <u>Excavation/Trenching Work Practices</u>

1. Design

Walls and faces of all excavations and trenches five feet or greater in depth, into which employees may enter, shall be guarded by shoring, sloping of the ground, or equivalent means. Design of shoring, sloping, or benching systems shall conform with accepted engineering requirements and applicable State or Federal OSHA regulations. All design work shall be approved by a Design Engineer.

2. Installation

The Project Supervisor shall ensure that installation of shoring, sloping or alternative systems, designed to allow work in an excavation or trench, shall conform with accepted engineering requirements and applicable State or Federal OSHA regulations. As necessary, the Design Engineer shall visit the excavation/trenching site to assure proper installation of the sloping, shoring, or alternate system.

3. Work Supervision

Work in an excavation or trench shall at all times be supervised by an IT Project Supervisor. This individual will remain above the excavation at all times and will be responsible for identifying any unusual developments above ground which may warn of impending earth movement. The Project Supervisor shall not make changes in the shoring or sloping system without first consulting the Design Engineer.

4. Inspections

Frequent inspections of excavations shall be made by the Project Supervisor, both before initial entry and as work progresses. If there is any evidence of possible cave-ins or slides, all

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work in an excavation shall cease until the necessary safeguards have been taken. Particular attention shall be paid after rainstorms or other earth destabilizing events.

5. Work Adjacent to Excavations

No employee shall work adjacent to any excavation until a reasonable examination of the excavation and surrounding area has been made to determine that no conditions exist that may expose employees to injury from moving ground. Special precautions shall be taken at excavations adjacent to streets, railroad tracks, or other sources of external vibrations or superimposed loads.

6. Hazard Prevention Reinforcement

Employees shall be reminded daily, prior to the start of the workshift, of the hazards associated with excavation/trenches. Signs of potential earth movement shall be brought to the immediate attention of the Project Supervisor. These reminders shall take place during the Tailgate Safety Meeting in accordance with ITC PRO 9540.

7. Confined Space Work

Trenching and Excavation work that requires employee entry into a confined space shall be performed in accordance with ITC PRO 9531.1 (Confined Space Industrial).

8. Unauthorized Entry

No employees shall be permitted to enter the excavation/trench unless they are specifically required to do so. Unauthorized persons shall not be allowed access.

9. Spoil Placement

All spoil shall be located at least two feet from the edge of the excavation to prevent it from falling back into the excavation. Since surface subsidence indicators, such as fissures or cracks, usually occur within a four-foot distance from the lip of the trench or excavation, it is important that Project Supervisors consider placing spoil at a greater distance from the lip so that surface indicators are not covered. No method that disturbs the soil in place (such as driving stakes) shall be used to contain the spoil material.

10. Worksite Guarding

Trenches and excavations shall be guarded on all sides with wooden or metal barricades that are linked with at least 3/4 inch wide yellow or yellow and black barricade tape. A minimum distance of two feet from the edges shall be maintained where possible. This is to warn employees and/or equipment operators from inadvertantly falling into the excavation or trench.

11. Battery-lighted Barricades

Battery-lighted barricades shall be used as follows:

a. A minimum of two battery-lighted barricades shall be used at corners, one on either side of the barricade.

b. At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.

c. Where trenches parallel roadways, distance between battery-lighted barricades shall not exceed 40 feet unless this requirement conflicts with (a) or (b) above and additional units are required.

d. All battery-lighted units shall be serviced as necessary to ensure equipment is operating.

12. Entry and Egress

Safe means of entry and egress from the excavation/trench shall be provided. This may be a ladder, stairway, or ramp securely fastened in place. Use of ladders for this purpose requires that the ladder side rails shall extend at least three feet above the original ground surface level. Trench access shall be provided and located so as to require no more than 25 feet of lateral travel.

13. Walkways and Bridges

Trenches shall only be crossed where safe crossings have been provided. When the depth of the excavation or trench exceeds 7.5 feet, walkways and bridges shall have standard guardrails (42 inches high at minimum and able to withstand 200 pounds force laterally at the center), and toeboards.

14. Pedestrian Bridges

Pedestrian bridges shall be of sufficient strength to prevent a vertical deflection greater than 0.5 inches when a weight of 250 pounds is applied in the center.

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15. Vehicle Bridges

Bridges intended for vehicles shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

16. Operating Equipment

Employees working near operating excavation equipment shall not be allowed to work in positions that place them in danger of contacting the equipment's moving parts.

17. Undermining

No undermining is permitted without prior review and approval by the Regional Health and Safety Office.

18. Surrounding Work Area

The work area around the excavation/trench shall be kept as free as possible of unnecessary clutter and equipment.

19. Water Entry and Drainage

Appropriate measures shall be taken to prevent surface water from entering the trench or excavation and to provide adequate drainage of the area adjacent to the excavation/trench. Accumulation of water or fluids that could endanger the health and safety of IT employees, either directly or through affecting the excavation/trench's stability, shall be controlled before further work progresses.

20. Backfilling

All trenches, excavations, temporary walls, exploratory drilling, etc., shall be promptly backfilled after work is completed and all associated equipment is removed.

21. Other IT Procedures

All applicable IT procedures specific to the job are to be followed in addition to these noted excavation/trench work practices and conditions.

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Attachment B

CONSTRUCTION KICK-OFF MEETING
SUBCONTRACTOR HEALTH & SAFETY REQUIREMENTS

Conference Date:

SUBCONTRACTOR: ASI - PENNA. DRILLING
CONTRACT(S):
LOCATION(S): Sitewide
OPERATION(S): Auger Sampling, Soil Sampling, Well Drilling
NUMBER OF EMPLOYEES: G-10
WMCO PROJECT ENGINEER: D. J. Carr
ASI SAFETY OFFICER: J. F. Poliziani

This information is provided as a convenience to the subcontractor in highlighting the health and safety requirements at the FMPC. All work at the FMPC shall be performed in accordance with the safety and health requirements and programs of the U. S. Department of Energy (DOE), the U. S. Department of Labor (OSHA), the National Fire Protection Association (NFPA), and Westinghouse Materials Company of Ohio (WMCO).

SAFETY AND FIRE PROTECTION REQUIREMENTS

Prior to the commencement of any construction activity, the subcontractor shall submit an accident prevention program for the specific contracted work, implementing in detail the pertinent requirements of the safety standards referenced herein.

The subcontractor shall administer and enforce all safety and health requirements as herein referenced in all subcontracts, of any tier, related to the work to be performed.

All subcontractors' equipment and tools will be inspected by WMCO Fire & Safety personnel prior to entry into the FMPC and throughout the course of the work activities. Equipment which fails to meet the safety requirements herein referenced, will not be permitted on the site.

All injuries shall be reported to the WMCO Medical facility as soon as is practical following the injury.

All safety glasses and other eye protection shall comply with ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection.

Safety glasses, hard hats, and a complete clothing change-out, including company issued safety shoes, are required for all work within the process area. A shower is required prior to leaving the process area.

All persons engaged in burning/welding activities or persons assisting those doing the work shall wear clothing with fire retardant characteristics.

Safety glasses with side shields or cover goggles are required during any operation, manual or with powered equipment, which produces dust or possible flying particles, e.g. chipping, grinding, sawing, etc.

Attachment B (Continued)

A radiation work permit (RWP) is required for all construction work within the FMPC Process Area.

Safety belts and/or lifelines are required for all elevated work above six (6) feet where a worker must leave a scaffold, ladder, or other work position not otherwise affording full fall protection.

All cranes and derricks must conform to DOE/OSHA annual inspection and certification requirments as contained in 29CFR1926.550. A copy of the most recent safety inspection and certification must accompany the equipment to the FMPC.

All self-propelled construction equipment and vehicles shall be equipped with an audible reverse signal alarm.

The transporting of personnel in the beds of pick-up trucks or other motor vehicles is prohibited unless such vehicles is provided with fixed seating as required by DOE/OSHA.

Ground Fault Circuit Interrupters (GFCI's) are required on all electrical equipment used outside of buildings or in damp places.

All flexible cords (extension cords) shall be of a type rated for hard usage and damp locations.

All temporary wiring and lighting shall conform to the requirements of the latest edition of the National Electrical Code.

The work area shall be completely roped off from other plant areas. The use of yellow "CAUTION" tape is permitted. All markings and/or barricades shall be maintained at an appropriate height and in good order to provide adequate warning of hazards.

Lighted barricades are required to mark all construction hazards, which are in close proximity to roadways, pedestrian walkways, and other established traffic routes.

An FMPC construction excavation/penetration permit must be secured prior to commencing any excavation or penetration of the ground, slabs, or structural components.

Open fires are prohibited at the FMPC.

Flammable or combustible liquids with a flash point of 140° F. or less (i.e., gasoline, diesel fuel, solvents,etc.) shall be handled in factory mutual approved safety cans with operable flame arrestor and self-closing lid(s). All safety cans shall be properly marked with the name of the liquid contents.

All areas where flammable liquids are stored or paints are mixed shall have "NO SMOKING" signs posted and no one is to smoke in the posted areas.

Liquified Petroleum Gas (i.e., propane, butane, MAPP, etc.) shall not be stored inside any FMPC building.

Attachment B (Continued)

All compressed gas cylinders are to be stored and transported in an approved rack or otherwise securely supported in an upright position.

All fuel gas-oxygen combinations used in cutting and welding equipment shall have reverse-flow check valves installed between the torch and the regulator.

Subcontractors shall provide suitable approved portable fire extinguisher for all work and storage areas which are not considered a part of the permanent facility.

A completed FMPC Flame and Welding Permit is required for all cutting, welding, and burning operations.

Combustible scrap and debris shall be removed at regular intervals during the course of construction. Disposal shall be in accordance with established WMCO requirements.

The storage of combustible materials shall be kept at least 50 feet from any building or structure.

Only flame resistant tarpaulins or approved materials of equal fire retardant characteristics shall be used for temporary enclosures. Subcontractors shall provide documented verification of fire retardancy to the WMCO Fire & Safety Group upon request.

Subcontractors shall not move any plant materials or equipment without the prior permission of the local production supervisor and/or the WMCO Project Engineer.

All employes are to immediately leave the building upon activation of localized evacuation alarms.

INDUSTRIAL HYGIENE REQUIREMENTS

Hearing Protection

Hearing protection (muff or plug type) shall be worn by all personnel in accordance with 29 CFR 1926.52, Occupational Noise Exposure and 29 CFR 1926.101, Hearing Protection, or if personnel are exposed to noise levels exceeding 90 dBA; e.g., grinding wheels, jackhammers, air compressors, sandblasting, etc.

Hearing protection shall be worn in all posted areas.

Respiratory Protection

Respirators shall be used in accordance with ANSI Z-88.2-1980. No individual shall be assigned to a job in which a respirator is or may be required unless he is properly medically certified, trained, fit-tested, and he is clean shaven in all face-sealing areas. Records documenting this shall be provided to and approved by WMCO's Industrial Hygiene and Safety

Attachment B (Continued)

Section prior to the start of any job.

Only NIOSH-approved respiratory protection equipment that is properly maintained shall be used.

Airline respirators shall be supplied with breathing air from a compressor that generates CGA, G-7.1-1973 Grade D quality air or better. Unknown subcontractor compressors shall be checked for proper air quality and for presence of a high temperature alarm or carbon monoxide alarm.

Appropriate properly equipped respirators shall be used to protect all personnel from potential work area respiratory hazards in all posted areas, or whenever necessary such as during welding, spray painting, dusty operations, and some cleaning operations.

Hazard Communication

All materials considered hazardous under 29 CFR 1910.1200 (Hazard Communication Standard) must be properly labeled. This includes all containers into which a hazardous material has been transferred.

Material Safety Data Sheets (MSDSs) for all materials used by the subcontractor and considered to be hazardous shall be submitted to the IH Department at least one week prior to the materials' arrival at the FMPC.

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Attachment C

TABLE D ANSI N13.12
SURFACE CONTAMINATION LIMITS*

Contaminants			Limit (Activity) (dpm/100 cm^2)**	
Group	Description	Nuclides (Note 1)	Removable	Total (Fixed plus Removable)
1	Nuclides for which the nonoccupational MCP_a (Note 2) is 2 x 10^{-13} Ci/m^3 or less or for which the nonoccupational MCP_w (Note 4) is 2 x 10 10^{-7} Ci/m^3 or less.	^{227}Ac $^{241,242m,243}Am$ $^{249,250,251,252}Cf$ $^{243,244,245,246,247,248}Cm$ $^{125,129}I$ ^{237}Np ^{231}Pa ^{210}Pb $^{238,239,240,242,244}Pu$ $^{226,228}Ra$ $^{228,230}Th$	20	Nondetectable (Note 3)
2	Those nuclides not in Group 1 for which the nonoccupational MCP_a (Note 2) is 1 x 10^{-12} Ci/m^3 or less	^{254}Es ^{256}Fm $^{126,131,133}I$ ^{210}Po ^{223}Ra ^{90}Sr ^{232}Th ^{232}U	200	2000 a Nondetectable (Note 3)
3	Those nuclides not in Group 1 or Group 2		1000	5000

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Attachment C (Continued)

TABLE D (Continued)
ALTERNATE SURFACE CONTAMINATION LIMITS
(All Alpha Emitters, except U_{nat} and Th_{nat} Considered as a Group)*

Contamination Contingencies	Limit (Activity) (dpm/100 cm^2)** Removable	Total (Fixed pl Removabl
If the contaminant cannot be identified; or if alpha emitters other than U_{nat} (Note 1) and Th_{nat} are present; or if the beta emitters comprise ^{227}Ac or ^{228}Ra	20	Nondetectab (Note 2)
If it is known that all alpha emitters are generated from U_{nat} (Note 1) and Th_{nat}; and if beta emitters are present that, while not identified, do not include ^{227}Ac, ^{125}I, ^{226}Ra, and ^{228}Ra	200	2000 alpha Nondetectable beta-gamma (Note 3)
If it is known that alpha emitters are generated only from U_{nat} (Note 1) and Th_{nat} in equilibrium with its decay products; and if the beta emitters, while not identified, do not include ^{227}Ac, ^{125}I, ^{129}I, ^{90}Sr, ^{223}Ra, ^{228}Ra, ^{126}I, ^{131}I, and ^{133}I	1000	5000

* The levels may be averaged over one square meter provided the maxi activity in any area of 100 cm^2 is less than three times the li value. For purposes of averaging with regard to isolated spots activity, any square meter of surface shall be considered to contaminated above the limit L, applicable to 100 cm^2, if (1) f measurements of a representative number n of sections it is determi that $1/n \sum S_i \geq L$, where S_i is the dpm/100 cm^2 determined f measurements of section i; or (2) it is determined that the activ of all isolated spots or particles in any area less than 100 c exceeds 3L.

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Attachment C (Continued)

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

* The levels may be averaged over one square meter provided the maximum activity in any area of 100 cm^2 is less than three times the limit value. For purposes of averaging with regard to isolated spots of activity, any square meter of surface shall be considered to be contaminated above the limit L, applicable to 100 cm^2 if (1) from measurements of a representative number n of sections it is determined that $1/n \sum_n S_i \geq L$, where S_i is the dpm/100 cm^2 determined from measurements of section i; or (2) it is determined that the activity of all isolated spots or particles in any area less than 100 cm^2 exceed 3L.

** Disintegrations per minute per square decimeter.

NOTES:

(1) Values presented here are obtained from the Code of Federal Regulations, Title 10, Part 20, April 30, 1975. The most limiting of all given MCP values (for example, soluble versus insoluble) are to be used. In the event of the occurrence of mixtures of radionuclides, the fraction contributed by each constituent of its own limit shall be determined and the sum of the fractions shall be less than 1.

(2) Maximum permissible concentration in air applicable to continuous exposure of members of the public as published by or derived from an authoritative source such as the National Committee on Radiation Protection and Measurements (NCRP), the International Commission on Radiological Protection (ICRP), or the Nuclear Regulatory Commission (NRC). From the Code of Federal Regulations, Title 10, Part 20, Appendix B, Table 2, Column 1.

(3) The instrument utilized for this measurement shall be calibrated to measure at least 100 pCi of any Group-1 contaminants uniformly spread over 100 cm^2.

(4) Maximum permissible concentration in water applicable to members of the public.

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Attachment C (Continued)

TABLE D ANSI N13.12 (Continued)
SURFACE CONTAMINATION LIMITS*

(3) The instrument utilized for this measurement shall be calibrated to measure at least 1 nCi of any Group-2 beta or gamma contaminants uniformly spread over an area equivalent to the sensitive area of the detector. Direct survey for unconditional release should be performed in areas where the background is ≤100 counts per minute. When the survey must be performed in a background exceeding 100 counts per minute, it may be necessary to use the indirect survey method to provide the additional sensitivity required.

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RI/FS WP
PASA Addendum
REV 1
October 4, 1989

APPENDIX B

Work Plan for Investigation of Drum Baling Area and Nearby Burial Trench

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APPENDIX B

Work Plan for Investigation of Drum Baling Area and Nearby Burial Trench

C.1.0 INTRODUCTION

The RI/FS investigation team has been asked to characterize the D&D facility construction site in order to determine the nature and extent of either radioactive or chemical contamination. The proposed construction site in part covers an area where a temporary drum baling operation existed in the 1950's. The investigation is also to determine if there are hazardous wastes in the soils and groundwater adjacent to a known trench. A site walkover of the area, including inspection of shallow trenches and fence post holes, indicates that much of the area is covered with a thin layer of rubble. It appears that the rubble is generally less than 12-inches thick and includes metal scrap and slag-like material. Scattered meter readings indicate radioactivity is associated with the scrap, discolored natural rock surfaces, layers within the rubble, and the slag.

A surface radiation survey was conducted over the proposed D&D facility site and several areas were found to have elevated readings. As preliminary excavation began for construction of the facility, it was discovered that there is some radioactive material beneath the surface. This material could not have been detected by the surface radiation readings. A number of three- to four-foot deep pits were dug in the area to determine if there is radioactive material below the surface. During a site walkover March 1, 1988, several of these pits had water accumulated in them to a depth of six inches or more. This amount of water accumulation during a period of no rainfall indicates there are shallow discontinuous saturated zones in the till.

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The discovery of the buried contamination lead to a review of land usage in the area. This review indicated that the eastern portion of the construction site had been used for drum storage and baling. It was also determined that a scrap metal burial trench was located along the extreme northern edge of the construction site, along the south side of the railroad tracks. The trench was apparently on the order of ten feet deep and 150 feet long.

This sampling program is designed to determine the extent and level of near surface radiation. It will also determine if there are significant levels of hazardous chemicals in the soil where the drum storage and baling operation was located. This program will also determine if there is soil contamination in the vicinity of the burial trench, if there is ground water in the till adjacent to the trench and if the ground water contains hazardous materials. A report will be submitted at the end of the investigation with the findings and a recommended coarse of action. Should immediate action be warranted, the report will include recommended plans.

C.2.0 GEOPHYSICAL SURVEYING

In order to focus the drilling and sampling effort, ground penetrating radar (GPR) will be used to try to determine the location of the trench and determine if there are any other unknown trenches in the construction site area. A magnetometer survey was not done because of the presence of scrap metal piles, a large crane parked in the area, and scrap metal in the surface rubble. If the GPR is unable to define the trench boundaries, native soil or fill, then a solid stem auger will be used to drill shallow borings This drilling will be done in as many locations as are required to determine the location and orientation of the trench.

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There are three locations where it appears there is access to do GPR traverses across the trench. Most of the area where the trench is thought to be is covered with large wooden boxes of asbestos wastes. One GPR traverse will also be run the length of the trench area. Three to four GPR traverses will be run over the entire site in an attempt to verify that there are no other trenches. Since the clay and moisture content of the soil influence the ability of the radar to penetrate the soil, at least one of these traverses will cross the storm sewer pipe in the area. If the GPR can locate the pipe, it will provide a measure of how deep the radar is penetrating under the field conditions at the time of the survey.

If the GPR surveys identifies other trenches, then the sampling program and the level of protection for the drilling and sampling crew will be revised.

C.3.0 CHARACTERIZATION SAMPLING

Prior to execution at the contamination site, a walkover radiation survey was done and indicated some radioactive contamination present. The ongoing surface radiation survey task will do a walkover radiation survey on the 100 foot grids to the south of the construction area. This survey will indicate if there is a similar level of surface contamination and if there is any reason to extend the soil investigation to the south.

Two soil sampling programs will be conducted. First, a shallow soil sampling program will be used over most of the area to quickly determine the degree of contamination and what remedial measures will be required to allow construction to proceed. Second, a deeper soil investigation will be conducted in the area of the former trench. This area is located on the northern fringe of the construction area and is less critical to construction progress.

[redacted]

C.3.1 <u>Shallow Soil Sampling</u>

The shallow soil sampling program will be used to define the vertical and lateral extent of the radioactive contamination. Approximately 96 shallow soil borings will be made on a 50-foot grid. The actual number of boring locations will be dependent on the amount of area covered by piles of scrap metal. The 50-foot grid will be tied to the RI/FS grid which is in place in the area. Prior to sampling, the surface at each sample location will be cleared of rocks or metal scraps that are too large to fit into the sampler. Soil samples will be collected using standard 18-inch, split spoon samplers. The samplers will be pushed into the soil with the hydraulic rams on an auger drilling rig. Two split spoons will be driven at each site to recover samples at a depth of 12, 24, and 36 inches.

The split spoon will be opened and a six inch length of core centered on the sample depth will be cut and placed in a 500 milliliter glass jar. The jar will be tightly closed, wiped clean on the outside, sealed with chain-of-custody tape and labeled with a unique sample number. The grid location and sample depth will be indicated on the label. Samples will be transferred to the RI/FS field trailers where a gamma scan will be made in a low background environment. The samples will then be returned to the investigation area and placed in 55-gallon drums for temporary storage. The drums will be sealed with chain of custody tape. After review of the scan data the samples for laboratory analysis will be removed from the drums and shipped to the IT Laboratory for analysis.

A gamma scan will be made of the samples to determine relative uranium concentrations. The procedures for the gamma scan are presented in Addendum A. Ten samples representing a range of scan readings will be selected and sent to the laboratory for gamma spectral analysis. The results of these ten samples will be used to develop a calibration curve to convert the field counts per minute readings to uranium values in parts per million. The calibration curve will be used to determine which soils are less than 200 ppm uranium. Seven additional samples will be sent to the laboratory for isotopic analysis to verify that uranium is the only source for the gamma radiation.

Soil samples are required to determine if hazardous chemical contamination exists in the soils from the drum storage and baling operations. Based on the sample results from the Characterization Investigation Study (CIS) a wide variety of chemicals could be present. In order to assess the potential for risk to the environment, the initial sample analyses for an area has to include the full spectrum of possible contaminants for the site. The results of the initial sampling can be used to justify limiting further sample analysis to a few constituents should additional investigation be required.

Two soil samples will be collected for HSL inorganics, volatile and semi-volatile organics, and PCB analysis. These samples will determine if hazardous materials are present in the area. These samples will include the native soil immediately below the fill. Suitable volumes of soil will be collected at each location, sealed in glass jars, labeled with unique sample numbers, date, time, location and depth of sample and shipped to the IT Laboratory for analysis. All samples will be handled under full chain of custody procedures.

Soil sampling for radiation measurements will begin in the area where the former drum storage and baling operation took place. As the samples for the radiation survey are collected, a portable organic vapor meter (HNu) will be used to screen the samples. If visible staining or HNu readings indicate the presence of organics in an area, the HSL samples will be collected from the portion of the area that appears to have the highest levels of contamination. If no field evidence for hazardous chemicals is discovered, the HSL samples will be selected at random from the drum handling area.

Two till wells exist on the east side of the construction site at well cluster 13. The till wells do not have any water in them at this time so they are of no immediate use to this investigation. They are included in the routine RI/FS water level measurement program and if water should accumulate in them in the future the need for sampling will be reevaluated.

C.3.2 Burial Trench Investigation

The burial trench is believed to contain scrap metal wastes. This investigation is to determine the location of the trench and determine if the contents of the trench constitute a threat to the environment. In order to make this evaluation the soils adjacent to the trench and any ground water in the vicinity of the trench must be sampled and analyzed for the full spectrum of materials that could have been placed in the trench. The basis for choosing the initial analyses has to be based on the CIS results. The results of the initial screening can be used to justify a more limited analytical program if further investigation or testing is warranted.

C.3.2.1 Locating the Trench

Most of the area where the trench is thought to be located is covered with wooden boxes and palates of asbestos waste. These boxes will have to be moved before a full definition of the trench location can be completed. If the GPR survey does not define the limits of the trench than a series of shallow borings across the area will have to be used to determine the limits of the trench. These borings will be made with a solid stem auger. Borings will be made to a depth of no more than five feet.

 [redacted]

Borings will be placed in lines perpendicular to the suspected trench side and spaced at five foot intervals. If the auger does not encounter fill the next boring toward the trench will be drilled. If the auger encounters fill than the next boring away from the trench will be drilled. A sufficient number of traverses will be made to define a reasonable limit to the sides of the trench. All boreholes will be grouted to the surface and soil cuttings properly contained.

The trench is thought to be approximately 150 feet long, ten feet deep and anywhere from ten to 30 feet wide. In order to assess the impact of a trench, the investigation will begin with six borings. One boring will be placed at each end and two borings will be placed at even spacing along either side of the trench. The six borings will be made using hollow-stem augers. Since the borings will be in till and only 18 feet deep, the use of hollow stem augers does not pose any problem in terms of creating cross contamination pathways to the much deeper sand and gravel aquifer. Augers and drilling equipment will be decontaminated between boreholes in accordance with the standard RI/FS procedures.

These borings will be sampled over the initial three feet using the same procedures as in the shallow sampling program. Continuous split spoon samples will be taken to the total depth of each boring to determine nature of the subsurface material. If the sampling indicates that the boring is going into trench material, the boring will be stopped, the hole will be filled with Volclay grout, and relocated beyond the trench boundary. The intent of the characterization is to determine what, if anything, is migrating from the trench rather than characterize the fill in the trench. Soils from these borings will be drummed and transferred to WMCO for disposal.

[redacted]

One sample from each boring will be collected for extended HSL analysis. If visible staining or the field HNu indicates contamination, the sample will be selected form the area with the highest contamination. If no field evidence exists with which to deuterium a sample point, the sample will be collected from the 10- to 15-foot interval. This interval was selected because it is below the bottom of the trench and is where contaminants would be migrating. If shallow ground water is encountered in the boring, and the HNu readings do not indicate organics are present, then no soil sample from that boring will be sent to the laboratory. Only a water sample will be collected after the well is installed and developed. There is no value in collecting soil-samples for analysis when the sample is below the water table. If the contamination is below the water table it is a ground water problem.

All six borings will be completed as monitoring wells with ten feet of screen in the bottom of the wells. All screen materials, well completion procedures, and decontamination procedures will be the same as the RI/FS. The elevation of the wells will be surveyed. Water table measurements will be made three days after the wells are completed to determine the local water table gradient in the vicinity of the trench. If there is no field evidence for contamination, a water sample will be collected from the upgradient well and two of the most down gradient wells.

Water samples will be collected from all six wells located around the former trench if there is field evidence for either radiological or chemical contamination in any well. Samples from the six wells will indicate if there are contaminants migrating from the trench and if there are local water bearing units within the till. The two shallowest wells in cluster 13 are till wells that were dry when drilled. The next shallowest well is apparently a 200-series well as defined in the RI/FS. The till wells, if they contains water, will indicate if contaminants are migrating from the construction site area. The 200- series well will indicate if there is ground water contamination in the upper portion of the upper sand and gravel aquifer. All water samples will be analyzed for full radiological analysis and the extended HSL parameters.

C.4.0 SCHEDULE

The walkover radiation survey and the staking of boring locations will begin on Saturday, March 5, 1988. The GPR survey will be done on Monday, March 7. One drilling rig will begin the shallow soil sampling on Thursday, March 10. A second drilling rig machine will start on Saturday, March 12. Radiological screening will be done on site and the results compiled daily. The shallow soil sampling will be completed in two to three days barring delays due to weather. The determination of the trench boundaries will take one day. The deeper sampling will follow and will be completed in three days. Water sampling will be completed at the end of the installation and development of all wells.

C.5.0 HEALTH AND SAFETY

The health and safety plan for this activity is included in Addendum B. These procedures are in addition to the normal health and safety procedures specified in the RI/FS work plan.

C.6.0 REPORTS

A summary report will be generated at the end of the shallow soil sampling program that will indicate the extent of the radiological sampling and if there is extensive contamination by organic chemicals. The data in this report will allow a decision to be made regarding the resumption of the construction program. This report will be ready five days after the soil sampling is

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completed as the gamma spectral analyses will take three days. A final report will be submitted after the laboratory results are received for the HSL analyses. This report will present the results of the investigation and recommendations if further action is required. Unless the data indicate that a more extensive investigation is warranted, the full data analysis will be included in the RI Report.

ADDENDUM A

FIELD GAMMA MEASUREMENTS

[redacted]

TITLE: Correlation of Shielded Sodium Iodide Detector with Total Uranium in Soil	NO: RSL-2007	PAGE 1 of 5
	REVISION: 0	DATE: 3/8/88

1.0 PURPOSE

This procedure provides the approach and method to scan soil samples in the field in order to determine the concentration of total uranium in soil, reported in parts per million (wt/wt). These samples will be collected during the Remedial Investigation conducted at the Fernald Feed Materials Production Center.

2.0 SCOPE

This procedure applies to the use of radiation survey instruments used to conduct indirect radiation measurements in an effort to characterize radiation material in soil samples.

3.0 RESPONSIBILITY

3.1 It is the responsibility of the Leader for Task leader, or his designee, to see that this procedure is followed during the field program phase.

3.2 It is the responsibility of the Leader for Task leader, or his designee, to delegate the performance of this procedure to personnel that are experienced with this procedure, and the shielded large volume scintillation detector.

3.3 It is the responsibility of the technician performing this procedure to follow it and report abnormal occurrences or results to the task leader, or his designee, immediately.

4.0 REFERENCES

4.1 Operation manuals for the large volume scintillation detector and ratemeter.

4.2 Field Screening of Subsurface Soil Samples for Radioactive Contamination, Quality Assurance Project Plan for Remedial Investigation, FMPC Fernald, Ohio, Volume V, Section 6.6.2.

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5.0 REQUIREMENTS

5.1 All procedures must be previously approved by the project management team.

5.2 Each soil sample must be previously packaged and labeled with the appropriate sample numbers.

6.0 PROCEDURE

6.1 Field Screening

6.1.1 Perform a background count with an empty sample container (500 milliliters wide mouth jar) inside the shielded enclosure, counting for 2 minutes. Record the data. Repeat this measurement at least three (3) times.

6.1.2 Perform a source check using a thorium lantern mantle at a previously determined position inside the shield. Count for 2 minutes. Record the data.

6.1.3 Select a sample and position it inside the shielded enclosure.

6.1.3.1 Record the sample number and the volume of the sample in the container.

6.1.3.2 Count the sample for 2 minutes.

6.1.3.3 Record the total counts measured.

6.1.4 Remove the sample and repeat step 6.1.3.

6.1.5 Repeat the background check and source check for each case of samples, not to exceed 12 samples and at the end of the counting procedure. Record the data.

6.2 Laboratory Analysis of Samples

6.2.1 Select several samples for analysis by IT/RSL.

6.2.1.1 Determine the range of the data for all samples analyzed.

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6.2.1.2 Select 2 samples with a countrate equivalent to the system background.

NOTE: Ensure that at least one of these samples was collected from a depth greater than 24".

6.2.1.3 Select 3 samples with a countrate at approximately the arithmetic average of all samples analyzed.

NOTE: As appropriate, select samples that were collected below the surface of the soil.

6.2.1.4 Select 2 samples with a countrate at approximately a 75 percentile of the samples analyzed.

6.2.1.5 Select at least 3 samples collected from depths greater than 12" where the countrate exceeded background.

6.2.2 Submit the 10 samples to RSL for gamma spectroscopy only. Measure the total uranium present in ppm, U-238 and U-235.

6.2.2.1 If the U-235 enrichment exceeds 0.72%, the task leader may select alpha spectroscopy to measure the U-234 component.

6.2.2.2 U-238 should be calculated by measuring the quantity of thorium-234 present in the sample and assumed to be in equilibrium with U-238.

6.2.2.3 Identify all significant gamma emitting isotopes measured by the gamma spectroscopy system.

6.3 <u>Correlate Field Instrument</u>

6.3.1 After performing analysis in 6.2.2, correlate the data from the laboratory (ppm total uranium) with the shielded SPA-3 using the following regression equation.

$$E = a\,(Em) + b$$

Where:

E is the lab data in ppm of total uranium
a is the slope of the line
E_m is the SPA-3 reading in average counts per minute
b is the y-axis intercept

2431

7.0 PRECISION AND ACCURACY

None

8.0 QUALITY ASSURANCE PROVISIONS

8.1 Responsible for Inspection

8.1.1 The Health Physics Services Manager, or his designee, shall inspect the work of technicians performing this procedure for completeness and adequate quality.

8.1.2 The technicians performing this procedure shall inspect data forms for accuracy and completeness and shall inspect instrument for proper operation and calibration.

8.2 Equipment Monitoring

8.2.1 The instrument being used shall be checked to see that calibration date has not expired.

9.0 CALCULATIONS

None

10.0 APPENDICES

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TITLE: Correlation of Shielded Sodium Iodide Detector with Total Uranium in Soil	NO: RSL-2007	PAGE 5 of 5
	REVISION: 0	DATE: 3/8/88

RADIATION SURVEY OF SOIL

Instrument: Eberline Model ESP-1 Serial Number 141
Detector Model SPA-3 Serial Number 405023

Location:__________ Background:__________ Counts in____ min

Date:__________ Source:__________ Counts in____ min

Each sample was counted for ___ minutes

Sample ID#	Total Counts	Sample ID#	Total Counts

* Selected for full radiological analysis

[redacted]

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ADDENDUM B

HEALTH AND SAFETY PLAN

SITE SAFETY WORKSHEET

Site Name: FMPC Date: March 1, 1988

Location: D&D Facility Area

Type of Site: (X) Industrial ( ) Construction
( ) Excavation (X) Drilling
( ) Demolition ( ) Drilling with Air

Site Status: (X) Active ( ) Inactive

If the activities involve excavation or drilling, attach a diagram showing the locations of buried utilities relative to the planned work locations. Include the sources of information.

Anticipated Activities: Surface Soil Sampling, Subsurface Sampling with a hollow stem auger drill rig, decontamination, steam cleaning.

Unusual Features: Surface and Subsurface Contamination by radioactive materials including uranium-metal.

Will personnel enter excavations deeper than five feet? No.

> If 'yes', attach a soil description and diagrams showing how the walls will be sloped or describing in detail the method of shoring. Show where spoils will be placed in relation to the excavation, and the locations of nearby heavy equipment and objects.

Heavy Equipment to be Used: Hollow stem auger drill rig and steam cleaner.

If equipment with booms or derricks is to be used, provide the voltage of overhead power lines and the source of information.

> Source of Information: R. Haaker performed inspection of work area on March 2, 1988.

Observe the following working clearance between equipment and power lines: (mark the appropriate blank)

_____ 10 feet (less than 50 kV) _____ 20 feet (less than 345 kV)

_____ 33 feet (less than 750 kV) __X__ There are no overhead power lines in the area.

Observe the following in-transit clearance between equipment and power lines: (mark the appropriate blank)

_____ 4 feet (less than 50 kV) __X__ 10 feet (less than 345 kV)

_____ 16 feet (less than 750 kV)

Describe plans for storage of any compressed gas cylinders to be used. Identify the gases.

None to be used.

Describe plans for storage of gasoline or diesel fuel on the site. give quantities of each.

Safety cans required.

Does work involve asbestos, biological agents, hazardous substances, chemical products, radioactive materials, or materials contaminated with these? Describe.

Radioactive materials. See Attachments 1 and 2. Asbestos is stored in the area.

Describe the fire hazards associated with the work activity. Attach plans of how the hazards will be controlled.

Pyrophoric uranium, hydrogen. See Attachment 5.

Does work involve confined space entry? No.

If yes, describe: ____________________

Entry is prohibited unless a Confined Space Permit is attached.

Do activities involve walking on tops of tanks, silos, or other structures? No. If yes, attach documentation of their integrity.

Protective equipment required: (X) Hard Hat, (X) Work Clothes

(X) Safety Toe Boots, ( ) Safety Glasses,

( ) Hearing Protection, (X) Other (specify):

See Attachments No. 3 and No. 4

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Monitoring Equipment Required: Smear Counter for α & β, uR meter, G-M Pancake detector, α - Scintillometer, CGI, PID. G-M detector and α - Scintillometer will be checked per requirement stated in Attachment No. 1 and No. 2.

Emergency Telephone Numbers:

Ambulance*:	738-6511 (on-site)
Police Department:	738-6511
Fire Department:	738-6511
Nearest Hospital: (w/emergency room)	

Route to clinic: (attach diagram) ______________________

____

____

____

Travel time from site: ______________________

Communications: The crews will have 2-way radios. The dispatcher can send ambulance to the work area.

Names of persons on-site that have first aid certificates:

____

Location of First Aid Kit: Located at entry to hot zone.

Location of nearest sanitary facilities and drinking water:

____

Location of Fire Extinguisher: Each drill rig will have its own fire extinguisher.

*On-site Westinghouse provides ambulance service, security and fire protection.

[redacted]

APPROVALS

Project Manager	Date
Rick Haaker* ASI Health & Safety Officer	Date
Site Safety Coordinator	Date

•Approval contingent on blanks in plan marked with being filled in. Penetration must be attached.

SITE WORKER BRIEFING

Given by: ______________________ Date: ______________

Attendees: ______________ ______________

______________ ______________

______________ ______________

______________ ______________

______________ ______________

______________ ______________

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ATTACHMENT 1

Monitoring/Dosimetry

Regular asbestos and gross alpha air samples will be collected in the worker's breathing zones.

Each person will wear a dosimeter badge.

Breathing zones and borehole head spaces will be monitored with an HNu and CGI.

[redacted]

Designers and Manufacturers of *Scientific and Industrial Instruments*

LUDLUM MEASUREMENTS, INC.
915 - 235-5494 - 235-4947 TELEX No. 466851 CD
POST OFFICE BOX 810 FAX NO. (915) 235-4672
501 OAK STREET
SWEETWATER, TEXAS, U. S. A. 79556

February 19, 1988

Mr. Richard Haaker
Advanced Sciences, Inc.
2620 San Mateo NE
Suite D
Albuquerque, NM 87110

Dear Mr. Haaker:

Per your inquiry, we will respond as follows.

The Ludlum Model 43-5 should be checked for proper operation after each mylar face change. Check the efficiency at the toe, center, and heal with an Alpha check source. The counts obtained over a one minute period should be within ±10% at all three points. Background of the Model 43-5 should be below 3 CPM at the operating voltage. The efficiency of the Model 43-5 is approximately 25% 2 Pi.

In regards to calibration, Ludlum Measurements recommends at least one year calibration. Because of radioactive sources or Government regulated agencies, one may need to consult the nearest Health Physicist or Radiation Safety Officer to find out proper calibration period. If equipment is used daily, a check source may be purchased to check the calibration of the instrument before each use.

If we may be of further service, please feel free to call on us.

Yours truly,

Chris Maxwell

Chris Maxwell
Nuclear Instrument Sales

CM-lb

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ATTACHMENT 3

Protective Clothing Requirements

- Cotton coveralls
- One pair of Saranex coveralls
- Boots (safety toe), boot covers, and PE liners between boots and covers. Liners taped to inner tyvek
- Two pairs of examination gloves, the inner pair taped to the inner tyvek
- One pair of chemical protective gloves
- Hard hat

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ATTACHMENT 4

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Decontamination Plan (Personnel)

Four zones will constitute the decontamination line. The decontamination sequence will consist of 10 steps. The decontamination sequence and the zone where each step will be completed are as follows:

Step No.	Step	Zone
1	Remove outer tape	Hot 1
2	Remove boot covers	Hot 1
3	Remove saranex[1,2]	Hot 2
4	Remove outer gloves	Hot 2
5	Remove outer exam gloves	Gray
6	(Wipe off APR)[3]	Gray
7	(Remove APR)[3]	Gray
8	Remove inner exam gloves	Gray
9	Personnel contamination survey	Clean
10	Exit to support zone	Support

[1]Persons may not enter Hot Zone 2 while wearing boot covers. Saranex will not touch any surface in Hot Zone 1.

[2]Persons may not enter the gray zone while wearing saranex. Work boots will not touch any surface in Hot Zone 2.

[3]If APR is worn.

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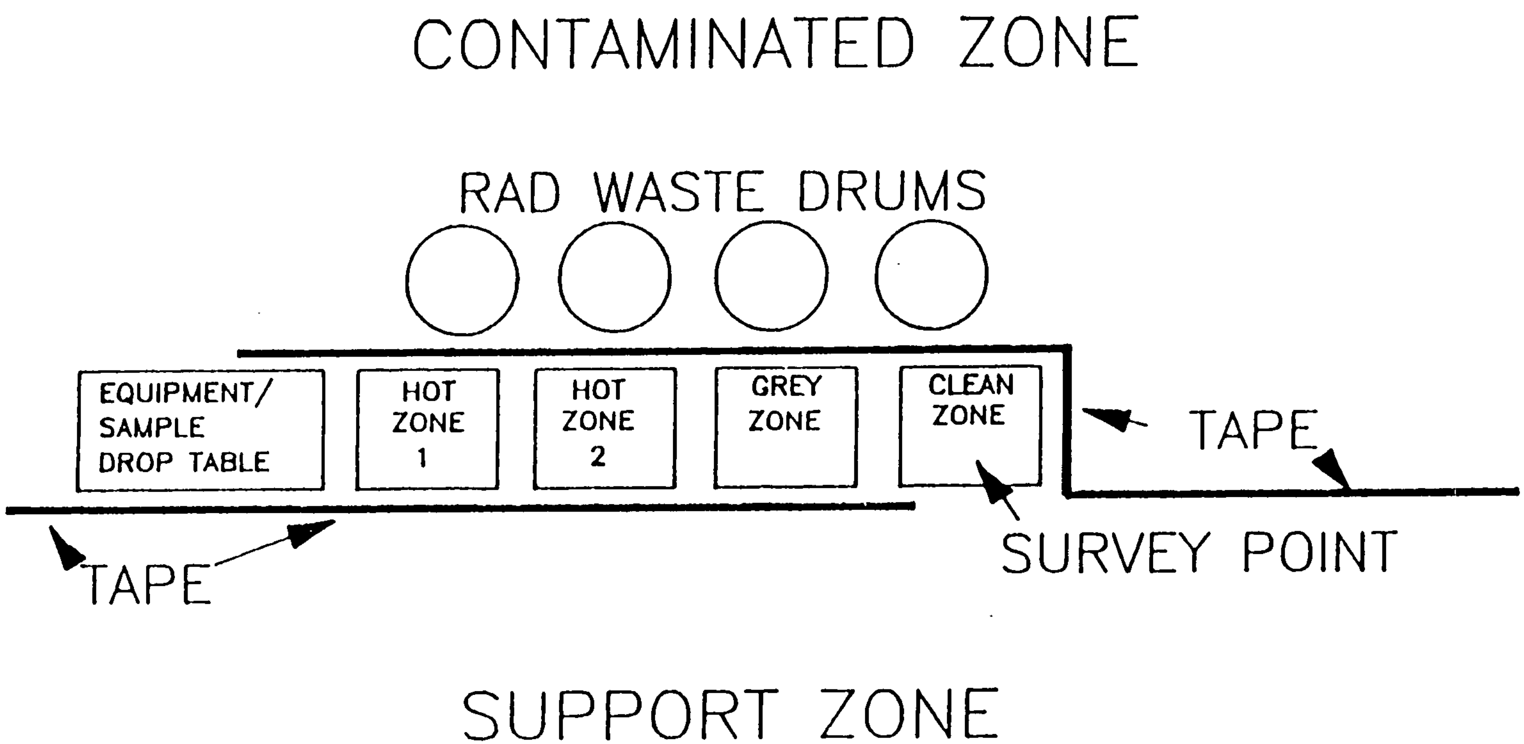
ATTACHMENT 4 (CONT.)

DIAGRAM OF DECON LINE



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ATTACHMENT 5 [redacted]

Contamination Control Plan

1. Whenever possible, equipment will be bagged and sealed before entering the contaminated area.

2. Vehicles (other than the drill rig) will not go into the contaminated area.

3. No eating, drinking, or smoking in the contaminated area.

4. Persons will be frisked each time before drinking water.

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Additional Monitoring Well Program

This Work Plan addendum presents an analysis of the current need for the installation of additional monitoring wells under the RI/FS. This work plan addendum specifies the locations and justifications for the installation of 19 high priority monitoring wells at both on-site and off-site locations. The completion of the longitudinal profile survey of Paddy's Run is included in this addendum because it is critical to the interpretation of the interaction between water in the creek and ground water in the aquifer. The wells and the survey are required to answer questions that have arisen from a detailed analysis of sample results and water table observations collected over the two years. All work will be conducted under the provisions of the RI/FS Work Plan dated March 1988.

This discussion presents 19 high priority wells for which there is known justification and need as well as 12 low priority wells which are likely to be required in the future to complete the RI/FS. The ultimate need for the 12 low priority wells can only be determined by evaluating the water table and initial sampling results from the high priority wells and completion of the Production and Additional Suspect Area investigation. The low priority wells are presented here to estimate the total number of wells that will be required to complete the RI/FS. Only the priority wells are funded and approved for installation at this time. An RI/FS Work Plan addendum for the additional monitoring wells in the South Plume Area was submitted to US EPA and Ohio EPA on December 15, 1989. This Work Plan addendum incorporates those South Plum wells, as discussed in a January 3, 1990 meeting with US EPA and Ohio EPA. The December 15, 1989 Work Plan is, therefore, being voided and replaced with this addendum.

Justification for individual wells is presented in terms of the needs of individual operable units. The locations of all the wells are shown in Figure 1. Table 1 indicates if the wells are a high or low priority.

All wells will be installed using current procedures for the installation of four inch diameter, 2000- and 3000-series wells in the sand and gravel aquifer. The wells will be sampled twice with a two month interval between sampling events. Samples will be analyzed for the full radionuclides and the general ground water parameters as defined in the RI/FS Work Plan. Therefore, only regulatory concurrence for the location of the wells and the frequency of sampling is required.

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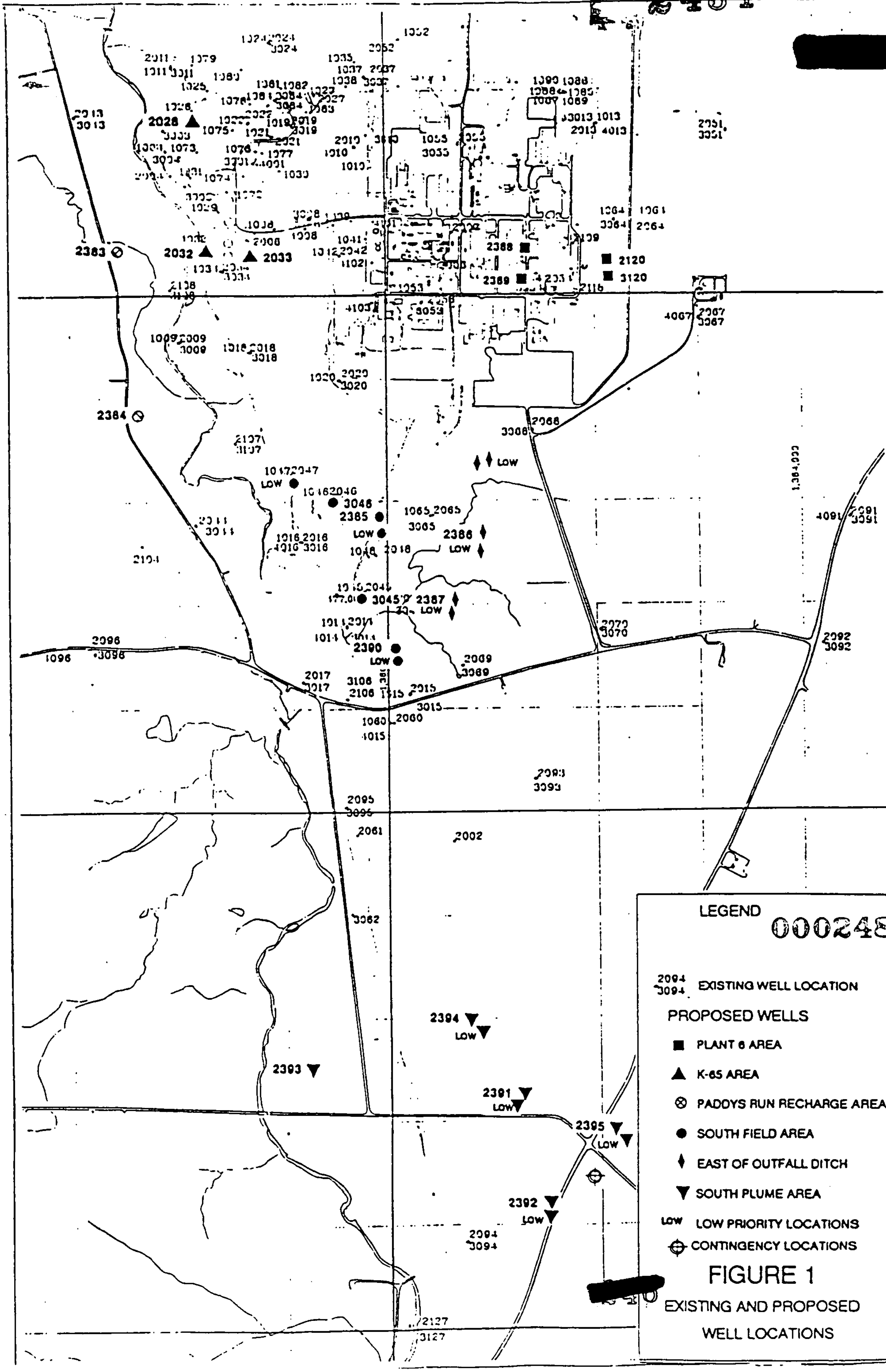

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FIGURE 1
EXISTING AND PROPOSED
WELL LOCATIONS

TABLE 1

WELL INSTALLATION PRIORITY

	HIGH	LOW
Operable Unit 3:		
	2388	
	2389	
	2120	
	3120	
Operable Unit 1 & 4:		
	2028	2033
	2032	
Operable Unit 5:		
	2383	
	2384	
	3046	
	3045	3047
	2385	3385
	2390	3390
	2386	3386
	2387	3387
		Possible new well pair
South Plume Area:		
	2391	3391
	2392	3392
	2393	
	2394	3394
	2395	3395

Operable Unit 3

The commitments of the Production and Additional Suspect Area Work Plan specify that if contamination is found in the 2000-series wells on the downgradient side of a facility, additional wells will be installed on the upgradient side of the facility to pinpoint the source of the contamination. Elevated uranium levels in the tens of micrograms per liter range are present in the aquifer in wells 2118 and 2109 on the downgradient side of Plant 6. The 2000 series wells further west in the Production Area indicate that the contamination is not coming from an area upgradient of the Production Area. Therefore, the contingency wells specified in the work plan should be installed on the west side of Plant 6 as Wells 2388 and 2389 at the locations shown in Figure 1. These wells will verify the contamination is only associated with Plant 6.

In addition, a condition of the Work Plan Addendum for the 24-well program specifies a well cluster on the downgradient side of Plant 6 if contamination is found in Wells 2118 or 2109. Since both of these wells indicate elevated levels of uranium, the well cluster should be installed to help define the plume. Given the east northeast ground water gradient in the area, wells 2120 and 3120 should be installed east of Plant 6 in the grass area in front of the new receiving warehouse as shown in Figure 1. This will help to bound the plume under Plant 6 to the east.

Operable Units 1 & 4

Two wells are required under Operable Units 1 and 4 that will also provide useful data for Operable Unit 5. Well 2028 is required at location 028 to provide an upgradient data point between Paddy's Run and the waste storage pits for Operable Unit 1. Well 2032 should be installed adjacent to existing well 1032, on the west side of the K-65 Silos, to determine if there is vertical migration of the uranium found in well 1032 to the sand and gravel aquifer below. Well 2033 is a low priority well to be installed on the downgradient side of the K-65 silos if well 2032 shows contamination in the aquifer. The sampling program beneath the silos indicates that releases to ground water have occurred.

Operable Unit 5

Paddy's Run Recharge Area

Water table data collected between December 1988 and July 1989 has documented a mounding effect on the water table due to recharge to the sand and gravel aquifer from Paddy's Run. The magnitude of this mound is much greater than had been expected and the impact of the recharge is also quite complex. The complexity arises because the recharge causes very large changes in local gradients in the aquifer. Current data indicate that there is a potential for a reversal of the gradient along the western boundary of the FMPC during the months of maximum recharge. This means that recharge from Paddy's Run could cause uranium to migrate to the west for some months of the year. The westerly gradient is opposite to the normal eastward gradient direction. While the net migration of the uranium will be to the east, this potential reversal and its impact must be understood to evaluate the risk to receptors on the western edge of the FMPC.

Existing wells at locations 009 and 108 show the highest water levels during the recharge event and provide data showing the vertical magnitude and duration of the recharge. Figure 2 is a hydrograph showing the magnitude of the change in the water level in wells 2009 and 3009 for the period from January 1988 through July 1989. Figure 3 is a hydrograph for wells 2108 and 3108 that shows the same peak water table level. The wells at location 108 were installed in March of 1989.

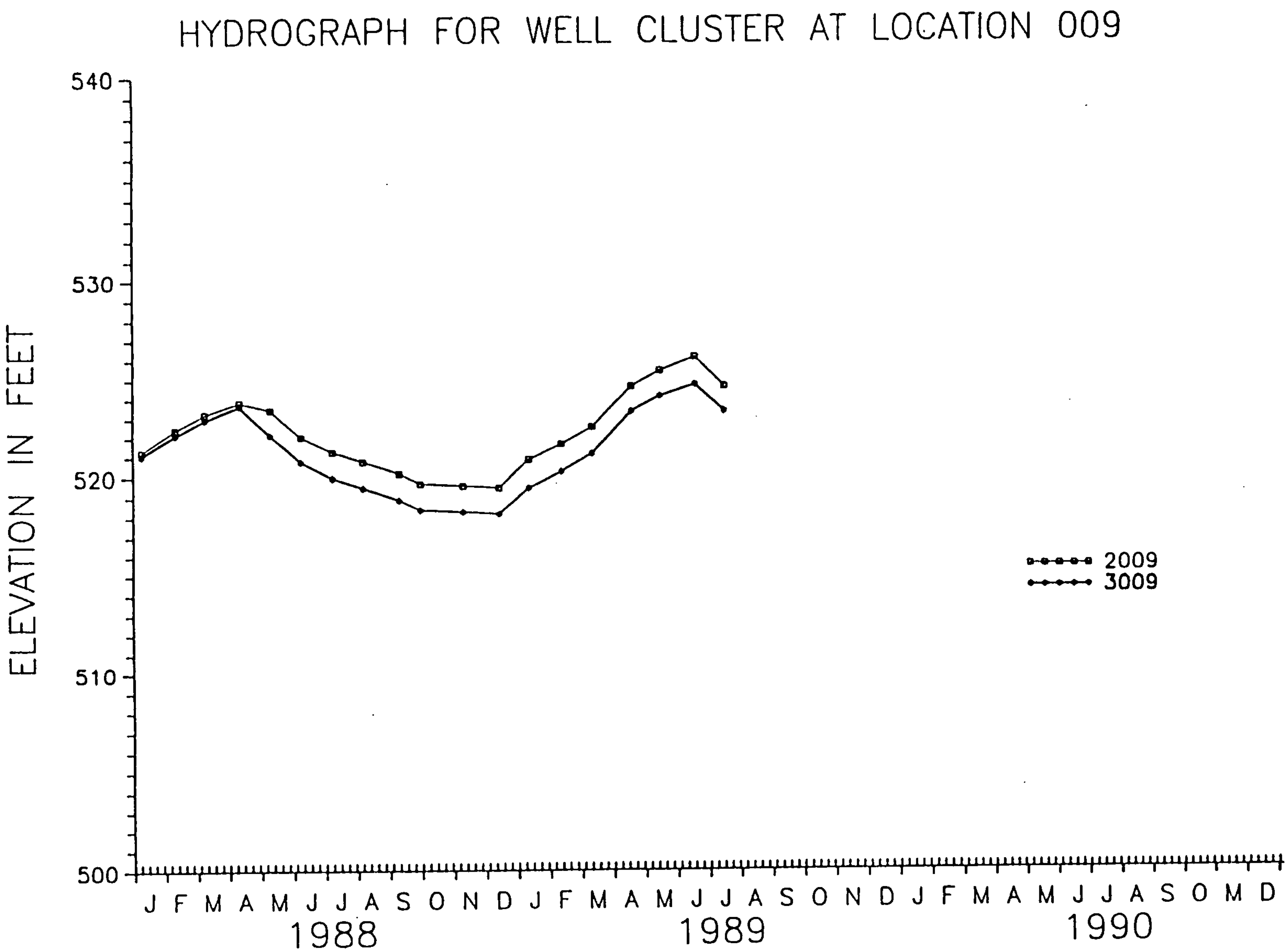
Two 2000-series wells are proposed for the western boundary of the FMPC as shown in Figure 1. Wells 2383 and 2384 will provide the water level and water chemistry data required to determine the significance and extent of the temporary ground water gradient reversal.

South Field Area

Ground water gradient changes due to recharge from Paddy's Run also appear to have a significant impact on the interpretation of data from wells in the South Field Area. The direction of the ground water gradient in the area between well location 047, northwest of the South Field, and location 069, near Willey Road, has been observed to change up to 90 degrees due to the recharge from Paddy's Run. Potentially, this means that a well that is downgradient from a body of contaminated water during some months may not be downgradient during all months.

Figure 4 is the hydrograph for the wells at location 049, which is adjacent to the confluence of the outfall ditch and Paddy's Run. The hydrograph also shows the total uranium values for the six samples that have been collected from well 2049. The correlation between low water level and low uranium levels could be caused by a change in the direction of the ground water gradient. During recharge the gradient is to the south. During low water level conditions the gradient is more to the east. Other wells on the site have similarly changing uranium values. Only long term monitoring and careful analysis of the relationship between recharge, water levels, and uranium levels will confirm if variations in the direction of the water table gradient are contributing to this apparent uranium concentration variation.

Well 2046, which was installed as part of the 24-well program, has had the highest total uranium level of any well outside the Waste Storage Area. When the gradient was west to east the value was 851 ug/l. When the gradient was southeast or northeast the uranium values were 232 and 309 ug/l, respectively. Wells 2047 and 2045,



HYDROGRAPH FOR WELL CLUSTER AT LOCATION 009
540
530
520
510
500
ELEVATION IN FEET
J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O M D
1988
1989
1990
2009
3009

FIGURE 2

HYDROGRAPH FOR WELL CLUSTER AT LOCATION 108

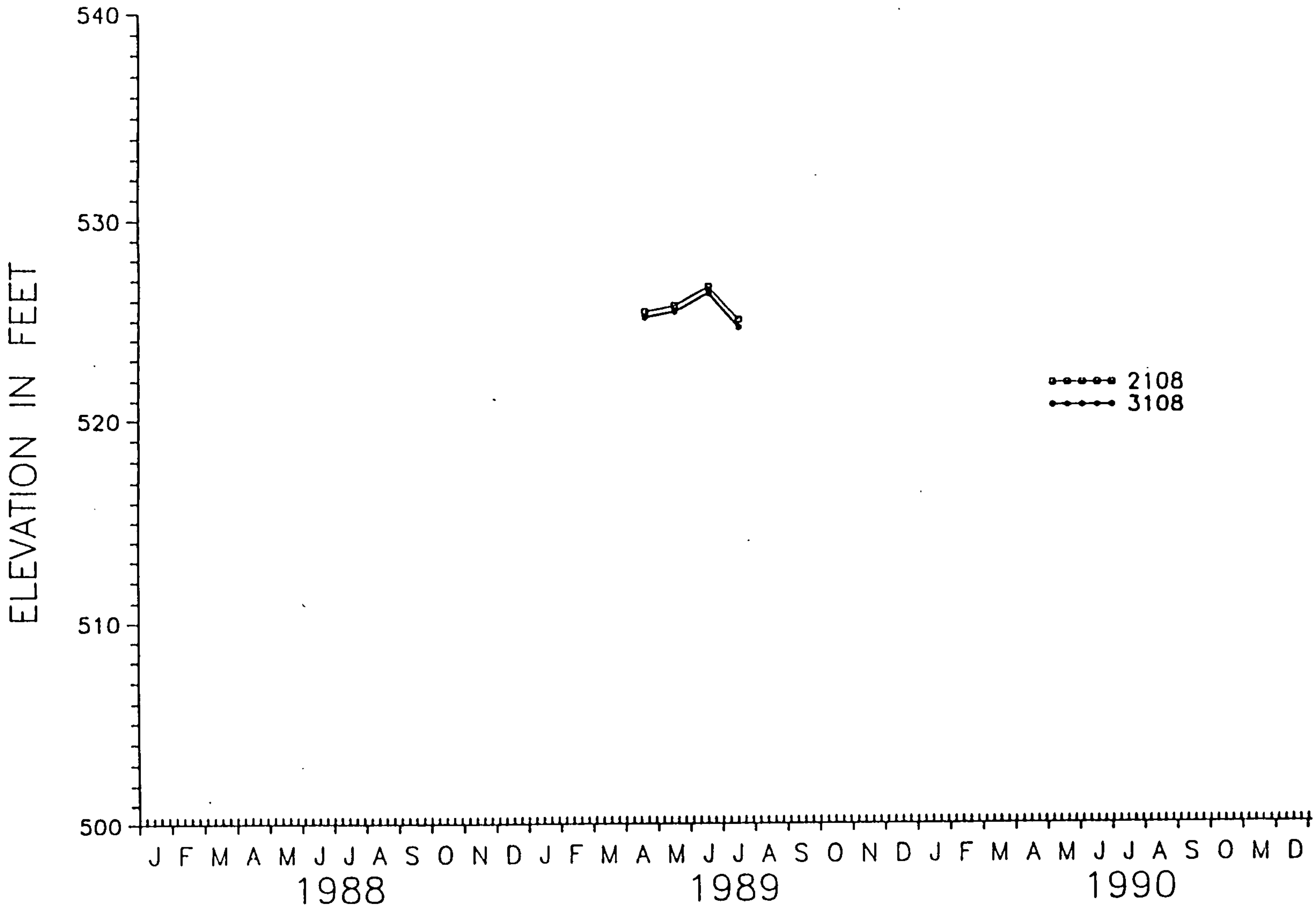


FIGURE 3

HYDROGRAPH AND TOTAL URANIUM DATA FOR WELL CLUSTER AT LOCATION 049

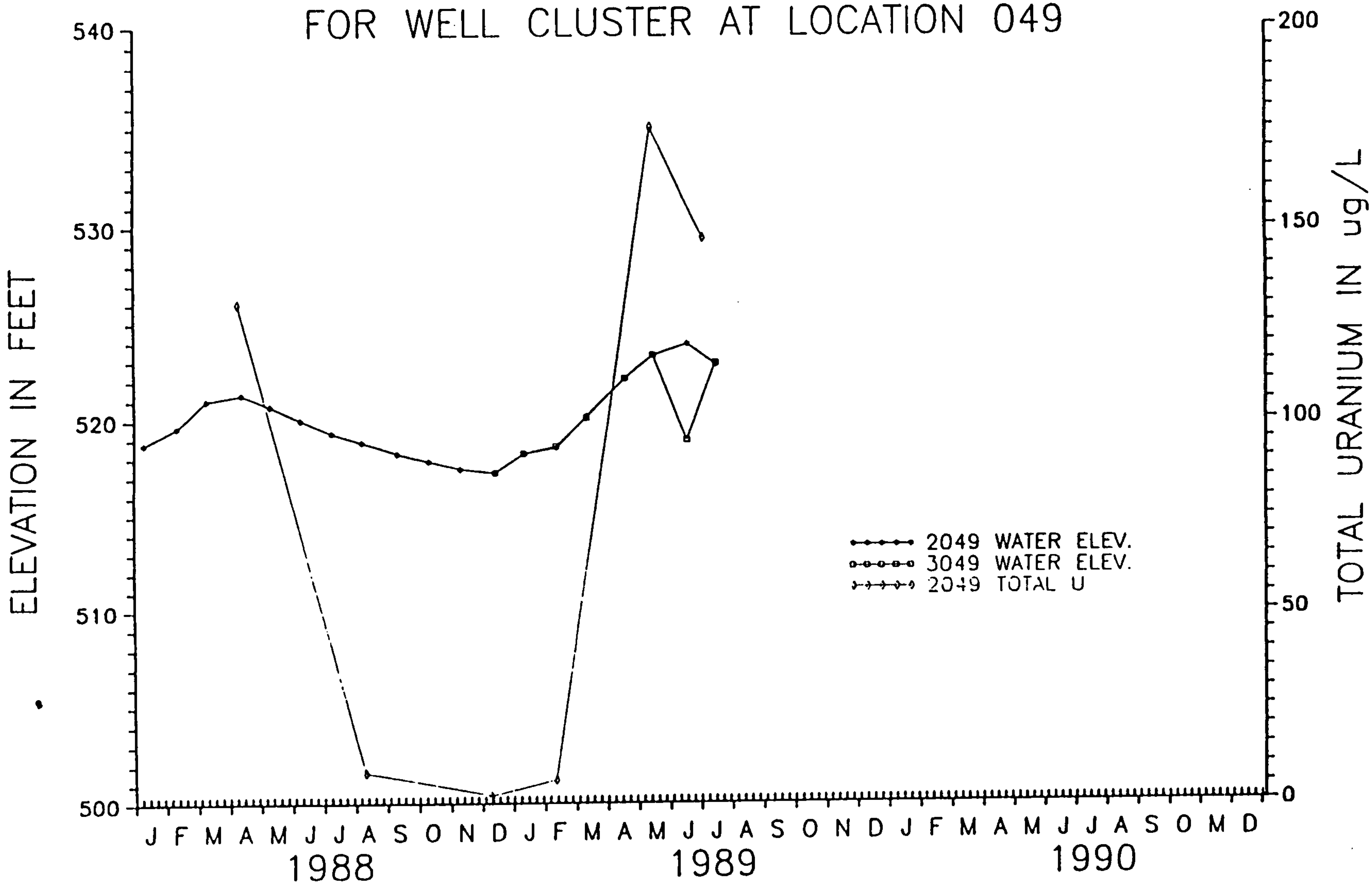


FIGURE 4

drilled in the area of the South Field as part of the 24-well program, have also shown elevated levels of uranium. As shown in Figure 1, wells 3046 and 3045 should be added to the existing well clusters to determine the vertical extent of the uranium plume present in the 2000-series well at these locations. These wells will satisfy a commitment made in the RI/FS Work Plan to install deeper wells if high levels of uranium are found in any wells. If uranium is detected in 3046, then an additional 3000-series well would be required at location 047, which is upgradient from location 046. Well 3047 is considered low priority.

A new well, 2385, should be installed half way between location 046 and 065 to monitor the easterly extent of contamination indicated at location 046. If contamination is found in well 2385 then well 3385 will be required to determine the vertical extent of contamination at that site. Well 3385 is currently considered low priority.

A major unresolved question is whether the uranium plume in the South Field is an ongoing source for the South Plume. The model predicts that the South Plume is very narrow because of the relatively high permeability of the sand and gravel aquifer. Highly permeable aquifers do not present much resistance to flow so the contaminant plume is not forced to disperse laterally. If the uranium plume under the South Field is part of the South Plume, the implications to the FS and the risk assessment are significant. In order to resolve this issue, well 2390 should be installed half way between location 045 and 015. This is where the plume connection must be if the uranium in the two areas is continuous from well 2046 to the South Plume. If contamination is found here then well 3390 will be required to determine the extent of vertical migration. Well 3390 is currently considered low priority.

<u>East of the Outfall Ditch</u>
Infiltration of uranium bearing water through the bottom of the Storm Water Outfall Ditch is generally accepted as the pathway for the introduction of uranium into the sand and gravel aquifer. At the time the original work plan was written, it was assumed that ground water under the outfall ditch flowed to the south. Therefore, monitoring wells were located to measure contamination moving to the south. Water table records from January 1988 through July 1989 indicate, however, that the southerly flow exists during periods of recharge. During low flow periods, the gradient is to the east and could result in a narrow, nor-south trending plume similar to that found south of the FMPC. There are currently no monitoring wells located along the eastern side of the outfall ditch that would have detected such a plume.

Wells 2386 and 2387 are proposed to verify that the gradient shift occurs and to determine if any uranium is migrating in an easterly direction from the outfall ditch. Current data suggest that the easterly gradient is neither steep nor present for very much of the year. Therefore, any uranium plume should not have migrated far from the outfall ditch. These two wells will provide the data regarding the width and magnitude of the ground water mound that results from recharge along the outfall ditch. They will also indicate if uranium has migrated from the outfall ditch to the east. As with the other proposed 2000-series wells, if elevated uranium is present in wells 2386 and 2387, a 3000-series well would be required in either or both locations. If elevated uranium is found in both 2386 and 2387 an additional well pair should be installed north of location 386 near the southeastern corner of the new Storm Water Retention Basin. Wells 3386, 3387, and the additional well pair are considered low priority.

South Plume Area

There are two issues to be addressed in relation to the South Plume. Emphasis has been on the plume that appears to have resulted from infiltration along Paddy's Run when there was uncontrolled runoff from the plant. The highest concentrations of uranium in this plume exceed 250 ug/l. The second issue is the lower levels of uranium which entered the creek system and infiltrated along the length of Paddy's Run downstream from the FMPC. The southernmost well installed for the RI/FS (well 2127) has had total uranium values of 37, 6, and 14 ug/l when sampled in April, May, and July of 1989. It is not clear what is causing this variation in uranium values, but it does seem likely that this variation is related to recharge occurring in the lower stretch of Paddy's Run.

The seven wells have recently been installed in the South Plume well program and data will be available in February 1990 from these wells. In addition data may become available from the Paddy's Run Road Site (PRRS) RI/FS. The location of wells and piezometers in the PRRS RI/FS will help with the interpretation of events along Paddy's Run. The possibility exists that unexpected findings will be forth coming from this data and additional wells will be required to evaluate risk to receptors in the area.

Current model interpretations indicate that the main plume has a long slender shape and that it extends a considerable distance to the southeast as shown in Figure 5. The location of the southern third of the plume is farther to the east than any drilling program proposed by either RI/FS. Well 2391 should be installed at the location shown in Figure 1, to determine if the model prediction of the southern tip of the plume is accurate. The appearance of 4.5 ug/l uranium in well 2094 in January 1988, while not a high value, indicates that uranium is present in the area. Location 094 is downgradient from the location of the two proposed wells in the PRRS RI/FS.

In the event that well 2391 contains elevated levels of uranium in excess of 50 ug/l then well 2392 should be installed at the

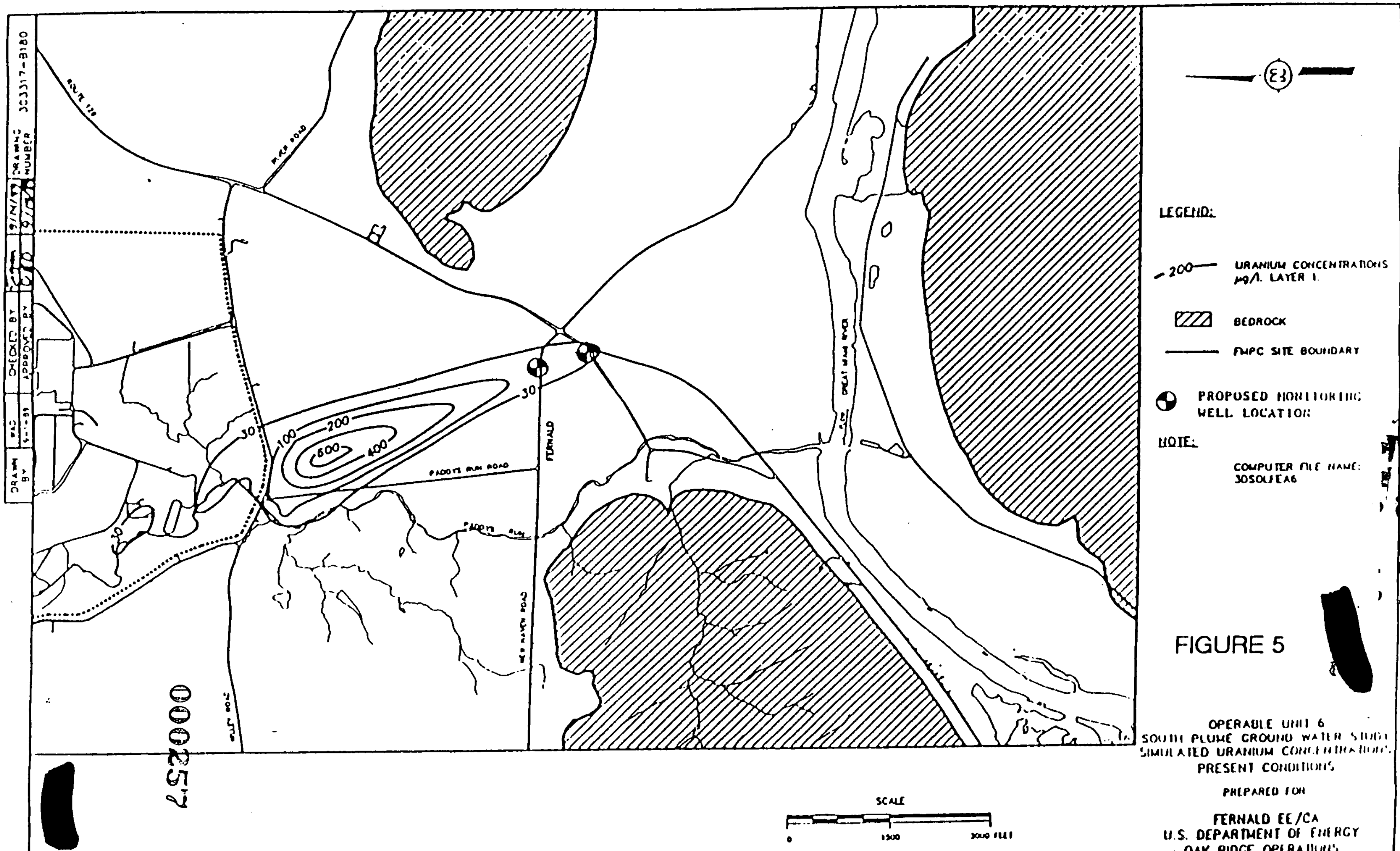


FIGURE 5

OPERABLE UNIT 6
SOUTH PLUME GROUND WATER STUDY
SIMULATED URANIUM CONCENTRATIONS
PRESENT CONDITIONS

PREPARED FOR

FERNALD EE/CA
U.S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS

INTERNATIONAL TECHNOLOGY CORPORATION

DRAWING NUMBER 303317-B180

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location shown in Figure 1, to determine the lateral extent of the plume and well 3391 installed to determine the vertical extent of the plume. If uranium is less than 50 ug/l then the next 2000 series well should be installed northwest of well 2391. In either case the result will be wells at adjacent locations that define or closely locate the southern extent of the plume and provide the necessary data to complete the calibration of the transport model.

Initial water level data from the PPRS RI/FS piezometers indicate that well 2393 should be installed on Rutgers Nease property as shown in Figure 1. This well will fill a large data gap between the other PRRS wells and the Fernald RI/FS wells and should complete the definition of the western boundary of the uranium plume.

Location 391 and the location to the northwest are on land owned by Harrison Poured Foundations Inc. Location 392 is on Century Farms property. One additional well to the east in the vicinity of Highway 128 will be required to verify the eastern boundary of the plume. A possible well location as shown on Figure 1 is also on Century Farms Property. Wells 3391, 3392, 3394, and 3395 are considered low priority at this time.

In order to determine what well locations are best the wells in this area will be drilled in the following sequence. Well 2391 will be drilled first and developed. A sample will be collected and sent to the laboratory for total uranium on a rush basis. Well 2393 will be drilled while the Well 2391 sample is in the laboratory. The results of this sample will determine if the third well is drilled northwest or southeast of well 2391. The determination of the need for and proper location of the remaining wells will be based on water levels readings and uranium concentrations in wells 2391 and 2392. The data will be discussed with the regulatory agencies as part of the decision making process.

Paddy's Run Profile Survey

The monthly water table records and quarterly water quality data show that the recharge from Paddy's Run has a tremendous bearing on ground water patterns and contaminant migration. The distance at any point along Paddy's Run between the bottom of the stream channel and the water table is therefore very important. A detailed survey of the longitudinal profile of Paddy's Run was initiated under a Task 9 order in the early spring of 1989. The survey work was completed for most of the length of Paddy's run on the FMPC property. The survey was terminated due to funding limitations before any work was done off-site. We propose that the survey be completed to provide an accurate profile of Paddy's Run so the relationship between flow in the stream and ground water levels may be more accurately used in the interpretation of data and the ground water modeling effort.

SOUTH PLUME GROUND WATER SAMPLING

Work Plan Addendum 39

The following sampling program is to be conducted using the sampling procedures, laboratories and analytical protocols as specified in the March 1988 Fernald remedial Investigation and Feasibility Study Work Plan. The purpose of the sampling is to collect ground water quality data with respect to the South Plume in addition to the two quarterly samples originally specified in earlier work plan addendums.

A sample will be collected from each of 51 wells specified in Table 1 and indicated on Figure 1. The samples will be analyzed for full radiological parameters and the general ground water parameters. Wells 2015, 2060, 2095, and 2106 will also be sampled for full HSL analyses.

TABLE 1

SOUTH PLUME MONITOR WELLS

2000 SERIES	3000 SERIES
2002	
2014	3014
2015*	3015
2016	3016
2017	3017
2018	3018
2020	3020
2044	3044
2045	
2046	
2047	
2048	
2049	3049
2060*	
2061	
	3062
2065	3065
2068	3068
2069	3069
2070	3070
2091	3091
2092	3092
2093	3093
2094	3094
2095*	3095
2096	3096
2104	
2106*	3106
2107	3107
2127	3127

* One time full HSL analysis.

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Document Change Request No. 59

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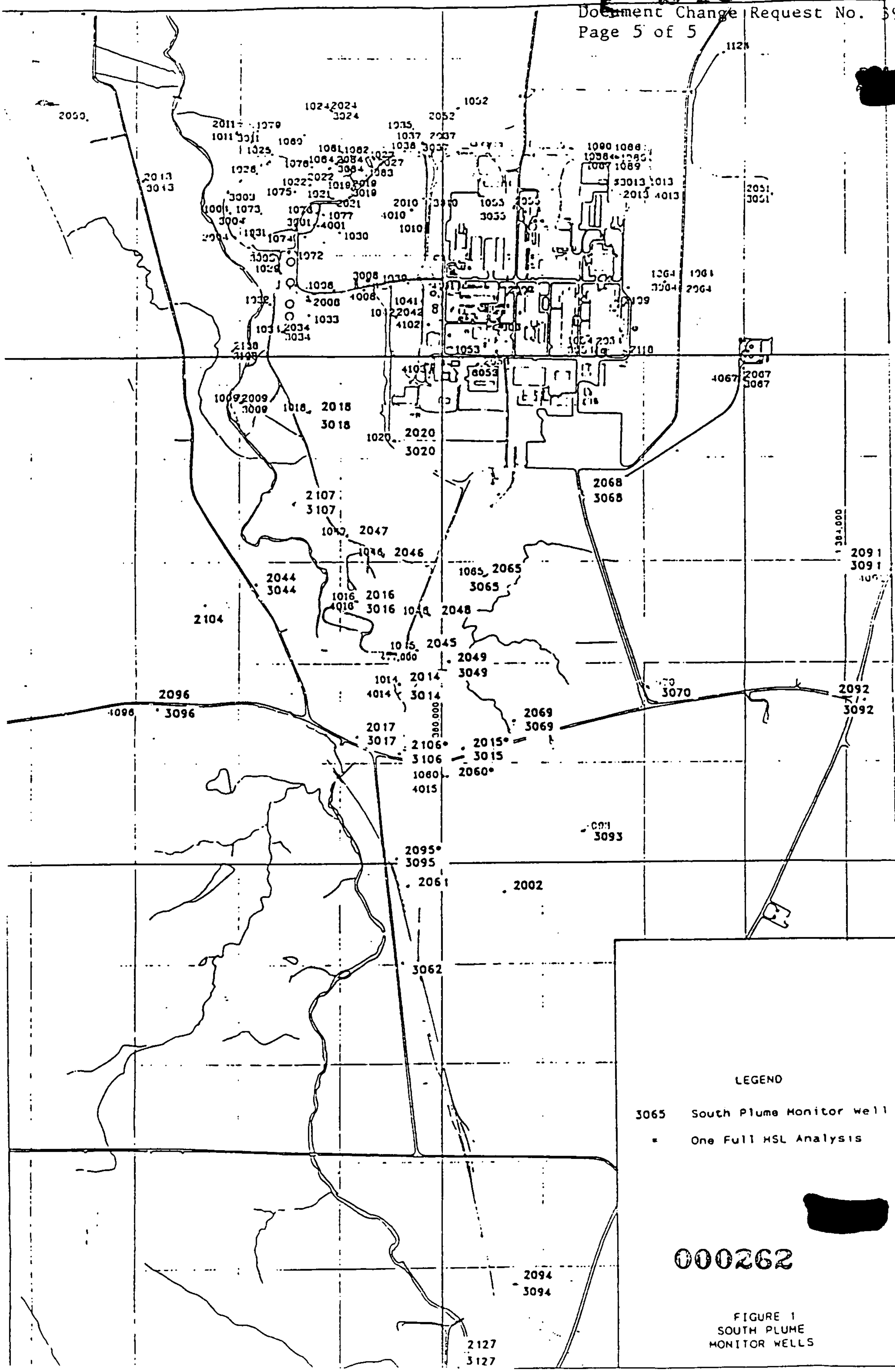

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FIGURE 1
SOUTH PLUME
MONITOR WELLS

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DOCUMENT CHANGE REQUEST NO. 43

ADDENDUM FOR SIX ADDITIONAL WELLS ALONG PADDY'S RUN

FOR THE

RI/FS
WORK PLAN

JULY 1990

2431

DOCUMENT CHANGE REQUEST NO. 43

The data from Rounds 4 and 5 as well as the initial sampling from the seven south Plume wells, installed in late 1989, have been reviewed and evaluated. This review indicates that there is a need for four high priority wells and possibly two low priority wells along Paddys Run. The attached figure shows the locations of the currently authorized 31 Well Program as well as the proposed six additional wells.

As has been discussed with the US and Ohio EPA's the data from location 125 in the South Plume area indicate the need for additional wells to define the vertical and lateral extent of the contamination at location 125. We are proposing the addition of a 4000-series well at location 125 to determine the vertical extent of the contamination found in wells 2125 and 3125. We are also proposing the installation of a new well cluster to the west of location 125. The new well cluster will consist of Wells 2396 and 3396 as shown on the attached figure.

Table 1 shows the results of ground water sampling Rounds 4 and 5 for the wells at location 108 west of the K-65 Silos. The samples from both the 2- and 3000- series wells yielded values of total uranium in the low thirties of parts per billion. The magnitude of the uranium values is not by itself alarming. What is alarming is the fact that the location is on the upgradient side of Paddys Run. The location is definitely within the area where the greatest impact of the recharge from Paddys Run occurs. It appears that the recharge is displacing the uranium plume downward and outward in all directions at this location. Well 3009 located approximately 500 feet south of Well 3108 and Well 3034 located approximately 550 feet east of Well 3108 have consistently had uranium values of less than five parts per billion.

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TABLE 1
TOTAL URANIUM IN GROUND WATER
(PARTS PER MILLION)

WELL	ROUND 4	ROUND 5
2108	32	32
3108	31	33

It is proposed that Well 4108 be installed at location 108 as a high priority well. The presence of uranium in the slightly upgradient location increases the possibility that uranium could be found in Wells 2383 and 2384 currently being installed as part of the 31 Well Program. It is therefore proposed that Wells 3383 and 3384 be added to the low priority wells. in the event uranium is found at either Well 2383 or 2385, in significant quantities a decision as to weather to proceed or not with installation of 3000 series wells can be made quickly. The attached figure shows the locations of wells 4108, 3383 and 3384.

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Additional Monitoring Well Program

This Work Plan addendum presents an analysis of the current need for the installation of additional monitoring wells under the RI/FS. This work plan addendum specifies the locations and justifications for the installation of 19 high priority monitoring wells at both on-site and off-site locations. The completion of the longitudinal profile survey of Paddy's Run is included in this addendum because it is critical to the interpretation of the interaction between water in the creek and ground water in the aquifer. The wells and the survey are required to answer questions that have arisen from a detailed analysis of sample results and water table observations collected over the two years. All work will be conducted under the provisions of the RI/FS Work Plan dated March 1988.

This discussion presents 19 high priority wells for which there is known justification and need as well as 12 low priority wells which are likely to be required in the future to complete the RI/FS. The ultimate need for the 12 low priority wells can only be determined by evaluating the water table and initial sampling results from the high priority wells and completion of the Production and Additional Suspect Area investigation. The low priority wells are presented here to estimate the total number of wells that will be required to complete the RI/FS. Only the priority wells are funded and approved for installation at this time. An RI/FS Work Plan addendum for the additional monitoring wells in the South Plume Area was submitted to US EPA and Ohio EPA on December 15, 1989. This Work Plan addendum incorporates those South Plum wells, as discussed in a January 3, 1990 meeting with US EPA and Ohio EPA. The December 15, 1989 Work Plan is, therefore, being voided and replaced with this addendum.

Justification for individual wells is presented in terms of the needs of individual operable units. The locations of all the wells are shown in Figure 1. Table 1 indicates if the wells are a high or low priority.

All wells will be installed using current procedures for the installation of four inch diameter, 2000- and 3000-series wells in the sand and gravel aquifer. The wells will be sampled twice with a two month interval between sampling events. Samples will be analyzed for the full radionuclides and the general ground water parameters as defined in the RI/FS Work Plan. Therefore, only regulatory concurrence for the location of the wells and the frequency of sampling is required.

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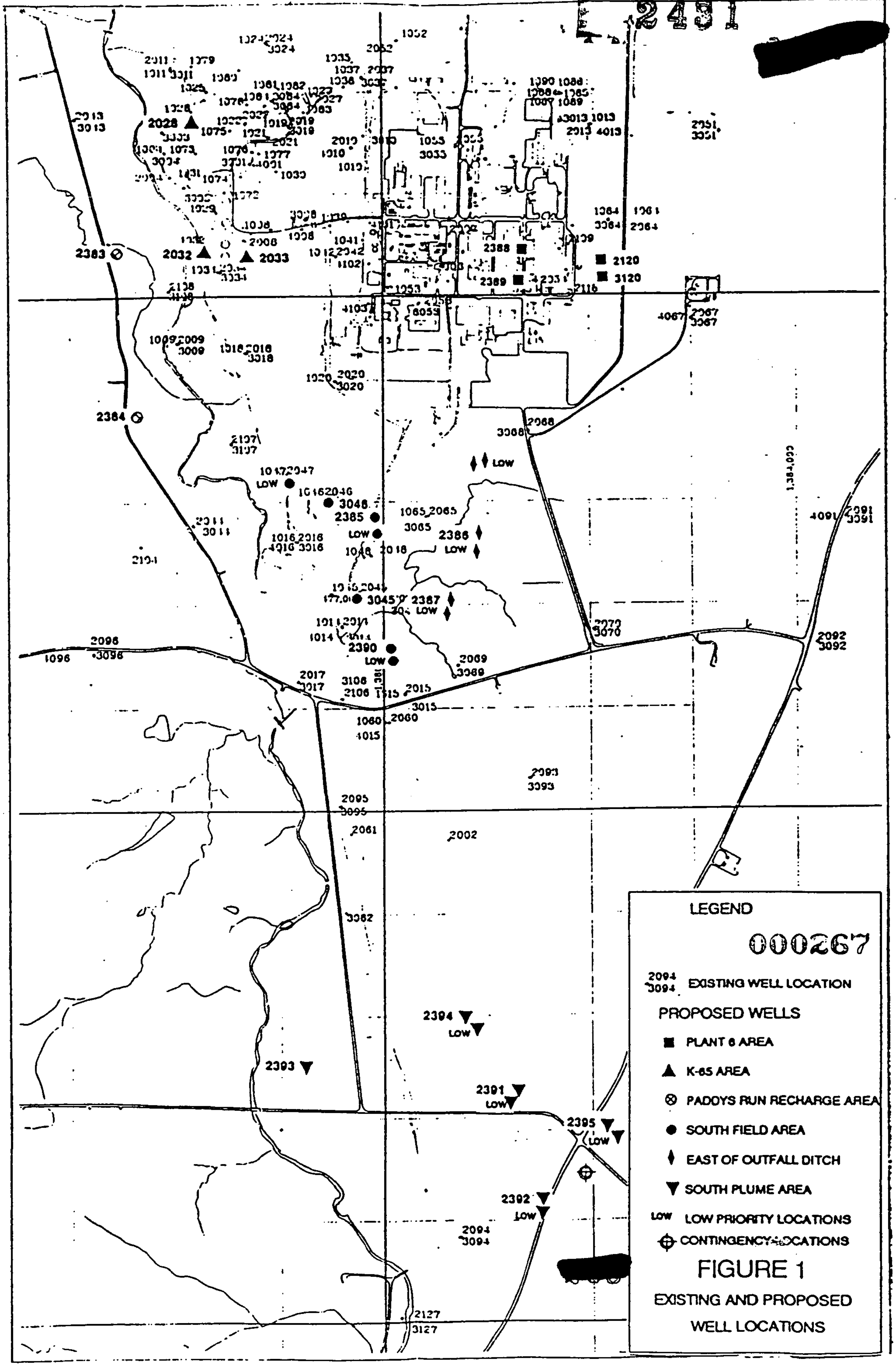

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EXISTING AND PROPOSED
WELL LOCATIONS

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	2384	
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	3045	3047
	2385	3385
	2390	3390
	2386	3386
	2387	3387
		Possible new well pair
South Plume Area:		
	2391	3391
	2392	3392
	2393	
	2394	3394
	2395	3395

Operable Unit 3

The commitments of the Production and Additional Suspect Area Work Plan specify that if contamination is found in the 2000-series wells on the downgradient side of a facility, additional wells will be installed on the upgradient side of the facility to pinpoint the source of the contamination. Elevated uranium levels in the tens of micrograms per liter range are present in the aquifer in wells 2118 and 2109 on the downgradient side of Plant 6. The 2000 series wells further west in the Production Area indicate that the contamination is not coming from an area upgradient of the Production Area. Therefore, the contingency wells specified in the work plan should be installed on the west side of Plant 6 as Wells 2388 and 2389 at the locations shown in Figure 1. These wells will verify the contamination is only associated with Plant 6.

In addition, a condition of the Work Plan Addendum for the 24-well program specifies a well cluster on the downgradient side of Plant 6 if contamination is found in Wells 2118 or 2109. Since both of these wells indicate elevated levels of uranium, the well cluster should be installed to help define the plume. Given the east northeast ground water gradient in the area, wells 2120 and 3120 should be installed east of Plant 6 in the grass area in front of the new receiving warehouse as shown in Figure 1. This will help to bound the plume under Plant 6 to the east.

Operable Units 1 & 4

Two wells are required under Operable Units 1 and 4 that will also provide useful data for Operable Unit 5. Well 2028 is required at location 028 to provide an upgradient data point between Paddy's Run and the waste storage pits for Operable Unit 1. Well 2032 should be installed adjacent to existing well 1032, on the west side of the K-65 Silos, to determine if there is vertical migration of the uranium found in well 1032 to the sand and gravel aquifer below. Well 2033 is a low priority well to be installed on the downgradient side of the K-65 silos if well 2032 shows contamination in the aquifer. The sampling program beneath the silos indicates that releases to ground water have occurred.

Operable Unit 5

Paddy's Run Recharge Area

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Ground water gradient changes due to recharge from Paddy's Run also appear to have a significant impact on the interpretation of data from wells in the South Field Area. The direction of the ground water gradient in the area between well location 047, northwest of the South Field, and location 069, near Willey Road, has been observed to change up to 90 degrees due to the recharge from Paddy's Run. Potentially, this means that a well that is downgradient from a body of contaminated water during some months may not be downgradient during all months.

Figure 4 is the hydrograph for the wells at location 049, which is adjacent to the confluence of the outfall ditch and Paddy's Run. The hydrograph also shows the total uranium values for the six samples that have been collected from well 2049. The correlation between low water level and low uranium levels could be caused by a change in the direction of the ground water gradient. During recharge the gradient is to the south. During low water level conditions the gradient is more to the east. Other wells on the site have similarly changing uranium values. Only long term monitoring and careful analysis of the relationship between recharge, water levels, and uranium levels will confirm if variations in the direction of the water table gradient are contributing to this apparent uranium concentration variation.

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HYDROGRAPH FOR WELL CLUSTER AT LOCATION 009

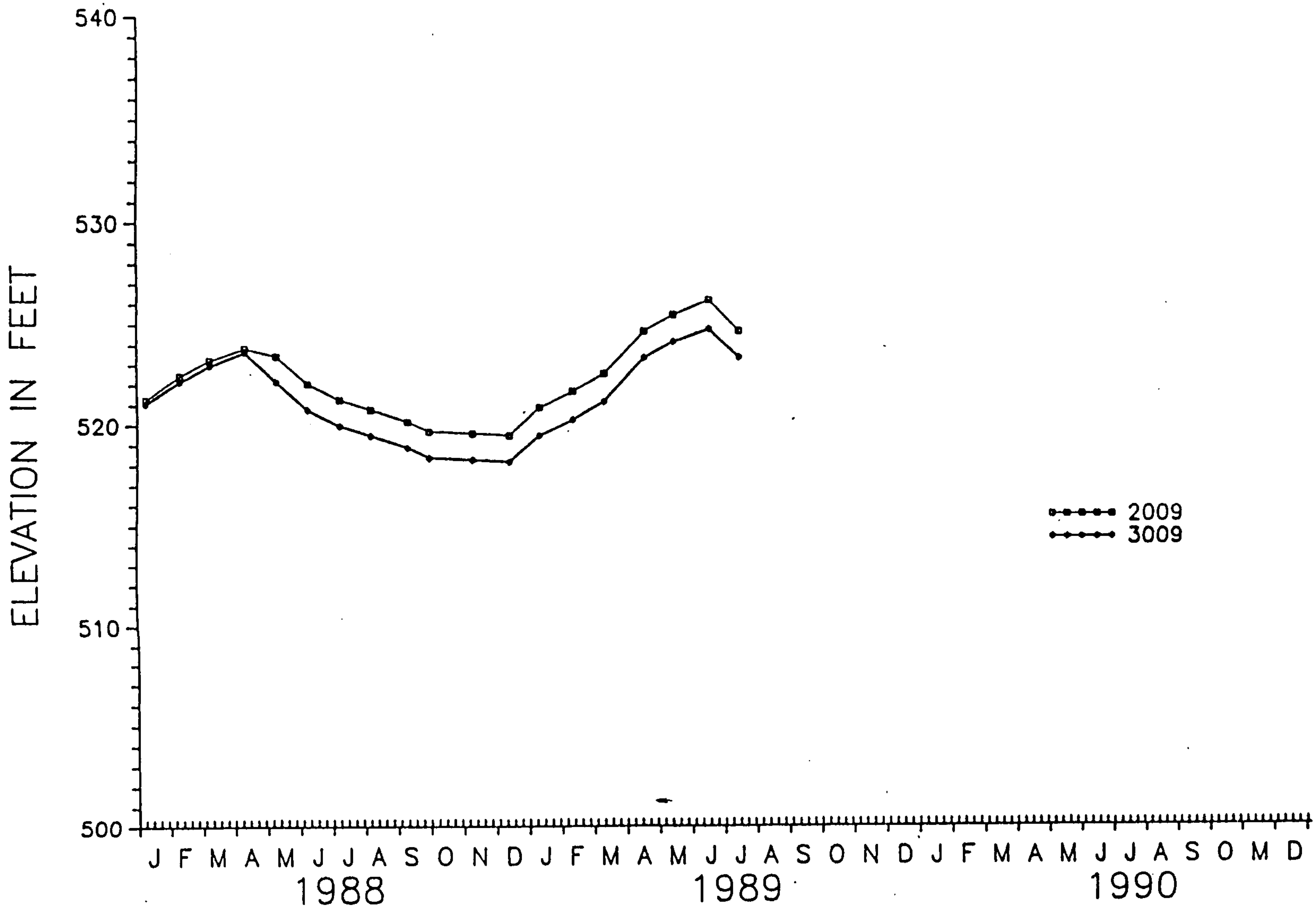

FIGURE 2

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HYDROGRAPH FOR WELL CLUSTER AT LOCATION 108

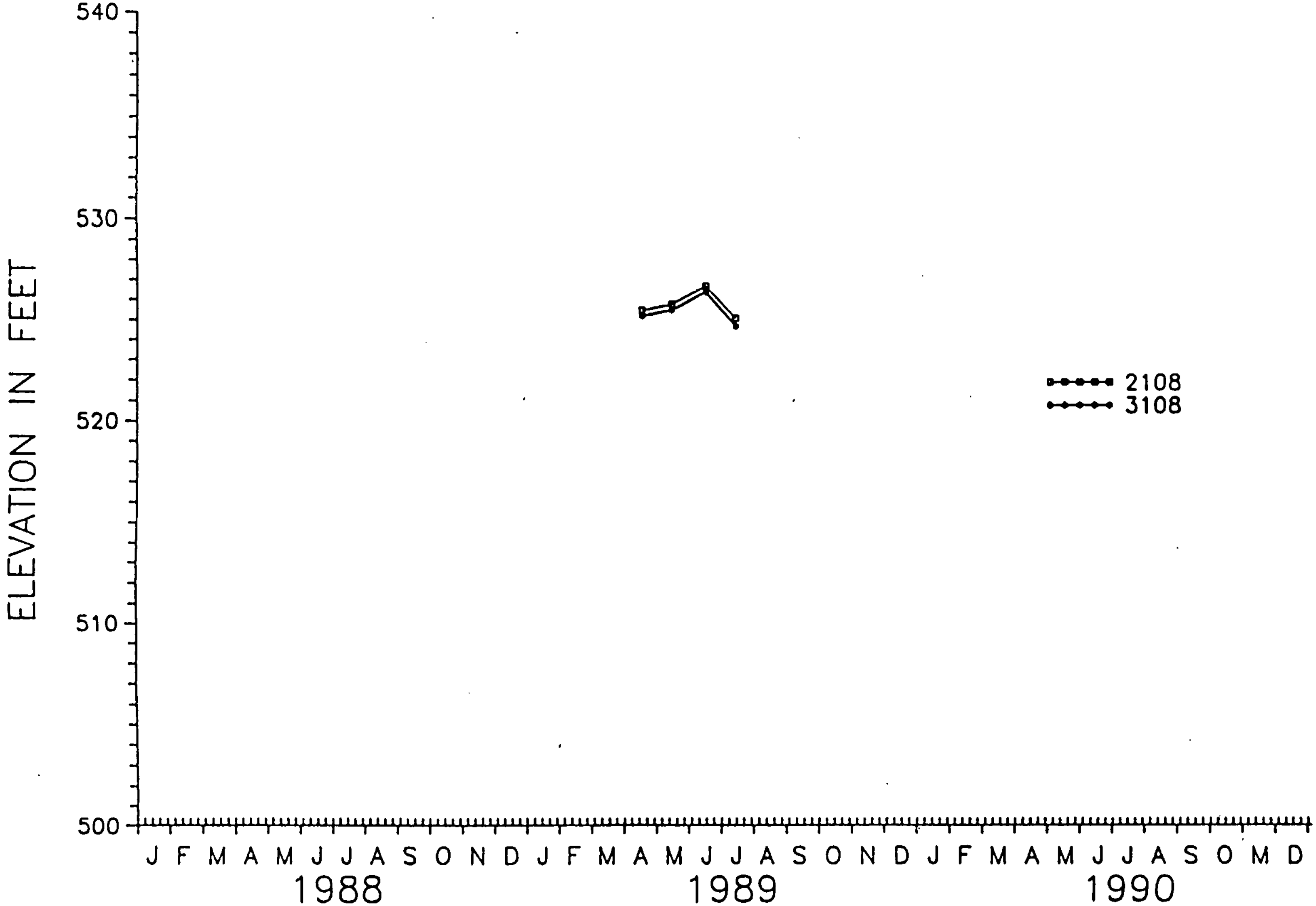

FIGURE 3

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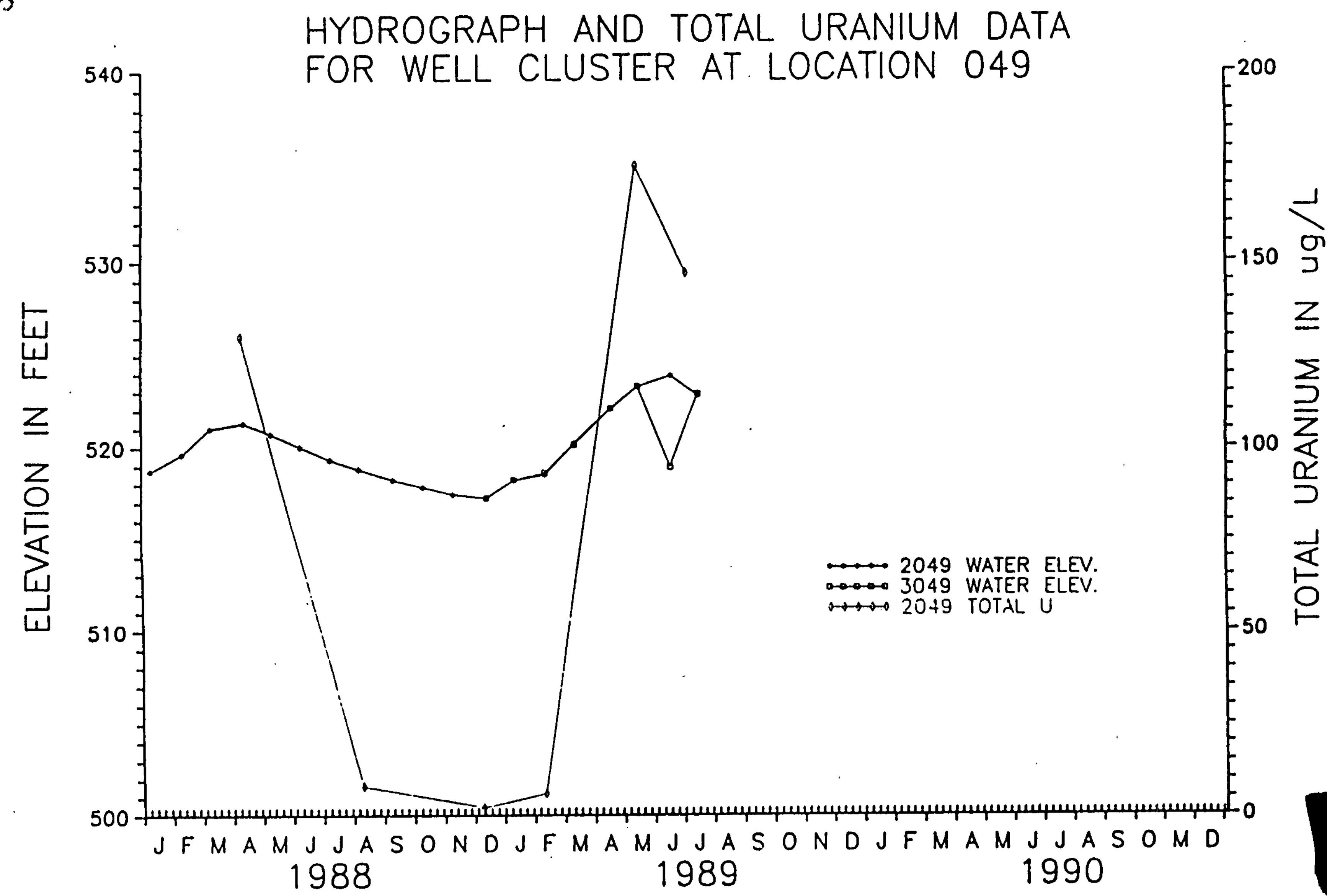

FIGURE 4

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drilled in the area of the South Field as part of the 24-well program, have also shown elevated levels of uranium. As shown in Figure 1, wells 3046 and 3045 should be added to the existing well clusters to determine the vertical extent of the uranium plume present in the 2000-series well at these locations. These wells will satisfy a commitment made in the RI/FS Work Plan to install deeper wells if high levels of uranium are found in any wells. If uranium is detected in 3046, then an additional 3000-series well would be required at location 047, which is upgradient from location 046. Well 3047 is considered low priority.

A new well, 2385, should be installed half way between location 046 and 065 to monitor the easterly extent of contamination indicated at location 046. If contamination is found in well 2385 then well 3385 will be required to determine the vertical extent of contamination at that site. Well 3385 is currently considered low priority.

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East of the Outfall Ditch

Infiltration of uranium bearing water through the bottom of the Storm Water Outfall Ditch is generally accepted as the pathway for the introduction of uranium into the sand and gravel aquifer. At the time the original work plan was written, it was assumed that ground water under the outfall ditch flowed to the south. Therefore, monitoring wells were located to measure contamination moving to the south. Water table records from January 1988 through July 1989 indicate, however, that the southerly flow exists during periods of recharge. During low flow periods, the gradient is to the east and could result in a narrow, nor-south trending plume similar to that found south of the FMPC. There are currently no monitoring wells located along the eastern side of the outfall ditch that would have detected such a plume.

Wells 2386 and 2387 are proposed to verify that the gradient shift occurs and to determine if any uranium is migrating in an easterly direction from the outfall ditch. Current data suggest that the easterly gradient is neither steep nor present for very much of the year. Therefore, any uranium plume should not have migrated far from the outfall ditch. These two wells will provide the data regarding the width and magnitude of the ground water mound that results from recharge along the outfall ditch. They will also indicate if uranium has migrated from the outfall ditch to the east. As with the other proposed 2000-series wells, if elevated uranium is present in wells 2386 and 2387, a 3000-series well would be required in either or both locations. If elevated uranium is found in both 2386 and 2387 an additional well pair should be installed north of location 386 near the southeastern corner of the new Storm Water Retention Basin. Wells 3386, 3387, and the additional well pair are considered low priority.

South Plume Area

There are two issues to be addressed in relation to the South Plume. Emphasis has been on the plume that appears to have resulted from infiltration along Paddy's Run when there was uncontrolled runoff from the plant. The highest concentrations of uranium in this plume exceed 250 ug/l. The second issue is the lower levels of uranium which entered the creek system and infiltrated along the length of Paddy's Run downstream from the FMPC. The southernmost well installed for the RI/FS (well 2127) has had total uranium values of 37, 6, and 14 ug/l when sampled in April, May, and July of 1989. It is not clear what is causing this variation in uranium values, but it does seem likely that this variation is related to recharge occurring in the lower stretch of Paddy's Run.

The seven wells have recently been installed in the South Plume well program and data will be available in February 1990 from these wells. In addition data may become available from the Paddy's Run Road Site (PRRS) RI/FS. The location of wells and piezometers in the PRRS RI/FS will help with the interpretation of events along Paddy's Run. The possibility exists that unexpected findings will be forth coming from this data and additional wells will be required to evaluate risk to receptors in the area.

Current model interpretations indicate that the main plume has a long slender shape and that it extends a considerable distance to the southeast as shown in Figure 5. The location of the southern third of the plume is farther to the east than any drilling program proposed by either RI/FS. Well 2391 should be installed at the location shown in Figure 1, to determine if the model prediction of the southern tip of the plume is accurate. The appearance of 4.5 ug/l uranium in well 2094 in January 1988, while not a high value, indicates that uranium is present in the area. Location 094 is downgradient from the location of the two proposed wells in the PRRS RI/FS.

In the event that well 2391 contains elevated levels of uranium in excess of 50 ug/l then well 2392 should be installed at the

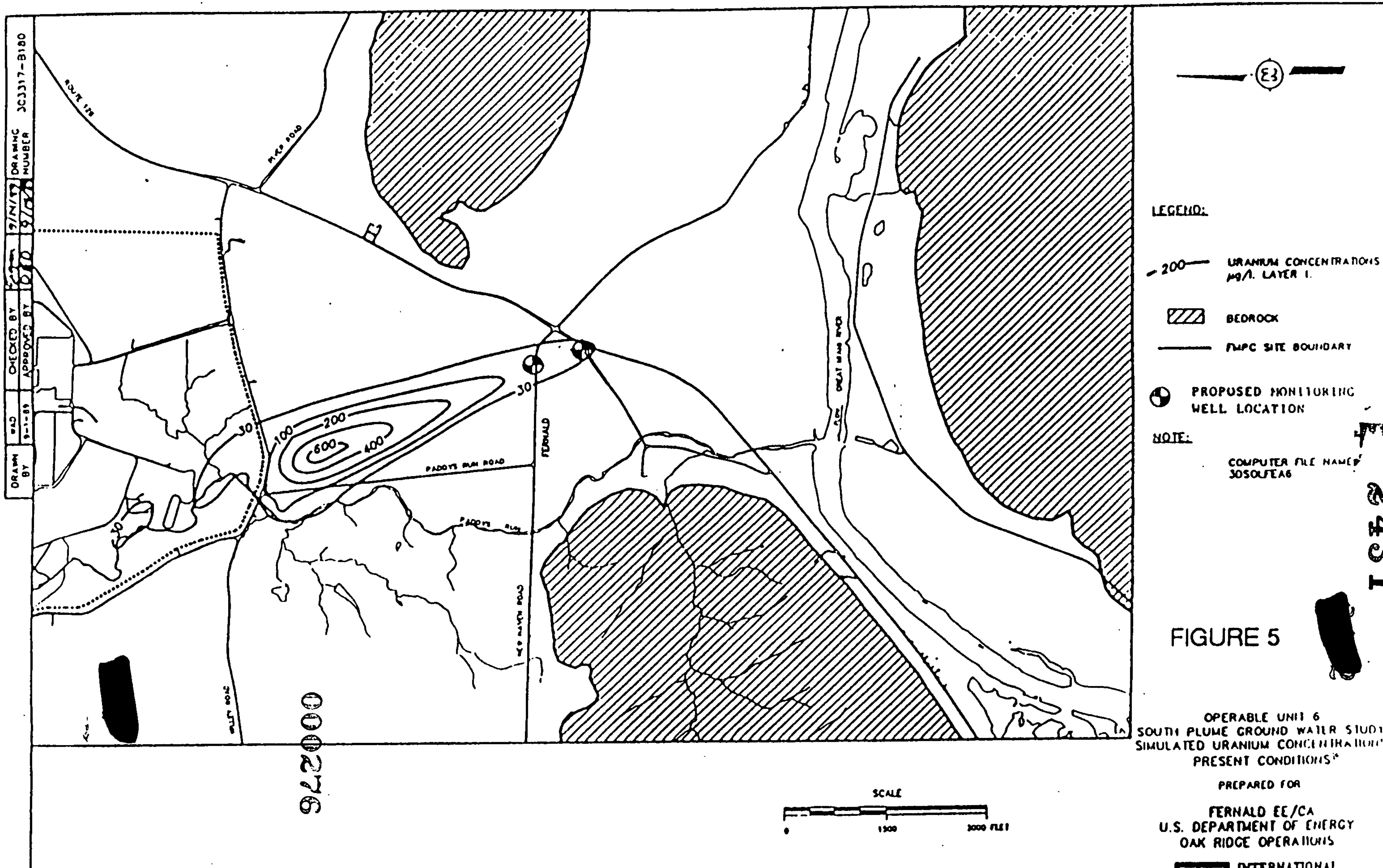

FIGURE 5

000276

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location shown in Figure 1, to determine the lateral extent of the plume and well 3391 installed to determine the vertical extent of the plume. If uranium is less than 50 ug/l then the next 2000 series well should be installed northwest of well 2391. In either case the result will be wells at adjacent locations that define or closely locate the southern extent of the plume and provide the necessary data to complete the calibration of the transport model.

Initial water level data from the PPRS RI/FS piezometers indicate that well 2393 should be installed on Rutgers Nease property as shown in Figure 1. This well will fill a large data gap between the other PRRS wells and the Fernald RI/FS wells and should complete the definition of the western boundary of the uranium plume.

Location 391 and the location to the northwest are on land owned by Harrison Poured Foundations Inc. Location 392 is on Century Farms property. One additional well to the east in the vicinity of Highway 128 will be required to verify the eastern boundary of the plume. A possible well location as shown on Figure 1 is also on Century Farms Property. Wells 3391, 3392, 3394, and 3395 are considered low priority at this time.

In order to determine what well locations are best the wells in this area will be drilled in the following sequence. Well 2391 will be drilled first and developed. A sample will be collected and sent to the laboratory for total uranium on a rush basis. Well 2393 will be drilled while the Well 2391 sample is in the laboratory. The results of this sample will determine if the third well is drilled northwest or southeast of well 2391. The determination of the need for and proper location of the remaining wells will be based on water levels readings and uranium concentrations in wells 2391 and 2392. The data will be discussed with the regulatory agencies as part of the decision making process.

Paddy's Run Profile Survey

The monthly water table records and quarterly water quality data show that the recharge from Paddy's Run has a tremendous bearing on ground water patterns and contaminant migration. The distance at any point along Paddy's Run between the bottom of the stream channel and the water table is therefore very important. A detailed survey of the longitudinal profile of Paddy's Run was initiated under a Task 9 order in the early spring of 1989. The survey work was completed for most of the length of Paddy's run on the FMPC property. The survey was terminated due to funding limitations before any work was done off-site. We propose that the survey be completed to provide an accurate profile of Paddy's Run so the relationship between flow in the stream and ground water levels may be more accurately used in the interpretation of data and the ground water modeling effort.

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DOCUMENT CHANGE REQUEST NO. 45

EIGHT-INCH DIAMETER TEMPORARY CASING FOR IMMEDIATE IMPLEMENTATION

FOR THE

RI/FS

WORK PLAN

000278 [redacted]

- After the walkover of the grid is completed, the scaler and timer are stopped and the following items are recorded on the Surface Measurements Field Logbook Form (Figure 5-3): (1) grid ID number, (2) the total count, and (3) the elapsed time.

- Return to each location which has been "flagged" within the grid and perform a systematic survey beginning at the flag and working outward to determine the areal extent of the elevated reading.

- Record the highest count rate and the approximate location and areal extent; insert a marker at the location of highest reading.

5.2 Drilling Procedures

Soil borings are made to determine the nature, arrangement, thickness and extent of the soil strata. The depth of borings, frequency, and the type of testing and sampling required are dependent upon the purpose of the subsurface investigation.

Borehole advancement for monitoring wells will be performed using cable tool drilling techniques. The use of mud rotary or continuous flight hollow stem augers is prohibited for monitoring wells. A soil auger drilling rig will be used to collect undisturbed soil samples in clay layers that may be found in the till. With the cable tool techniques, the hammer is used to dislodge the soils and mix them with potable water for recovery and removal from the hole. Cable tool borehole drilling will be performed in accordance with Section 2.2.5, Percussion Drilling Borehole Advancement, IT Manual of Practice, Subsurface Investigations.

Comments from the IT Manual of Practice, Subsurface Investigations pertinent to the cable tool drilling technique follow:

- When advancing the boring using cable tool drilling techniques, a temporary steel casing will be drilled, driven, or pushed as the borehole is advanced. **The temporary casing will be threaded, nominal ten-inch diameter for constructing 1000 series monitor wells. The temporary casing will be threaded, nominal eight-inch or nominal ten-inch diameter to allow for the construction of the monitoring well in the 2000, 3000, and 4000 series borings.** Additionally, the temporary casing in the 4000 series boring may be nominal ten-inch diameter to approximately 150 foot depth, then telescope to nominal eight-inch diameter to allow for the construction of the monitoring well. Cuttings will be removed from the borehole using a sand pump or dart valve bailer.

THE CONTENT OF CHANGE IS UNDERLINED ABOVE

JUSTIFICATION FOR THE USE OF EIGHT-INCH DIAMETER TEMPORARY CASING IN RI/FS MONITOR WELLS

June 28, 1990

- At present < 400 feet of reliable 10-inch casing is available
- Problems with threads and collar failure of 10-inch casing
- Casing for cable-tool applications not readily available
- Materials to "make up" new 10-inch have been obtained
- New 10-inch to be on location within the next month
- 8-inch presently approved for telescoping in 4000 series monitor wells
- Substitution of 8-inch will allow continued full utilizaton of drilling crews on-site

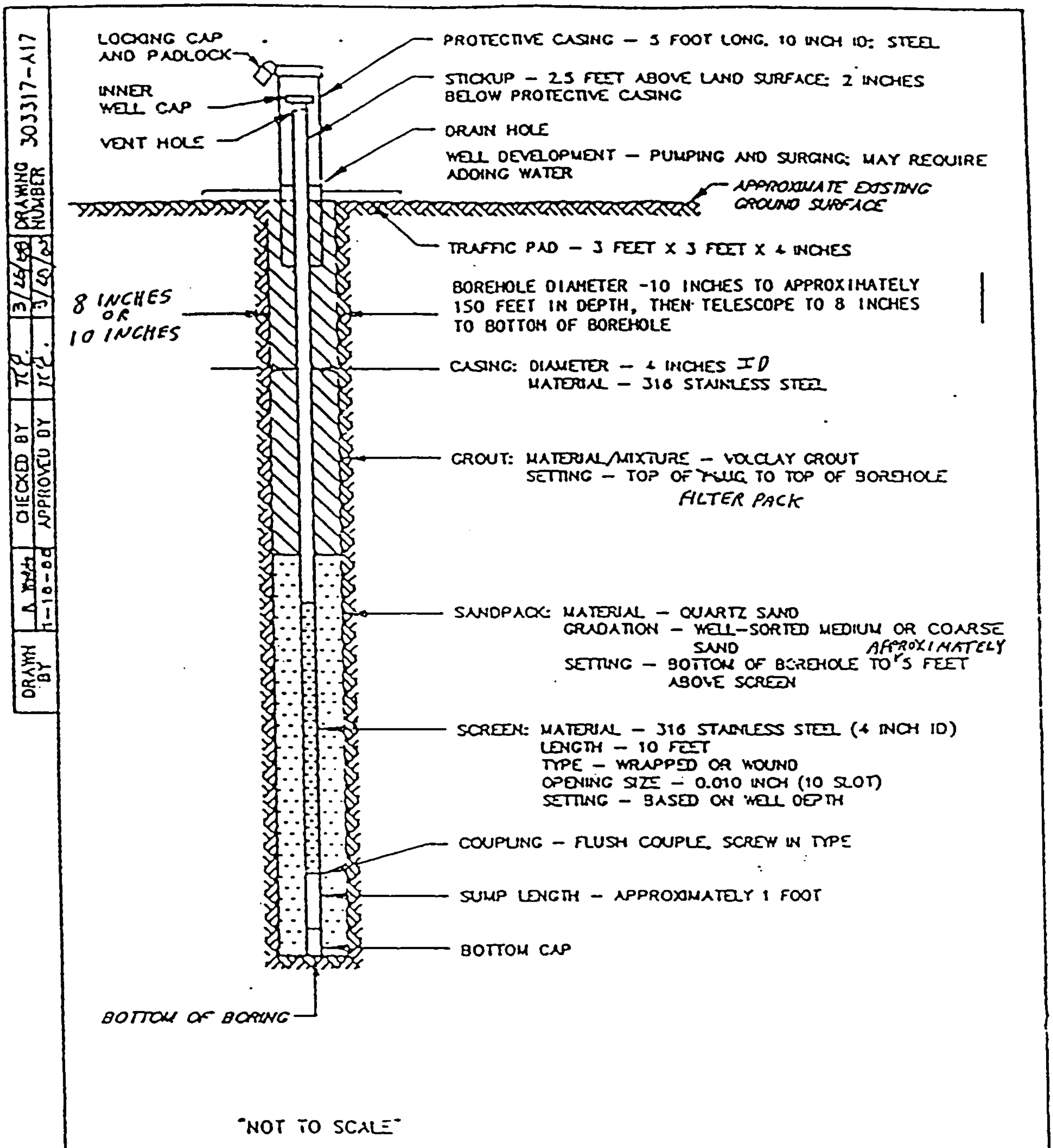

FIGURE 5-15

SUMMARY OF SPECIFICATIONS FOR WELL COMPLETION
3000- AND 4000-SERIES WELLS

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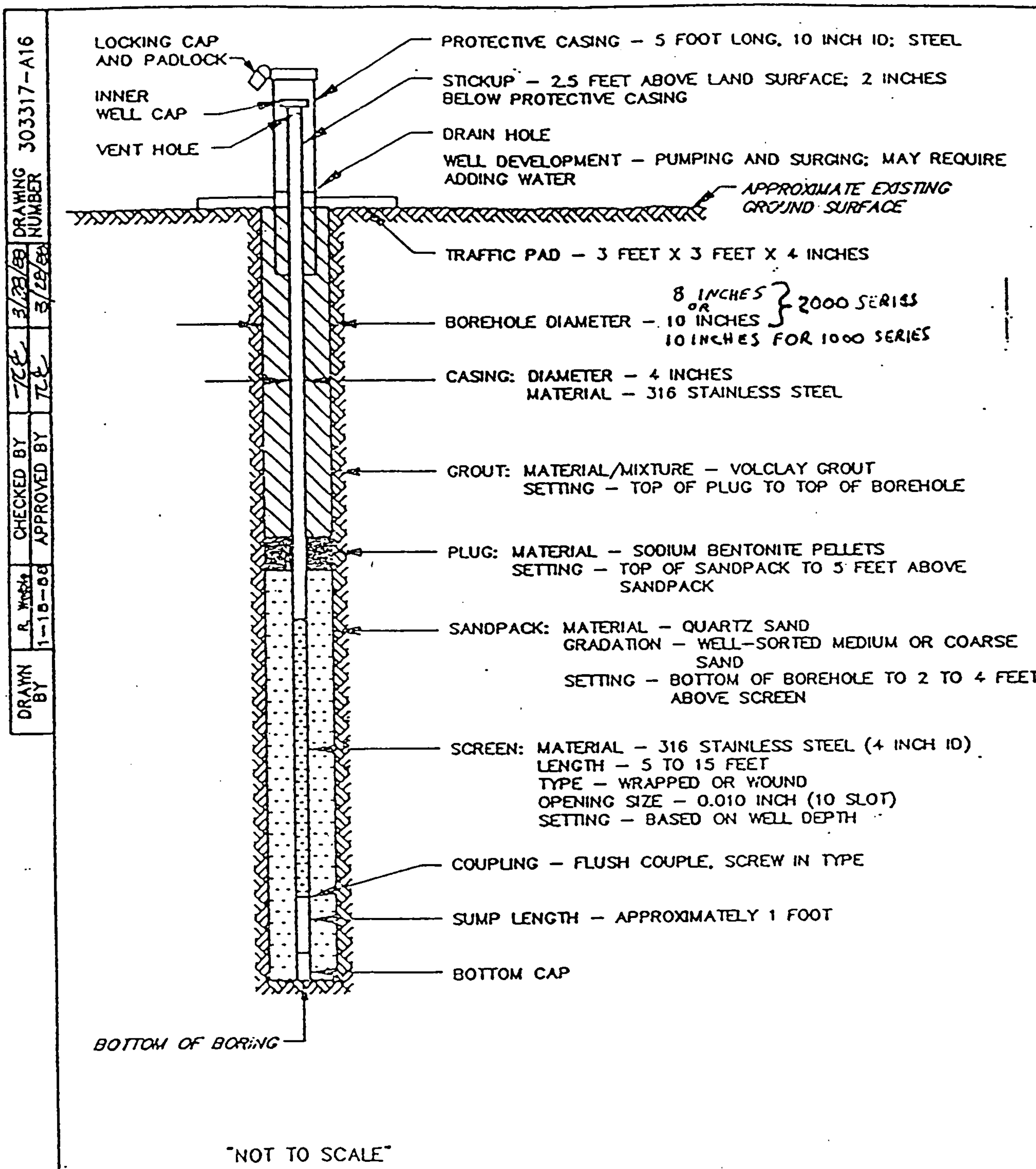

FIGURE 5-14

SUMMARY OF SPECIFICATIONS FOR WELL COMPLETION
1000- AND 2000- SERIES WELLS

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DOCUMENT CHANGE REQUEST NO. 48

DELETION OF SECTION 6

MANAGEMENT PLAN

OF THE

WORK PLAN

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DOCUMENT CHANGE REQUEST NO. 48

[redacted]

RI/FS
DATE: 7/6/90
VOL. WP Sect. 6.0

SECTION 6.0

MANAGEMENT PLAN

THIS SECTION HAS BEEN DELETED AND HAS BEEN REPLACED BY THE PROJECT MANAGEMENT PLAN WHICH EXISTS AS A SEPERATE DOCUMENT.

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DOCUMENT CHANGE REQUEST NO. 49 [redacted]

SCHEDULE OF CALIBRATION
OF RADIOLOGICAL EQUIPTMENT

FOR THE

QAPP

000286 [redacted]

TABLE 8-3 CONTINUED

TABLE 8-3
(cont)

INSTRUMENT/EQUIPMENT	MANUFACTURER	CALIBRATION REFERENCE	CALIBRATION FREQUENCY
Ludlum Model 19 Micro R Meter	Per Section 5 Ludlum Instruction Manual	Ludlum Model 19 Micro R Meter Instruction Manual	6 Months
Ludlum Model 12 Portable Survey Meter with 44-9 Pancake CM detector or 43-5 alpha scintillation detector	Per Section 5 Ludlum Instruction Manual	Ludlum Model 12 Survey Meter Instruction Manual	6 Months
Eberline BC-4 Beta counter	Known Beta Gamma Source, Section IV-D of Instruction Manual	Eberline BC-4 Beta Counter Instruction Manual	6 Months
Eberline SAC-4 Scintillation Alpha	Known Alpha Source Section IV-D of Instruction Manual	Eberline SAC-4 Scintillation Alpha Counter Instruction Manual	6 Months

(a) Each Day Samples Are Analyzed.
(b) Operational check before each use.

000287

K-65 SILOS SAMPLING AND ANALYSIS PLAN

U.S. DEPARTMENT OF ENERGY

FEED MATERIALS PRODUCTION CENTER

FERNALD, OHIO

ADDENDUM TO THE FMPC RI/FS WORK PLAN

2431

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

1.1 Background 1
1.2 Purpose 9
1.3 Scope 12

2.0 SAMPLING RATIONALE 12

2.1 Statistical Basis for Sampling Strategy 12
2.2 Recommended Number of Samples 14
2.3 Recommended Number of Analyses 22

3.0 SAMPLING METHODOLOGY 23

3.1 Location Preparation 23

3.1.1 Preparation of Support Facilities and Laydown Area 23
3.1.2 Delivery and Preparation of Sampling Equipment 26
3.1.3 Delivery and Set-up of Crane 26

3.2 Sampling Operations 26

3.2.1 General Silo Sampling Procedure 28
3.2.2 Field Testing in Soil 30
3.2.3 Field Testing in Lime Sludge Pond(s) 30
3.2.4 Mock Sampling of Silo 4 30

3.3 Sample Handling 31

3.4 Decontamination Requirements 31

3.5 Chain-of-Custody and Request for Analysis 33

3.6 Sample Packaging and Shipping 36

3.7 Sampling Analysis 36

3.7.1 Radiological and Chemical Analysis 36
3.7.2 Physical Analysis 38

4.0 K-65 SILOS STRUCTURAL INTEGRITY 41

5.0 FACILITY AND EQUIPMENT REQUIREMENTS 42

000289

[redacted]

2431 [redacted]

5.1 WMCO Facilities 42
5.2 Equipment 42

5.2.1 Respiratory Equipment 42
5.2.1.1 Personnel Certification 42
5.2.1.2 Respiratory Equipment Certification 42

6.0 QUALITY ASSURANCE 42

7.0 WASTE MANAGEMENT 43

8.0 MANAGEMENT PLAN 43

9.0 CALIBRATION AND PREVENTIVE MAINTENANCE 46

9.1 Calibration 46
9.2 Preventive Maintenace 46

10.0 FIELD ACTIVITY DAILY LOG 47

APPENDIX A - DETAILED WORK PROCEDURES (DWP)

DWP-001 - K-65 SILOS SAMPLING PROCEDURE
DWP-002 - SAMPLE CORE HANDLING
DWP-003 - BREATHING AIR SYSTEM
DWP-004 - K-65 MOCK SILO SAMPLING PROCEDURE
DWP-005 - RADON MONITORING AND SAMPLING CHECKLIST FOR K-65 SILOS
DWP-006 - SET-UP AND POSITIONING OF THE CRANE PROCEDURE
DWP-007 - K-65 SILO SAFETY NET APPLICATION

APPENDIX B - PROGRAM PLANS

PLAN-001 - SITE-SPECIFIC HEALTH AND SAFETY PLAN
PLAN-002 - TRAINING PLAN

APPENDIX C - CHAIN OF CUSTODY/SAMPLE COLLECTION PROCEDURES

2431 [redacted]

TABLES

NUMBER	TITLE
1-1	Characteristics of the K-65 Residues Stored at the FMPC
1-2	Nonradiological Constituents of Waste Storage Silo contents
1-3	Radionuclide Concentrations in the Silos
1-4	Inorganics Concentrations in the Silos
1-5	Organics Concentrations in the Silos
1-6	Geotechnical Analytical Results
1-7	EP Toxic Metals Range of Values for K-65 Silos
1-8	Detailed Work Procedures for K-65 Sampling
2-1	Determination of Number of Samples (Radionuclides): Method SW-846
2-2	Determination of Number of Samples (Silo 1 Inorganics): Method SW-846
2-3	Determination of Number of Samples (Silo 2 Inorganics): Method SW-846
2-4	Core Sections and Analysis
3-1	Recommended Maximum Contamination Limits for Items Given Radiation Clearance
3-2	Inorganic Target Analyte List (TAL)
3-3	Engineering Properties Parameters
9-1	Field Equipment Calibration Procedures

FIGURES

NUMBER	TITLE
1-1	K-65 and Metal Oxides Silos Sampling Results
2-1	Identification of Core Samples
2-2	Sectioning of SE and NW Sample Cores
2-3	Sectioning of NE Sample Cores
2-4	Subsampling of Sample Cores for Engineering Test
3-1	Sampling Area Layout/Crane Route
3-2	Conceptual Positioning of Crane and Sampler
3-3	Conceptual Sketch of Trailer-Mounted Core Holder
3-4	Chain-of-Custody Record
3-5	Request for Analysis
8-1	K-65 Silos Sampling Schedule
8-2	Organization Chart
10-1	Field Activity Daily Log

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1.0 INTRODUCTION

This plan provides for the sampling and analysis of materials contained in two concrete silos (Silos 1 and 2) located in the Waste Storage Area at the U.S. Department of Energy (DOE) Feed Materials Production Center (FMPC). These storage silos have been used to store waste raffinate slurries (K-65 residues). Previous sampling studies conducted on the K-65 residues in Silos 1 and 2 have produced variable results, indicating that the residues are not homogeneous. Because of the variability in the analytical results from previous studies and the partial recoveries from the 1989 sampling effort, the available data are not complete enough to adequately characterize the K-65 residues for purposes of evaluating remedial actions. Therefore, resampling, as described in this plan, is required.

This document is an addendum to the FMPC RI/FS Work Plan. Unless different methods have been approved by virtue of being incorporated in this addendum, all work and documentation associated with the K-65 Silos Sampling and Analysis effort is to be performed in accordance with the FMPC Quality Assurance Project Plan (QAPP), Volume 5 of the FMPC RI/FS Task 2 Report Work Plan Requirements documents.

Approval, distribution, control and revision of this addendum are to be in accordance with Sections 15.1, 15.2, 15.3 and 15.4 of the FMPC QAPP. Changes to this appendix must be approved before the changes are implemented, in accordance with Section 15 of the QAPP.

1.1 BACKGROUND

As a part of the Operable Unit 4 (OU 4) Remedial Investigation (RI) the contents of the K-65 silos were sampled in 1989.

The sampling of the silos was only partially successful because of the inability to recover continuous sample cores. Even though an average of 20 feet of penetration of the material was achieved, there was no sample recovery in three locations. One sample contained 12.5 feet of core (66 percent core recovery): eight sample cores were less than 1.5 feet (4 to 9 percent recovery); and four cores ranged from 3.25 to 4.25 feet (18 to 30 percent recovery). Figure 1-1 provides a summary of the core recovery results of the 1989 sampling effort.

The following summarizes additional information on Silos 1 and 2 from various sources including the RI Report for OU 4.

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Construction:

The silos were constructed in 1951 and 1952. They are of cylindrical concrete construction, 80 feet in diameter and approximately 36 feet high. The silo domes had an

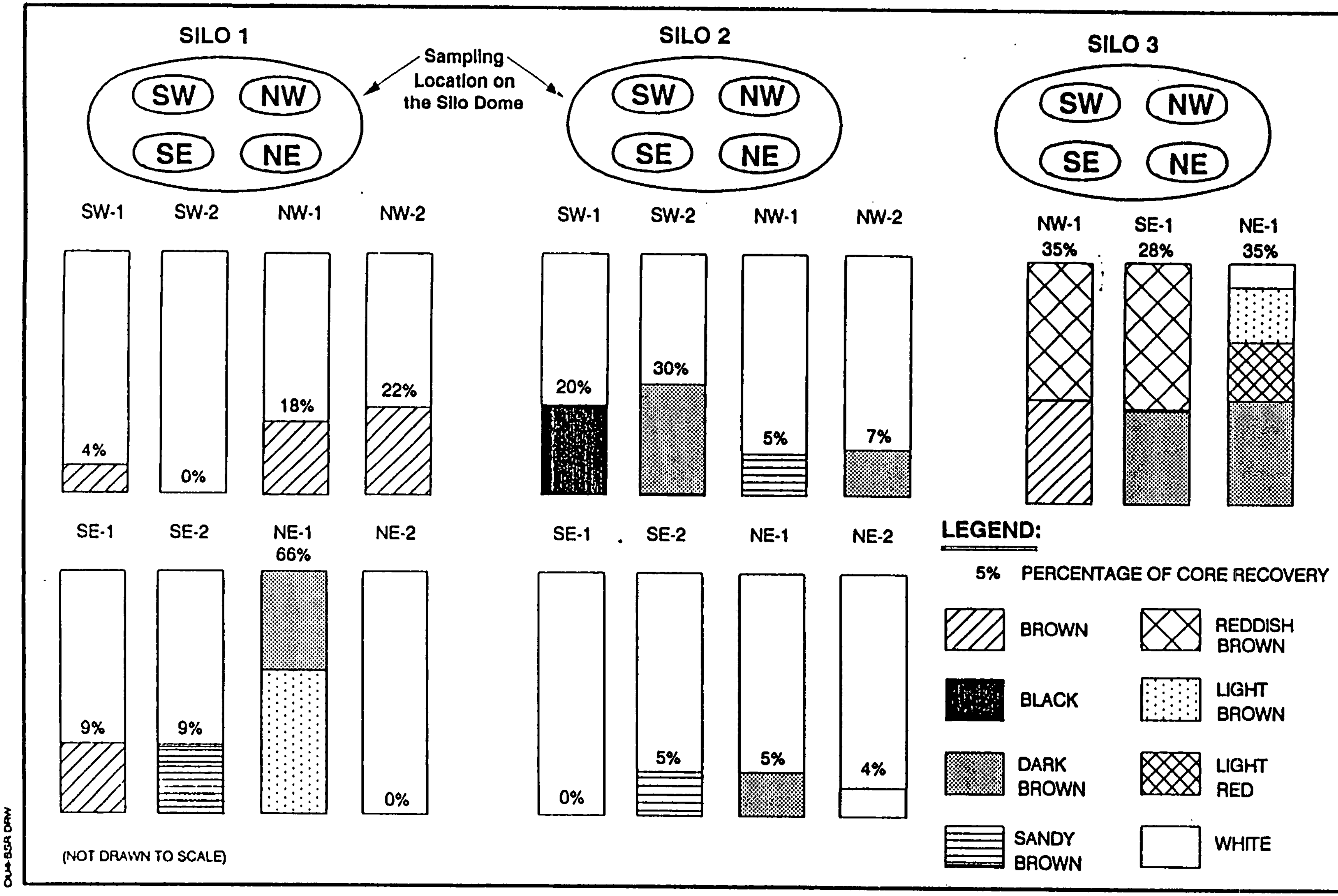

FIGURE 1-1 K-65 AND METAL OXIDES SILOS SAMPLING RESULTS

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original design thickness of 4 inches at the center and this thickness tapered to 8 inches at the dome wall edge.

Radionuclide Analysis:

Historic analyses of the K-65 silo residues indicated that approximately 11,200 kilograms of uranium (0.71 percent U-235) is present in the residues (Grumski 1987; ASI/IT 1988). Analytical results of residue samples taken in July 1988 (Gill 1988) indicated that the uranium concentration was 1400 parts per million (ppm) in Silo 1 and 1800 ppm in Silo 2. In addition, approximately 1.6 to 3.7 kilograms of radium were estimated to be in the K-65 Silo residues (Grumski 1987; Litz 1974). Data from these previous studies are summarized in Tables 1-1 and 1-2.

Radiological data from the 1989 sampling effort for Silos 1 and 2 are presented in Table 1-3. The concentration of Ra-226 in Silo 1 ranges from 89,280 pCi/g to 192,600 pCi/g; in Silo 2 it ranges from 657 to 145,300 pCi/g. Th-230 concentrations in Silo 1 range from 10,569 to 43,771 pCi/g; 8365 to 40,124 pCi/g in Silo 2. The concentrations of Pb-210 in Silo 1 range from 48,980 to 181,100 pCi/g; and they range from 77,940 to 399,200 pCi/g in Silo 2. Total uranium concentrations in Silo 1 range from 1189 to 2753 ppm and they range from 137 to 3717 ppm in Silo 2.

Chemical Analysis

Chemically, the K-65 residue material within Silo 1 and 2 are mixtures of hydroxides, carbonates, and sulfates. Approximately 40 to 60 percent of the residue material is silicates (SiO_2); carbonates and sulfates comprise approximately 20 percent. The primary form of uranium contained in the residue material is sodium uranyl carbonate (Dettorre et al., 1981). Other elements contributing at least 1 percent to the total are calcium, iron, magnesium, and lead. Table 1-2 presents a summary of the elemental, nonradioactive constituents of the silos.

Samples obtained during the 1989 sampling effort were analyzed for HSL inorganics and organics. A summary of the analytical datA for inorganic and organic constituents is provided in Tables 1-4 and 1-5. Complete analytical results are provided in Appendix B of the OU 4 RI Report. The results of the HSL inorganic analyses show that the principal inorganic constituents in Silos 1 and 2 are barium, calcium, iron, lead and magnesium. PCBs (Aroclor 1248 and 1254) were detected in samples collected from the K-65 silos with concentrations ranging from 1700 to 12,000 parts per billion (ppb) and 1900 to 3900 ppb, respectively.

Geotechnical Analysis

000294

Silos 1 and 2 contain waste raffinate slurries that were decanted by means of baffles and weirs placed along the height of the silo wall. Over the years the waste slurries have settled to form a wet muddy-looking material that is a mixture of clay and silty sand

CHARACTERISTICS OF THE K-65 RESIDUES STORED AT THE FMPC

	Silos 1 and 2				Silo 3
Characteristic	Vitro (1952)	Litz[a] (1974)	NLO[a] (1980)	Gill (1988)	DOE (1987)
Physical					
Dry weight (kg)	1.59×10^6	--	8.79×10^6	--	--
Volume (m^3)	3,155	--	5,522	--	3,902
Density (kg/m^3)	1,179	--	--	--	--
Water content (%)	30	--	--	--	--
Radiological	(ppm)	(ppm)	(ppm)	(ppm)	(kg)
Radium	0.3	0.28-0.36	0.2	0.13-0.21	0.015[b]
Uranium	2,110	1,800-3,200	600	1,400-1,800	18,000
Total thorium	--	--	--	301-322	--
Chemical					
Carbonates + Sulfates (%)	20				
Quartz (%)	25				
Muscovite clay (%)	60				

[a]As reported by Dettore et al., 1981.
[b]Assumes all radium in K-65 residues is Ra-226 with specific activity of 0.988 Ci/g.
Note: Data validation is currently in progress.

NONRADIOLOGICAL CONSTITUENTS OF WASTE STORAGE SILO CONTENTS

Silos 1 and 2						
Constituents	Silos 1 & 2 Vitro (1952) (ppm)	Silos 1 & 2 Litz (1974) (ppm)	Silos 1 & 2 NLO (1980) (ppm)	Silos 1 & 2 Grumski (1987) (% wt)	Silos 1 & 2 Gill (1988) (% wt)	
Aluminum				0.875	3.7	2.6
Antimony				ND	<0.1	ND
Arsenic				0.03		
Barium	45,300	50,000		0.07	2.0	2.1
Boron				0.015		2.1
Cadmium				ND		
Calcium				3.89	4.0	13.2
Chlorine						
Chromium				0.012	ND	0.4
Cobalt		1,600-2,000	1,500-2,000	0.175	0.6	1.1
Copper		500-800	400-600	0.50	0.2	0.4
Fluorene						
Gold		65-70	<40-60	<0.005		
Iron		13-18,000		1.2	8.3	9.8
Lanthanum				0.089	0.2	0.1
Lead	94,900	60-70,000	48-52,000	5.1	7.5	10.3
Magnesium				1.25		
Manganese				0.02		
Mercury						
Molybdenum				0.02	0.4	<0.1
Nickel		3,500-3,700	2,000-3,000	0.225	1.0	1.8
Palladium		13-18				
Platinum		0.9-1.4				
Potassium						
Selenium						
Silver		18	20	0.002		
Sodium				0.7		
Strontium						
Tin				0.008		
Titanium				0.07		
Vanadium				0.021		
Zinc				ND	<0.1	<0.1
Zirconium				0.02	0.1	0.2
PO_4				ND		
SiO_2				40.76	68.9	55.1
SO_4						

ND = Not Detected.

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TABLE 1-3

RADIONUCLIDE CONCENTRATION IN THE SILOS
(1989 Sampling Program)

SILO 1

Nuclide (pCi/g)	S1NE1A	S1NE1B	S1NE1C	S1SE1	S1SE2	S1SW1	S1NW1
Th-228	ND	ND	ND	ND	ND	ND	ND
Th-230	21,412	39,693	30,751	10,569	20,848	40,818	43,771
Th-232	ND	ND	ND	ND	ND	ND	766
Ra-226	108,100	192,600	166,400	116,800	89,280	181,200	163,300
Ra-228	ND	ND	ND	ND	ND	ND	ND
Pb-210	181,100	83,110	77,460	71,920	48,980	69,480	54,350
U-234	815	326	622	663	814	594	897
U-235/236	ND	ND	ND	ND	56	ND	50
U-238	920	398	610	545	758	532	687
U-Total (ppm)	2753	1189	1831	1633	2280	1602	2066

SILO 2

Nuclide (pCi/g)	S2SW1	S2NW1	S2NE2	S2SW2	S2NE1	S2NW2
Th-228	ND	ND	ND	411	ND	638
Th-230	31,825	32,784	8365	29,716	40,124	25,391
Th-232	ND	ND	ND	851	ND	ND
Ra-226	145,300	61,780	657	104,900	65,520	68,310
Ra-228	ND	ND	ND	ND	ND	ND
Pb-210	141,900	145,200	87,930	77,940	150,700	39,200
U-234	859	1107	974	121	848	1404
U-235/236	ND	74	47	ND	36	70
U-238	661	1069	874	46	814	1240
U-Total (ppm)	1972	3210	2620	137	2437	3717

ND = Not Detected
Note: Data validation is currently in progress.

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TABLE 1-4

INORGANICS CONCENTRATION IN THE SILOS
(1989 Sampling Program)

Contaminant (ppm)	Silo 1	Silo 2
Aluminum	60.4 - 1430	464 - 2570
Antimony	ND	ND - 7.2
Arsenic	14.7 - 68.4	57.5 - 1960
Barium	1970 - 7860	89.2 - 8370
Beryllium	0.88 - 2.8	0.66 - 6.0
Cadmium	2.1 - 8.0	3.4 - 19.1
Calcium	2150 - 5700	2430 - 301000
Chromium	21.0 - 165	12.9 - 68.8
Cobalt	349 - 1260	6.2 - 2430
Copper	122 - 473	ND - 1790
Iron	4340 - 75100	4010 - 37800
Lead	35800 - 85100	153 - 29800
Magnesium	1500 - 6020	1520 - 8740
Manganese	33.5 - 257	74.2 - 403
Mercury	0.23 - 2.8	ND - 2.3
Nickel	629 - 2580	14.6 - 2200
Potassium	158 - 492	37.8 - 289
Selenium	106 - 180	ND - 118
Silver	5.0 - 23.3	ND - 22.8
Sodium	360 - 13100	226 - 4070
Thallium	ND - 0.52	ND - 1.4
Vanadium	72.2 - 240	21.9 - 214
Zinc	14.4 - 212	11.2 - 154
Cyanide	0.52 - 4.4	ND - 4.5

000298

ND = Not Detected
Note: Data validation is currently in progress

[redacted]

TABLE 1-5

ORGANICS CONCENTRATIONS IN THE SILOS
(1989 Sampling Program)

CONTAMINANT	Silo 1	Silo 2
VOLATILE ORGANICS ANALYSIS DATA (ppb)		
Methylene Chloride	840 - 4100	1100 - 6300
Acetone	140 - 5300	ND - 1600
Chloroform	480 - 1500	660 - 1300
2-Butanone	7100 - 21000	7800 - 15000
4-Methyl-2-Pentanone	ND - 1400	ND - 2700
Toluene	ND - 430	ND - 250
Chloromethane	ND	ND
Styrene	ND - 350	ND - 200
Total Xylenes	ND	ND - 200
SEMIVOLATILE ORGANICS ANALYSIS DATA (ppb)		
Bis(2-Ethylhexyl)Phthalate	93 - 6000	ND - 560
Di-n-Octyl Phthalate	ND - 820	ND
PESTICIDE ORGANICS ANALYSIS DATA (ppb)		
Aroclor-1248	ND - 8000	ND
Aroclor-1254	1100 - 12000	420 - 6000

ND = Not Detected
Note: Data validation is currently in progress.

particles. During the 1989 sampling effort, this material was easily penetrated by the LEXAN sampling tube, which reached to the bottom of the silos. This indicated that the material might be in a sludge-like condition. Free liquid was occasionally observed during the course of the sampling.

Silo 1 contains material that is brown; Silo 2 contents vary in color from white to brown to black. Water content for the materials in both the silos is consistently high ranging from 21.8 to 73.5 percent. The specific gravity is between 2.59 and 3.37. Only two out of eight samples taken from the silos were plastic. Table 1-6 provides a summary of results from the geotechnical analyses.

EP Toxicity Testing

Extraction procedure (EP) toxicity was measured by using the EPA extraction procedure designed to simulate the leaching a waste could undergo if it is disposed in a landfill. After extraction, the extract from each sample was analyzed for the EP toxic metals. The results are summarized in Table 1-7. Lead was found to have leached from the Silos 1 and 2 residue samples in concentrations as high as 904 pm and 714 ppm, respectively. These values are in excess of the maximum allowable concentration (MAC) specified under federal standards.

1.2 PURPOSE

The purpose of this K-65 Silos Sampling and Analysis Plan is to describe a statistically sound sampling and analysis approach to characterize the residue materials in Silos 1 and 2. The plan will:

- Prescribe an efficient and safe method for collecting samples from the K-65 Silos
- Specify analyses of the samples that will provide sufficient data to characterize the waste materials and evaluate final disposition options
- Specify methods to ensure protection of the public and the environment
- Specify controls to ensure the quality of the data resulting from laboratory analyses and physical tests, as well as controls to satisfy environmental protection requirements.

TABLE 1-6

GEOTECHNICAL ANALYTICAL RESULTS
(1989 Sampling Plan)

Sample ID	Color	Water Content (%)	Specific Gravity	Liquid Limit	Plastic Limit	Plasticity Index	200 Sieve (Percent Finer)
S1-NE-1A	Dark Brown	50.7	3.19	55.2	50.0	5.2	72.7
S1-NE-1C	Light Brown	71.5	2.74	70.3	66.6	3.7	71.5
S1-SE-2T	Sandy Brown	31.9	3.37	NP	NP	NP	43.9
S1-Compos.	NA	22.8	2.58	NP	NP	NP	54.5
S2-NW-1A	Brown	25.9	2.87	NP	NP	NP	39.8
S2-NE-2BT	White	21.8	2.59	NP	NP	NP	51.9
S2-SW-1A	Black	73.5	3.11	NP	NP	NP	63.3
S2-Compo	NA	34.2	2.78	NP	NP	NP	38.1
S3-NW-1A	Reddish Brown	7.4	2.35	NP	NP	NP	93.2
S3-NW-1C	Brown	3.7	2.08	NP	NP	NP	93.9
S3-SE-1A	Reddish Brown	10.2	2.58	NP	NP	NP	90.0
S3-SE-1C	Dark Brown	6.3	2.29	NP	NP	NP	92.9
S3-Compo	NA	3.8	2.75	NP	NP	NP	87.8

NA = Not Applicable
NP = Non Plastic
Note: Data validation is in progress

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TABLE 1-7

EP TOXIC METALS RANGE OF VALUES FOR K-65 SILOS

(1989 Sampling Program)

Analyte	Silo 1	Silo 2	Maximum Allowable Concentration
Arsenic (ppm)	ND - 0.484	0.163 - 0.592	5.0
Barium (ppm)	0.079 - 14.5	0.095 - 2.62	100
Cadmium (ppm)	ND - 0.100	0.017 - 0.278	1.0
Chromium (ppm)	0.020 - 0.964	ND - 1.02	5.0
Lead (ppm)	0.159 - 904	0.155 - 714	5.0
Selenium (ppm)	0.217 - 0.997	0.240 - 1.56	1.0
Silver (ppm)	ND - 0.121	ND - 0.213	5.0
Mercury (ppm)	ND	ND	0.2

ND = Not Detected
Note: Data validation is currently in progress.

1.3 SCOPE

The sampling, analysis, and testing of materials contained in the K-65 Silos are required to obtain accurate chemical, radiological, and physical characteristics to support the assessment of alternatives for final disposition of the material. To accomplish this objective, this plan provides for furnishing of all necessary facilities, labor, technical and professional services, supervision, equipment, materials, and supplies for conducting the sampling, analysis, and testing tasks.

This K-65 Silos Sampling and Analysis Plan describes the technical approach to be used for completing the required tasks. Detailed procedures for conducting the tasks are contained in Appendix A. A list of these procedures is provided in Table 1-8. Detailed Work Procedure (DWP-001), "Silo Sampling" provides a sequential overview of the sampling and analysis procedural requirements. Appendix B contains the Site-Specific Health and Safety Plan and the Training Plan. Plan-001, "Site-Specific Health and Safety Plan", will describe applicable policies, requirements and procedures to ensure the health and safety of the workers and protection of the environment. Appendix C contains sample collection and chain-of-custody procedures.

2.0 SAMPLING RATIONALE

The objective of the overall silo sampling program is to adequately characterize the radiological, chemical and physical composition of the K-65 Silos contents. As such, it is not only important to quantify the mean concentration of each contaminant of concern for comparison to regulatory standards, but also to determine the spatial variability of the concentrations and the degree of confidence in any resultant conclusions.

2.1 Statistical Basis for Sampling Strategy

To establish the statistical basis for determination of the sample size, method SW-846 was used, the statistical method recommended by the U.S. Environmental Protection Agency (EPA). A requirement for the effective use of SW-846 in establishing an appropriate sample size is a prior estimation of the mean and standard deviation of the population to be sampled. Further, because the assumed mean must be compared to the regulatory threshold (RT) for use in the equation, any available data for use in approximating the mean must be consistent with the basis of the regulatory threshold. In the case of SW-846, this implies measured concentrations in an aqueous solution generated from EPA-approved extraction procedures. The 1989 sampling results, which provided leachate of known quality, were used to determine the sample size per method SW-846.

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TABLE 1-8

DETAILED WORK PROCEDURES FOR K-65 SILOS SAMPLING

DWP-001	K-65 SILOS SAMPLING PROCEDURE
DWP-002	SAMPLE CORE HANDLING PROCEDURE
DWP-003	BREATHING AIR SYSTEM PROCEDURE
DWP-004	K-65 MOCK SILO SAMPLING OPERATIONS
DWP-005	RADON MONITORING AND SAMPLING CHECKLIST FOR K-65 SILOS
DWP-006	SET-UP AND POSITIONING OF CRANE PROCEDURE
DWP-007	K-65 SILO SAFETY NET APPLICATION

[redacted]

2.2 Recommended Number of Samples

The spatial variability of the silo contents must consider both horizontal and vertical variability. The known disposal history would indicate that the K-65 residues are homogenous in the horizontal direction and non-homogeneous in the vertical direction. Material variability in the vertical direction is most directly related to changes in the disposed material over time. It is being assumed, therefore, that four sampling locations per silo will provide sufficient horizontal coverage to account for any compositional variability in the horizontal direction.

An underlying assumption in the statistical analysis to determine sample size is that the expected mean concentration of each parameter is equal to 50 percent of the RT. Based on the assumption that the RT is twice the mean concentration, the recommended number of samples per SW-846 would increase as the mean concentration approaches the RT and decrease as the mean concentration moves away from the RT. Probability dictates that any RT is more likely to fall outside of the narrow range between the observed mean and the RT. Consequently, the difference between the actual mean and the RT will be much greater than the value used in the current calculations, resulting in a lower number of samples to be collected than estimated here.

Tables 2-1, 2-2, and 2-3 summarize the results of the analyses of the number of samples to be collected using the 1989 data and SW-846 methodology. In all cases except three, the recommended number of samples is less than four. The exceptions involve arsenic, calcium, and copper in Silo 2. The large number for arsenic is primarily due to the one high reading (1960) in sample S2NE1. Calcium concentrations span three orders of magnitude; however, because this parameter is not likely to drive the remedial effort, there seems little reason to use the recommended number of samples calculated for this parameter as the minimum number that should be collected for all parameters. The higher than average number of samples for copper is attributed to two factors: a high reading in S2NE1 (1790) and the substitution of the value zero for the ND reading in sample S2NE2. A more appropriate value to use would have been one-half the detection limit. Use of this value would have resulted in a lower number of recommended samples.

It is acknowledged, however, that the available data may not be fully representative of the silo contents. Based on this knowledge and the SW-846 statistical analysis, four sample cores will be drawn from each silo for analysis and archiving. Eleven samples will be drawn from three cores of each silo for a total of 22 samples. Figures 2-1, 2-2, 2-3, and 2-4 show the core sectioning and sampling scheme for the program.

[redacted]

TABLE 2-1

Determination of Number of Samples (Radionuclides) Method SW-846

SILO 1

Nuclide (pCi/g)	S1NE1A	S1NE1B	S1NE1C	S1SE1	S1SE2	S1SW1	S1NW1	MEAN	STD	EST NMBR OF SAMPLES
Th-230	21412	39693	30751	10569	20848	40818	43771	29694.6	12487.4	0.4
Ra-226	108100	192600	166400	116800	89280	181200	163300	145382.9	40061.6	0.2
Pb-210	181100	83110	77460	71920	48980	69480	54350	83771.4	44598.0	0.6
U-234	815	326	622	663	814	594	897	675.9	191.3	0.2
U-238	920	398	610	545	758	532	687	635.7	170.6	0.1
U-Total*	2753	1189	1831	1633	2280	1602	2066	1907.7	511.5	0.1

SILO 2

Nuclide (pCi/g)	S2SW1	S2NW1	S2NE2	S2SW2	S2NE1	S2NW2	MEAN	STD	EST NMBR OF SAMPLES
Th-230	31825	32874	8365	29716	40124	25391	28049.2	10776.3	0.3
Ra-226	145300	61780	657	104900	65520	68310	74411.2	48312.1	0.9
Pb-210	141900	145200	87930	77940	150700	399200	167145.0	117874.0	1.1
U-234	859	1107	974	121	848	1404	885.5	427.2	0.5
U-238	661	1069	874	46	814	1240	784.0	414.2	0.6
U-Total*	1972	3210	2620	137	2437	3717	2348.8	1243.3	0.6

* ppm

NOTES:

S1SW1 - The first penetration of the southwest manway of Silo 1

S2NW2 - The second penetration of the northwest manway of Silo 2

TABLE 2-2

Determination of Number of Samples (Silo 1 Inorganics) Method SW-846

SILO 1

Inorganic (mg/kg)	S1NE1A	SINE1B	SINE1C	S1NW1	S1SE1	S1SE2	S1SW1	MEAN	STD	EST NMBR OF SAMPLES
Aluminum	1260	60.4	1380	450	364	1430	733	811.1	549.0	0.9
Arsenic	57	47.9	45.8	54.5	14.7	68.4	61	49.9	17.3	0.2
Barium	4340	1970	4140	5000	2720	2190	7860	4031.4	2043.8	0.5
Beryllium	2.8	1.3	1.4	1.1	0.88	2.4	1.3	1.6	0.7	0.4
Cadmium	4.4	2.3	2.9	2.1	3	8	2.7	3.6	2.1	0.7
Calcium	5580	2320	2150	4130	3500	5700	5410	4112.9	1516.4	0.3
Chromium	43.3	25.8	22.8	21	165	111	42.6	61.6	55.2	1.7
Cobalt	1260	404	1210	681	349	814	657	767.9	357.7	0.4
Copper	473	122	410	217	126	307	209	266.3	136.2	0.5
Iron	24100	9090	7170	4340	22600	75100	8370	21538.6	24856.7	2.8
Lead	35800	61400	85100	81300	38900	38800	76900	59742.9	21798.7	0.3
Magnesium	2770	3270	3620	1900	1500	6020	2830	3130.0	1472.0	0.5
Manganese	178	36.5	83.1	33.5	94.2	257	54	105.2	83.1	1.3
Mercury	2.8	0.47	0.72	0.43	0.23	0.6	0.56	0.8	0.9	2.3
Nickel	1970	815	2580	1180	629	1350	1140	1380.6	679.4	0.5
Potassium	158	347	424	350	173	293	492	319.6	122.9	0.3
Selenium	172	139	170	162	106	180	168	156.7	25.8	0.1
Silver	9.8	5	23.3	9.5	6.3	13.1	9.8	11.0	6.0	0.6
Sodium	360	5730	13100	7080	1640	2610	7010	5361.4	4322.9	1.3
Thallium	0.09	0.38	0	0.49	0.24	0	0.52	0.2	0.2	1.7
Vanadium	240	111	110	105	72.2	140	106	126.3	53.9	0.4
Zinc	212	14.4	26.3	24.7	23.9	57.3	17.8	53.8	71.2	3.6
Cyanide	0.52	1.4	1.4	2.9	0.99	1.6	4.4	1.9	1.3	1.0

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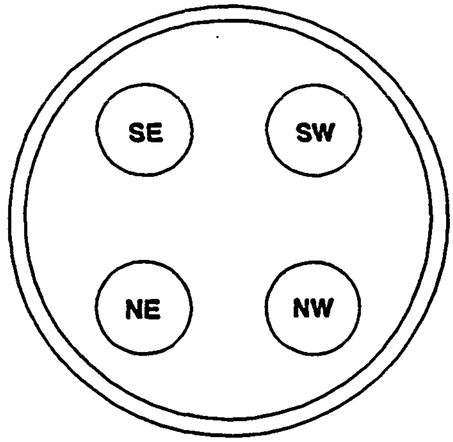
TABLE 2-3

Determination of Number of Samples (Silo 2 Inorganics) Method SW-846

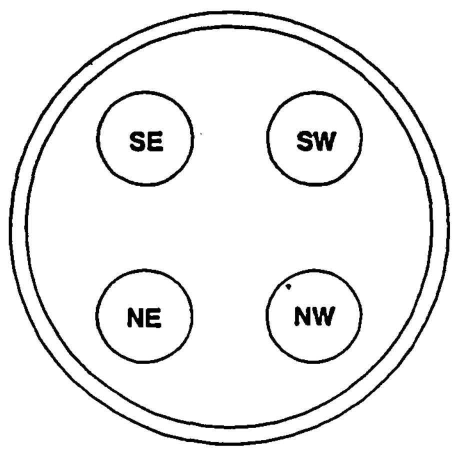
SILO 2

Inorganic (mg/kg)	S2NE1	S2NE2	S2NW1	S2NW2	S2SW1	S2SW2	MEAN	STD	EST NMBR OF SAMPLES
Aluminum	2570	1360	1250	1180	464	551	1229.2	756.7	0.8
Arsenic	1960	330	71.3	57.5	81.4	64.5	427.5	758.1	6.9
Barium	2460	89.2	1190	3090	8370	8000	3866.5	3503.7	1.8
Beryllium	2	0.66	6	2.7	1.6	2.1	2.5	1.8	1.2
Cadmium	19.1	4.1	5.6	5	3.6	3.4	6.8	6.1	1.7
Calcium	41900	301000	10300	2430	3610	8570	61301.7	118328.1	8.1
Chromium	42.2	12.9	68.8	47.2	24.3	34.1	38.3	19.4	0.6
Cobalt	2430	6.2	648	543	692	602	820.2	827.6	2.2
Copper	1790	0	220	221	263	249	457.2	660.1	4.5
Iron	13500	4010	37800	26900	8330	11400	16990.0	12791.9	1.2
Lead	21600	153	15100	17600	28500	29800	18792.2	10823.8	0.7
Magnesium	7390	8740	4200	4220	1520	2060	4688.3	2867.7	0.8
Manganese	403	335	170	160	74.2	83.2	204.2	135.1	1.0
Mercury	1	2.3	1.7	0.37	0	0.34	1.0	0.9	1.9
Nickel	2200	14.6	878	787	1070	897	974.4	704.7	1.1
Potassium	207	37.8	271	192	118	289	185.8	94.8	0.6
Selenium	91.1	0	117	95.9	118	105	87.8	44.4	0.6
Silver	22.8	0	9.1	12	7.4	10.1	10.2	7.4	1.1
Sodium	4070	588	912	226	3100	857	1625.5	1567.4	2.0
Thallium	0.61	0	0.33	0.39	1.4	0.82	0.6	0.5	1.5
Vanadium	142	21.9	214	211	151	193	155.5	72.1	0.5
Zinc	154	11.2	31.6	70.8	25.8	25.7	53.2	53.3	2.2
Cyanide	1.1	0	4.5	0.9	2.5	1.6	1.8	1.6	1.7

[redacted]



SILO #1 (S1)



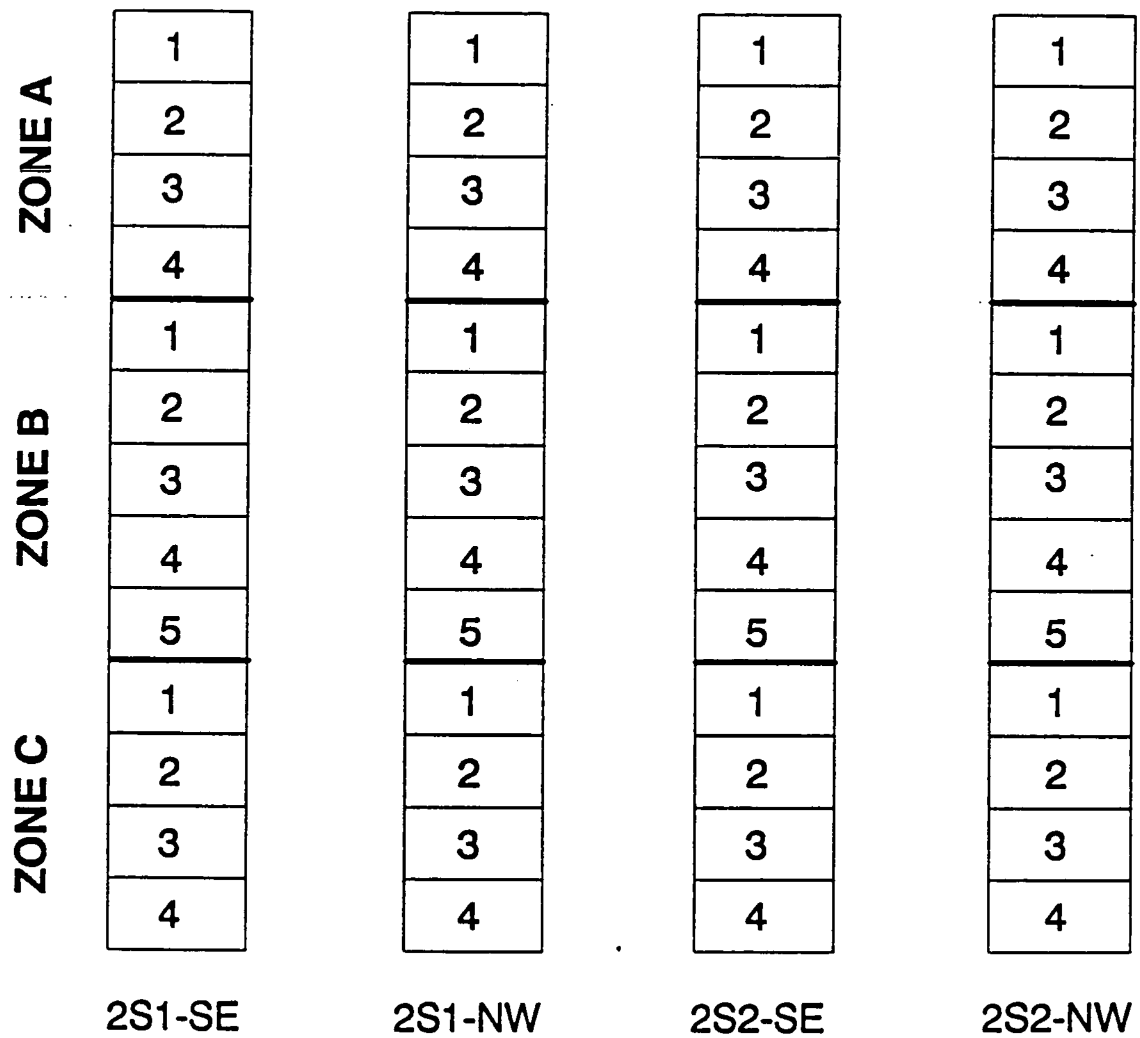
SILO #2 (S2)

General sample nomenclature is as follows:

Silo Number - Manway I.D. - Zone I.D. - Section I.D.
Example: 2S1-SW-A-1 Indicates top section from Zone A of SW core taken from Silo #1 (Second Sampling Run)

FIGURE 2-1. IDENTIFICATION OF CORE SAMPLES

2431



Sample core subsamples will be taken from all of the specified zones above. These zones will be determined by physical variability and radioactivity or, if physical variability is limited, then core will be divided into top (A), middle (B), and bottom (C) zones. All sections of each zone will be 18" in length. Samples will be taken from each zone for such analytical tests as HSL inorganics, HSL organics, TCLP metals, and radionuclides. Additionally, a composite sample will be drawn from all sections of each core and from the most radioactive section of each core. These will be submitted for same analytical tests as individual zone samples.

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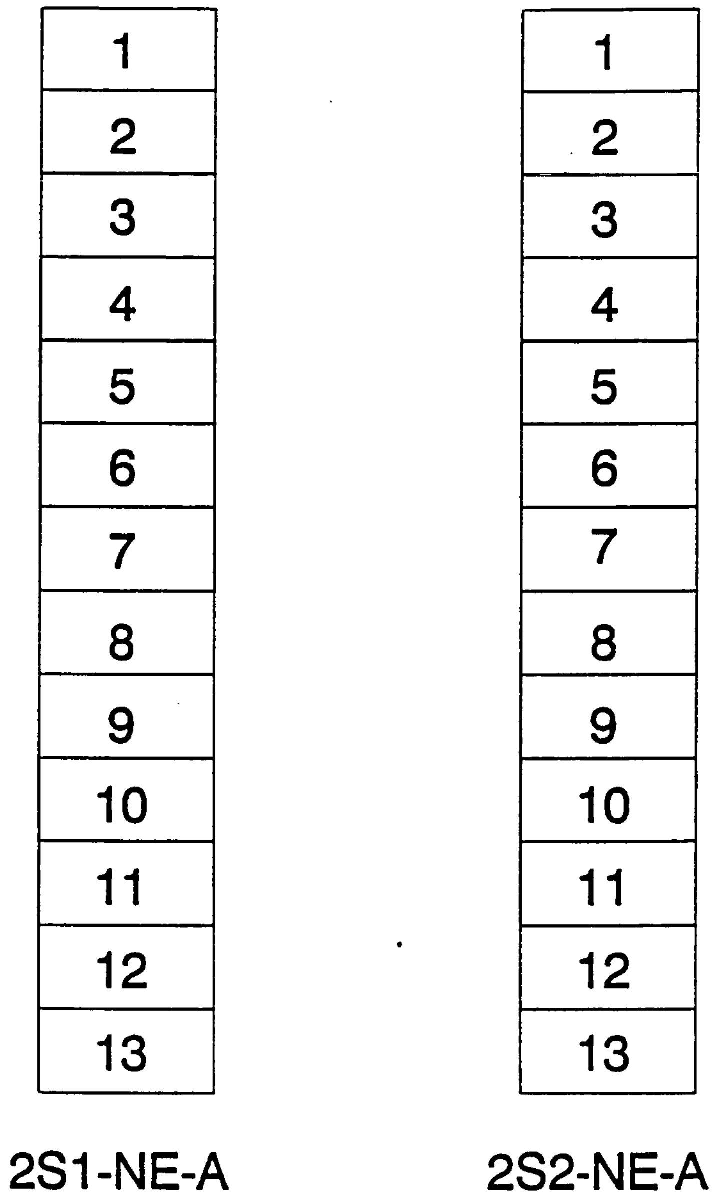
FL/303317.09.33/2-2

FIGURE 2-2. SECTIONING OF SE AND NW SAMPLE CORES



Sample sections specified above are 18" in length. Representative samples will be taken from each section to yield one composite sample from each core (total of two). Analyses to be performed on these composite samples will be for HSL organics, HSL inorganics, TCLP metals, and radionuclides.

Note: Only one zone specified per core (A)

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FL/30317.09.33/2-3

FIGURE 2-3. SECTIONING OF NE SAMPLE CORES

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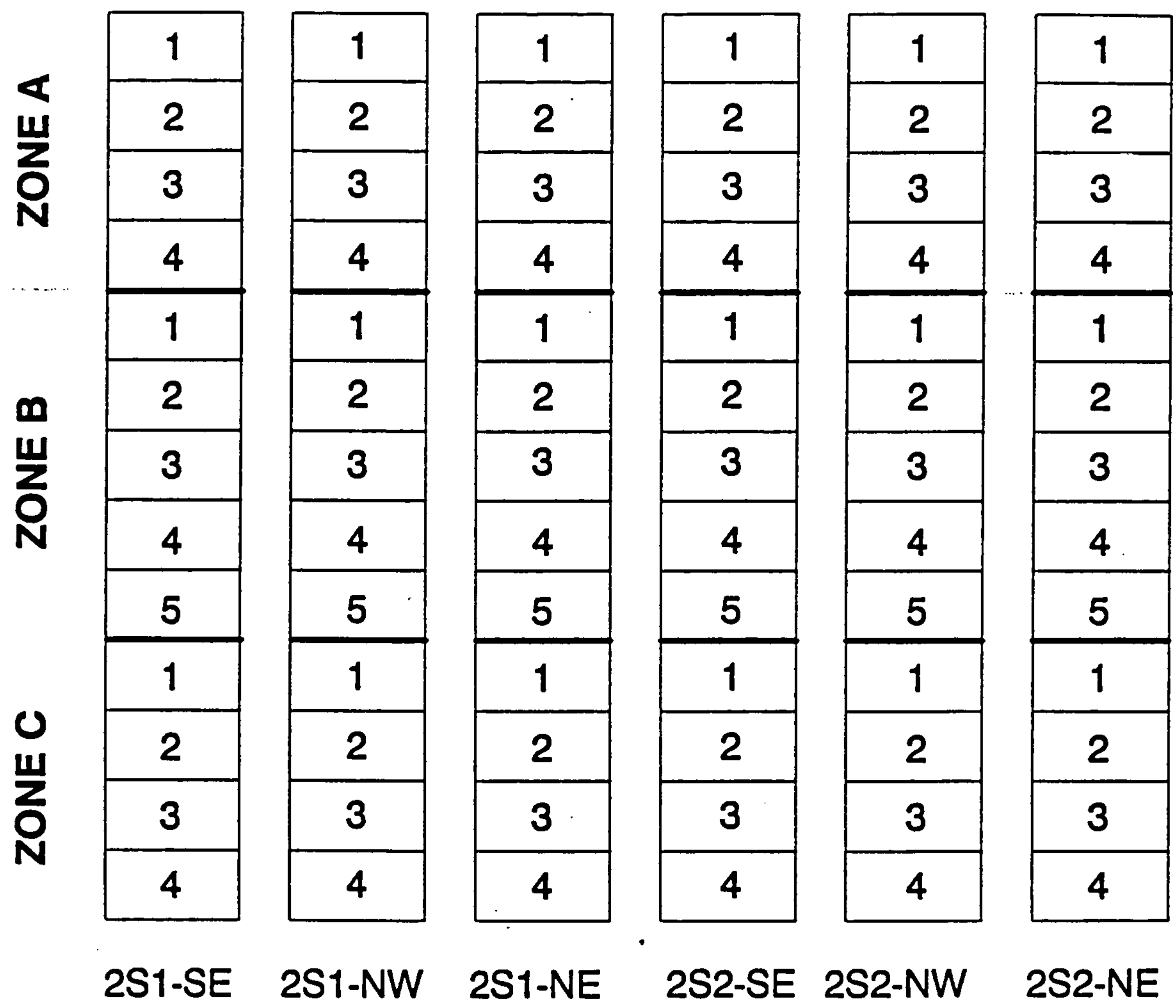

The SE, NW, and NE sample cores will be subsampled for engineering tests. Three composited samples from each silo will be made up of subsamples from the same horizontal layers found in each of the three specified cores (6 total). Criteria to select specific zones from each core for sampling will be based on the same zone criteria used in sectioning SE and NW cores less the radiologically most active zone criteria.

000312

FJ/30317.08.33/2-4

FIGURE 2-4. SUBSAMPLING OF SAMPLE CORES FOR ENGINEERING TESTS

At the direction of a geotechnical specialist, the cores from the southeast and northwest manways will be subdivided into zones based on differences in observed physical characteristics. The reasoning is that those areas of material exhibiting distinctly different observable characteristics may represent areas with correspondingly different chemical and radiological characteristics. Plant process records indicate that the K-65 silos received material from different sources with varying physical characteristics.

The zones of each sample core will be further subdivided into 18-inch sections. A zone will then be sampled by compositing equal masses of material from the sections within that zone. If there is no observed significant variability in a core, samples will be drawn from the top, middle, and bottom portions of each core as previously described. In addition to these samples, a sample will be taken from the section with the highest radiation reading based on a radiological scan in the examination trailer. This will provide a "worst case: condition from a radiological standpoint. Four samples have been drawn from each of the two cores thus far.

To safeguard against missing a critical section, a composite sample will also be prepared from the same two cores. This sample will be formed by proportional masses from the full length of each core section. The resultant composite samples, therefore, can be considered as "biased" because they are formed from discrete zones of varying properties. This compositing scheme should account for any zone with extreme properties that are not conducive to visual observations or screening results (e.g., metals concentration). This provides the fifth sample from each of the two cores.

A composite sample will be collected from the core from the northeast manway from each silo. This sample will be formed by equal masses of material from each core section, equally spaced (18-inch lengths) along the core. No specific allowance will be made for visual characteristics or radiological screening results.

No samples will be taken from the fourth core from each silo because these cores are intended for long-term archiving.

It must be noted that the results of the visual characterization, field screening, or laboratory analyses could increase the number of vertical samples to be analyzed from a given core. The remaining sections of each core will be archived and can be retried for additional analyses, if deemed necessary. The need for additional vertical samples could be identified during the course of this sampling and analysis program, or could arise during future points int he remedial action process (e.g., to confirm a critical design assumption).

2.3 Recommended Number of Analyses 000313

Sub-sampling from the four cores taken from each silo will result in eight distinct samples and three composite samples from each silo, resulting in 11 total samples for radiological [redacted] and chemical analysis from each silo. A total of 22 samples, therefore, will be collected from the two silos, along with 8 quality control samples which include 1 blind duplicate sample, 2 sets of triplicate samples, 2 equipment rinsates, and 1 equipment rinsate blank. Handling of these samples is described in procedure DWP-002. Each sample will be analyzed for radiological parameters, Hazardous Substance List (HSL) inorganics, HSL organics, and TCLP metals as defined in Section 3.7.1. TCLP organic analyses will be performed on those samples containing organic compounds as determined by the HSL organic analyses. Table 2-4 lists the core sections and analyses to be conducted.

Composite samples will be used where applicable for the physical testing program described in Section 3.7.2. Other physical testing described in Section 3.7.2 which requires an undisturbed sample will be acquired from a 5-inch section cut from the sample core for this purpose. The composite samples will be formed from individual samples taken from the same horizontal strata in each of the three sampled cores from a given silo. This compositing strategy will take advantage of the expected similarity of properties within each horizontal strata. Six composite samples are proposed, representing three horizontal layers in each of the K-65 Silos. The specific layers to be sampled will be those exhibiting the best combination of the following three properties: (1) present in all three cores at approximately the same depth; (2) relatively homogeneous within the layer but different from adjacent layers; and (3) of sufficient thickness to be of concern to the eventual evaluation of vertical heterogeneity. If no such layers are present, composite samples will be formed from comparable depths from the top, middle, and bottom of each core as determined by the visual characterization of the cores. If necessary to properly account for significant layering, more than three composite samples may be collected.

3.0 SAMPLING METHODOLOGY

Detailed operational procedures have been prepared for this sampling effort and are presented in Appendix A. These procedures have been written in a detailed step-wise fashion so that the K-65 Sampling Supervisor and sampling team members will have a clear understanding of the methodological approach. Included in the following sections are summaries of each major step in the sampling process: (1) Location Preparation, (2) Sampling Operations, (3) Sample Handling, (4) Decontamination Requirements, (5) Chain-of-Custody and Request for Analysis, (6) Sample Packaging and Shipping, and (7) Sample Analysis.

3.1 Location Preparation

3.1.1 Preparation of Support Facilities and Laydown Area

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An enclosed, 40-foot long examination trailer with rear access doors will be used as the controlled handling area for the sample cores. The location of the trailer and laydown area are shown in Figure 3-1. The examination trailer and laydown area will be away

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TABLE 2-4

Core Sections and Analyses (Radiological and Chemical)

SAMPLE NO.	CORE SECTION SAMPLED	ANALYSES REQUESTED
1	2S1-SE-A-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
2	2S1-SE-B-1,2,3,4 & 5	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
3	2S1-SE-C-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
4	2S1-SE-R	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
5 (COMP.)	2S1-SE-A-1,2,3, & 4 2S1-SE-B-1,2,3,4 & 5 2S1-SE-C-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
6	2S1-SE-D-3	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
7	2S1-NW-A-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
8	2S1-NW-B-1,2,3,4 & 5	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
9	2S1-NW-C-1,2,3,4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
10	2S1-NW-R	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
11 (COMP.)	2S1-NW-A-1,2,3 & 4 2S1-NW-B-1,2,3,4 & 5 2S1-NW-C-1,2,3 & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
12	2S2-SE-A-1,2,3 & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
13	2S2-SE-B-1,2,3,4 & 5	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
14	2S2-SE-C-1,2,3 & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
15	2S2-SE-R	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
16 (COMP.)	2S2-SE-A-1,2,3, & 4 2S2-SE-B-1,2,3,4 & 5 2S2-SE-C-1,2,3 & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
17	2S2-NW-A-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
18	2S2-NW-B-1,2,3,4 & 5	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
19	2S2-NW-C-1,2,3, & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
20	2S2-NW-R	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
21 (COMP.)	2S2-NW-A-1,2,3, & 4 2S2-NW-B-1,2,3,4 & 5 2S2-NW-C-1,2,3 & 4	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
22	2S2-NW-D-1	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
23 (COMP.)	2S1-NE-A-1 THRU 13	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
24 (COMP.)	2S2-NE-A-1 THRU 13	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES
25 (COMP.)	2S2-NE-D-3	HSL INORGANICS, TCLP METALS, ISOTOPICS, HSL ORGANICS, PCBS, PESTICIDES

Core Sections and Analyses (Geotechnical)

SAMPLE NO.	CORE SECTION SAMPLED	ANALYSES REQUESTED
26	2S1-SE-A-1 THRU 4 2S1-NW-A-1 THRU 4 2S1-NE-A-1 THRU 4	SEE TABLE 3-3
27	2S1-SE-B-1 THRU 5 2S1-NW-B-1 THRU 5 2S1-NE-B-1 THRU 5	SEE TABLE 3-3
28	2S1-SE-C-1 THRU 4 2S1-NW-C-1 THRU 4 2S1-NE-C-1 THRU 4	SEE TABLE 3-3
29	2S2-SE-A-1 THRU 4 2S2-NW-A-1 THRU 4 2S2-NE-A-1 THRU 4	SEE TABLE 3-3
30	2S2-SE-B-1 THRU 5 2S2-NW-B-1 THRU 5 2S2-NE-B-1 THRU 5	SEE TABLE 3-3
31	2S2-SE-C-1 THRU 4 2S2-NW-C-1 THRU 4 2S2-NE-C-1 THRU 4	SEE TABLE 3-3

NOTES:
THOSE SAMPLES WITH A "D-1" OR "D-3" SUFFIX ARE QUALITY CONTROL SAMPLES. THOSE SAMPLES WITH AN "R" SUFFIX ARE HIGH RADIATION SAMPLES. THE NUMBERS IN THE SAMPLE IDENTIFIER FOR ALL SAMPLES, EXCEPT THE QUALITY CONTROL SAMPLES, INDICATE THE SECTIONS OF [illegible] SAMPLE CORE THAT ARE COMPOSITED TO FORM THAT PARTICULAR SAMPLE.

[redacted]

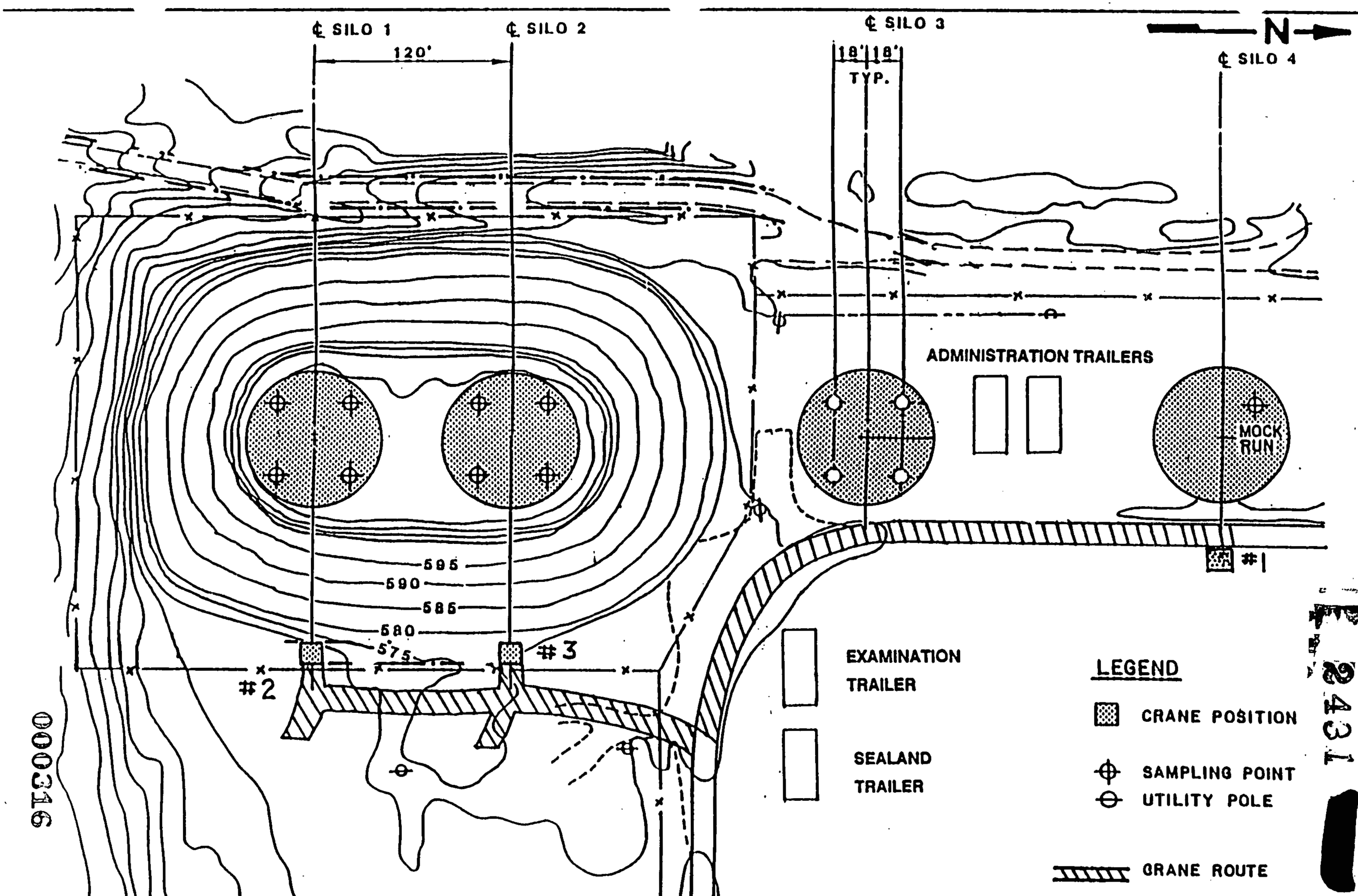

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FIGURE 3-1. SAMPLING AREA LAY-OUT/CRANE ROUTE from Silos 1 and 2 in an area of comparatively low background radiation. This location is necessary to increase the sensitivity of radiation-measuring instruments during radiological scanning of the cores. Controlled ventilation through a HEPA filter and two stage airlocks must be provided during sample cutting and packaging. In addition to the examination trailer, two administration trailers will be placed between Silos 3 and 4 and a sealand lab/break trailer will be placed east of the examination trailer. Temporary power will be required for the administration trailers and the lab/break trailer.

3.1.2 Delivery and Preparation of Sampling Equipment

All sampling equipment will be brought into the FMPC through the Main Security Gate and will be transferred through the plant to the laydown area. All incoming equipment will be inspected and inventoried before use. Procedure DWP-001 will be followed for preparing the sampling equipment for use.

3.1.3 Delivery and Setup of Crane

Sampling operations require the use of a 165-ton crane equipped with a 220-foot long boom (See Figure 3-2). Due to its size, the crane will be delivered to the site in pieces and assembled near Silo 4 at the site of the mock run. Setup and positioning of the crane will follow Procedure DWP-006. The crane vendor/supplier shall provide documentation of inspection and servicing of the crane to comply with Occupational Safety and Health Administration (OSHA), Section 1910.180 and 1926.550 and with all relevant national consensus (ANSI) standards before the unit is allowed on site. Any identified deficiencies must be corrected prior to use. Load testing will be performed and documented in accordance with WMCO Maintenance Work Instruction CRA-001.

The security fence in the immediate vicinity of the silos will be breached at several locations to allow access for the crane. WMCO personnel will perform the dismantlement and reconstruction of the fence. A temporary security barrier around the breached fence shall be in place during reinstallation of a permanent fence. Only authorized personnel will be allowed access through the security fence.

3.2 Sampling Operations

Sampling operations will be conducted as four distinct activities. The activities are:

- Vibra-Corer field testing in soil north of Silo 4.
- Vibra-Corer field testing in the lime sludge ponds
- Mock sampling of Silo 4
- Sampling of Silos 1 and 2.

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This progression of sampling was chosen because of the radiological and possibly hazardous nature of the K-65 residues in Silos 1 and 2. The testing in the soil will be performed to test the basic performance of the new Vibra-Corer Unit and Remote Throttle Control Assembly. The testing in the lime sludge ponds will be performed to test the

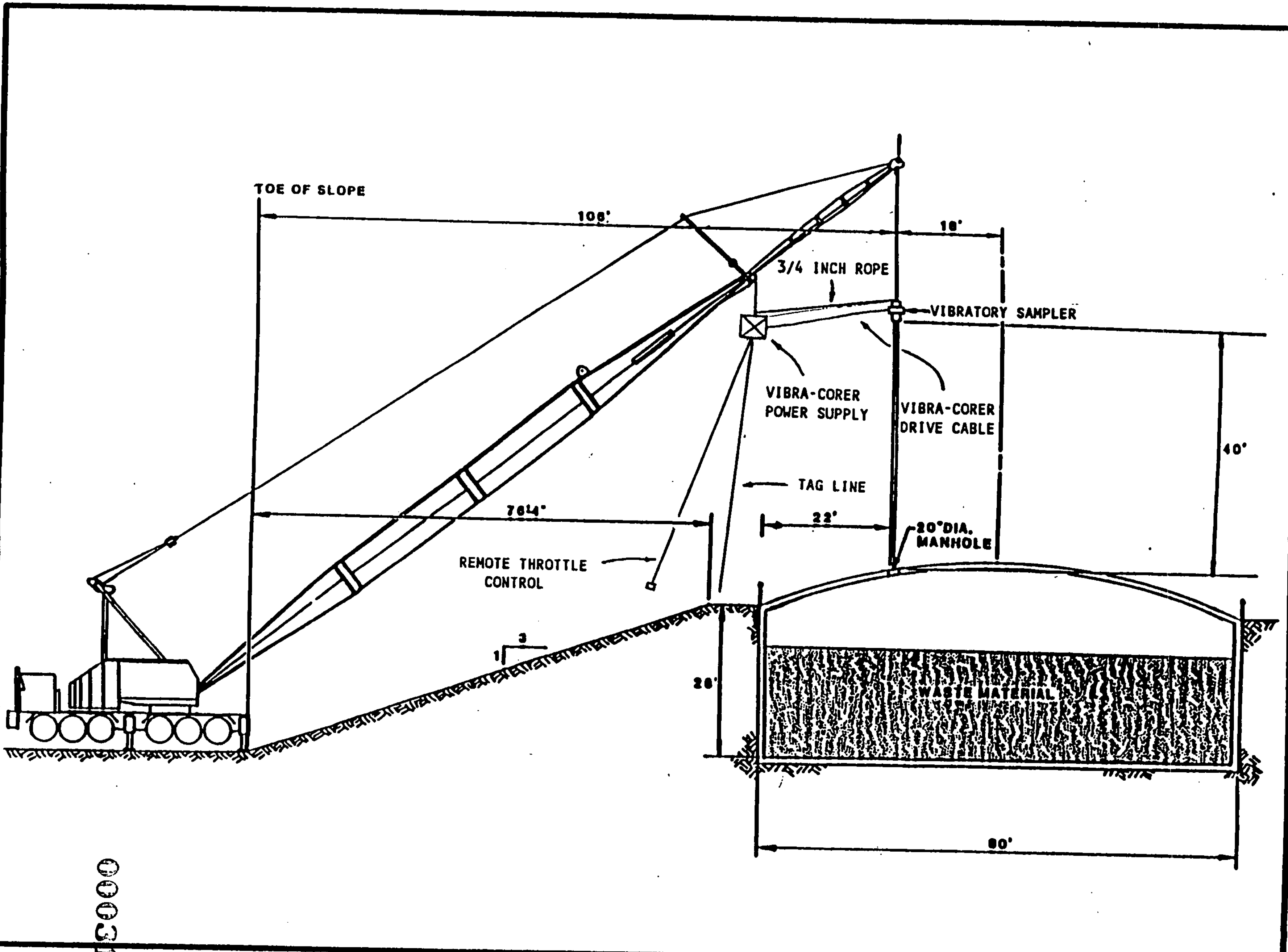

FIGURE 3-2. CONCEPTUAL POSITIONING OF CRANE AND SAMPLER

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performance of the Vibra-Corer in material similar to that found in the K-65 Silos. The mock sampling run will be conducted on Silo 4, which is empty, to demonstrate and refine the specialized sampling techniques, to test equipment operation, to train personnel adequately, and to provide documentation to the impact assessment project file. This sequence will further train the sampling personnel. The last activity will be the sampling of Silos 1 and 2.

3.2.1 <u>General Sampling Procedure</u>

The sampling team will consist, at a minimum, of the 14 persons listed below with training records documented:

- DOE Representative
- K-65 Sampling Supervisor, IT
- Crane Operator (subcontractor)
- Crane Rigger(s) (subcontractor/IT)
- Vibra-Corer operator (IT)
- Two sampling technicians (IT)
- Five Radiological Safety Technicians (RST),(WMCO/IT)
- Health Physics Supervisor (WMCO)
- Quality Assurance (QA) engineer (ASI)

In addition, a security guard must be present if the K-65 fence is breached. Before sampling Silos 1 and 2, the radon removal system will be operated by WMCO personnel in accordance with WMCO Procedure WMCO RE-S-01-001 on the silo to be sampled until the radon concentration has been reduced to the prescribed acceptable level for sampling.

A Crane Rigger in the Vibra-Corer pickup area will guide the crane operator when picking up the clean Vibra-Corer and when lowering the completed sample core onto a flatbed trailer in the pickup area (See Figure 3-3). Sampling personnel on the silo will guide the crane operator while positioning the Vibra-Corer over the open manhole during sampling operations, in accordance with Procedure DWP-001. Prior to this point, the manhole flanges on the silos will have been removed in accordance with Procedure DWP-001.

During the sampling of each silo, a 45-foot long polyester section of pipe sleeving will be connected to the manway glovebag and positioned above the manhole before lowering the Vibra Corer through the manhole. The Vibra-Corer unit will then be turned on and lowered to penetrate the residue, thereby collecting the continuous core sample. When the Vibra-Corer has reached within one foot of the bottom of the silo, the vibrating mechanism will turn off. As the Vibra Corer is withdrawn from the silo, the polyester sleeve will be extended over the core barrel. After withdrawal of the entire core barrel,

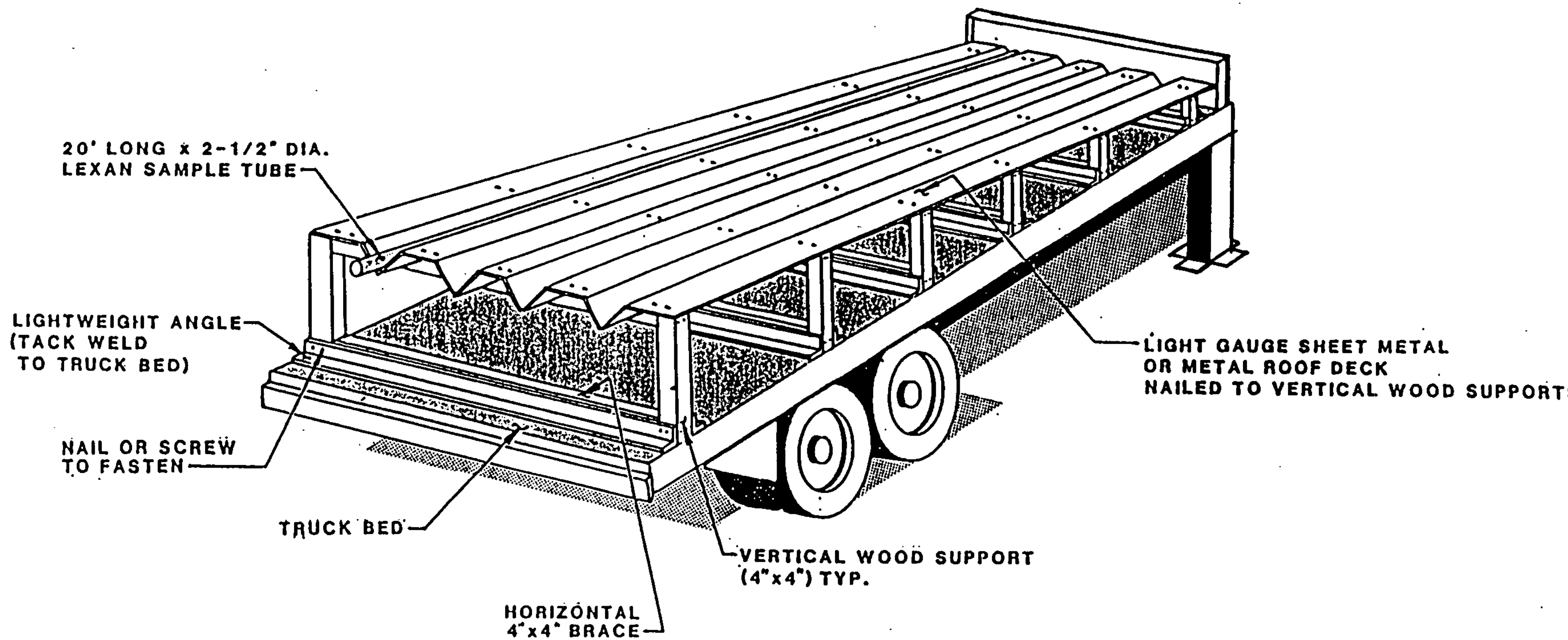

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FIGURE 3-3. CONCEPTUAL SKETCH OF TRAILER-MOUNTED CORE HOLDER the sleeve will be taped shut at the bottom. The Vibra-Corer containing the core sample will then be raised from the silo using the crane. If excessive forces are detected, crane boom movements may be required or the Vibra-Corer will be turned on and operated momentarily to relieve the binding forces.

As the crane lowers the core to the pickup area, the core will be placed on a specially designed trailer bed. The sleeved core will be transported by truck to the laydown area by the examination trailer. All manhole flanges will be replaced and resealed per Procedure DWP-001 after completion of the sampling program.

3.2.2 <u>Field Testing in Soil</u>

The Vibra-Corer will be tested in soil north of Silo 4 to evaluate the performance of the sampling device and associated equipment during a full penetration test. This test will determine those vibratory adjustments required for smooth and efficient operation of the Vibra-Corer.

A 40-foot section of the sampling tube with the liner and cutterhead will be used. The Vibra-Corer will be suspended from a boom truck or small crane and lowered into the soil to retrieve a soil sample. A penetration permit will be obtained from WMCO prior to testing. Results of testing shall be documented on the Field Activity Daily Log.

3.2.3 <u>Field Testing in the North Lime Sludge Pond</u>

The Vibra-Corer will be tested in the north lime sludge pond to test the capabilities of the sampling device in material similar to that found in the K-65 Silos. The lime sludge pond will be sampled at the north and east sides in an effort to retrieve continuous and undisturbed samples. These two locations will provide materials of different consistency in which to test the Vibra-Corer.

A 20-foot section of the sampling tube with the liner and cutterhead will be used. The Vibra-Corer will be suspended from a boom truck or small crane and lowered into the sludge pond to retrieve a sample. The crane will be located on the north bank and the east bank of the north lime sludge pond.

After determining the amount of material retrieved, the material will be returned to the Lime Sludge Pond. A penetration permit will be required from WMCO prior to testing. Results of testing shall be documented on the Field Activity Daily Log.

3.2.4 <u>Mock Sampling Run on Silo 4</u> 0321

A full-scale mock sampling run is planned after the lime sludge pond field testing to further test the Vibra Corer sampling device, the crane, and the overall implementability of the detailed sampling procedures. Particular attention will be given to the execution time of each activity, and ways that procedure execution can be streamlined to minimize the time spent on the silos. Improved equipment or procedures to minimize the chance of malfunctions will also be considered. The mock sampling run will be accomplished per Procedure DWP-004, "Mock Silo Sampling Operations". Deficiencies identified in the detailed sampling procedures will be immediately communicated to the Sampling Task Manager. An alternative course of action will be identified by the Sampling Task Manager along with other task coordinators. All changes must be documented and approved before the change is implemented, in accordance with Section 15.0 of the FMPC RI/FS Quality Assurance Project Plan (QAPP). If required, multiple mock sampling runs will be performed until the K-65 Sampling Task Manager is satisfied that all sampling personnel are adequately trained.

3.3 Sample Handling

When the approximately 22-foot long cores are removed from the silos, the following activities will be performed:

- Capping, decontamination, and labeling of the Lexan core barrels (DWP-002);
- Visual inspection, video recording, and radiological scanning of cores (DWP-002);
- Analysis of radiological scanning data and reevaluation of number of samples required from each core;
- Sectioning the Lexan core, and packaging and shipping individual samples, (DWP-002);
- Labeling of the core and core sections with unique five-digit identification numbers (DWP-002); after completion of sectioning, all core sections will be accounted for;
- Capping, decontamination, and packaging the remaining core sections for long-term archiving (DWP-002);
- All waste generated will be handled in accordance with WMCO Procedure SOP-65-C-106.

3.4 Decontamination Requirements

During sampling, the sampling devices and some measurement equipment may become contaminated. All equipment used during sampling must be screened for external radiological contamination before leaving the regulated sampling site. The maximum radiological surface contamination limits for the equipment are shown in Table 3-1. WMCO Procedure SOP-1-C-915 will be followed for decontamination of these items.

Equipment to be used for more than one sample extraction must be decontaminated to reduce personnel exposure and cross contamination of samples. All equipment to be used for analytical sampling must be decontaminated prior to use by an alkonox wash, deionized water rinse, methanol rinse, O.1N hydrochloric rinse followed by a final deionized water rinse. Two equipment rinsate samples must be done with deionized water poured over the equipment used for the 20th and 22nd samples. A blank of the deionized water must also be submitted for analysis.

Sampling equipment that is to be reused will be decontaminated before use for resampling. All non-analytical sampling equipment will decontaminated using a approved cleaner and rinsed with deionized water. All analytical sampling equipment will be decontaminated using an alkonox was, deionized water rinse, methanol rinse, O.1N hydrochloric rinse, and deionized water rinse. Upon completion an equipment rinsate sample must be taken and submitted for analysis.

The sampling personnel will be responsible for decontaminating the equipment. Clean rubber gloves will be used for the decontamination activities. The RST will survey the equipment before and after cleaning to determine if the radiological contaminants have been removed. The procedures will be repeated a maximum of three times if necessary. If, after the third attempt, the equipment is not cleaned below the levels defined in Table 3-1, another piece of equipment will be used.

Gross decontamination conducted during silo sampling will be performed with an approved cleaner, followed by a wipe down with paper towels. Gross decontamination conducted in the sample trailer (outside of lexan tube) will be done with the use of damp paper towels.

All equipment to be decontaminated will be handled in an area designated for this purpose. Catch basins will be used to collect excess decontamination solutions. These solutions will be transferred to properly labeled 55 gallon drums. All paper towels, gloves, catch basins, shoe covers, protective clothing, etc. shall be disposed of as referenced in Section 7.

TABLE 3-1

RECOMMENDED MAXIMUM CONTAMINATION
LIMITS FOR ITEMS GIVEN RADIATION CLEARANCE

	Recommended Limit	
Parameter	(dpm/100 cm^2)[1]	(mrad/hr)
Alpha	20[2]	N/A
Beta/Gamma	100[3]	0.05

[1]No 100cm^2 area to average greater than this value.

[2]Loose surface contamination as determined by swipe or "nondetectable" by audible response on a direct frisk.

[3]Fixed/loose contamination by direct frisk.

3.5 Chain of Custody and Request for Analysis

A formal Chain-of-Custody procedure will be implemented for the silo sampling program. A sample is defined as being "in custody" when:

- It is in the physical possession of the designated responsible party.
- It is in the view of the designated responsible party.
- It is placed in a secure area by the designated responsible party.
- It is in a secure area restricted to access by authorized personnel only.

The full-length core samples collected from the silos will be labeled and numbered, and a Chain-of-Custody form will be completed. A separate Chain-of-Custody form will be completed for all zones or sections sampled, including those to be archived by WMCO, and a Request for Analysis Form will be completed for those zones or sections samples to be sent to the laboratory for analysis. Sample Chain-of-Custody and Request for Analysis Forms are shown in figures 3-4 and 3-5, respectively.

FERNA
RI/FS

CHAIN-OF-CUSTODY RECORD

R/A Control No. ______

C/C Control No. 00150

PROJECT NAME/NUMBER ______ LAB DESTINATION ______

SAMPLE TEAM MEMBERS ______ CARRIER/WAYBILL NO. ______

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ______

Possible Sample Hazards: ______

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ______
   Received By: ______
2. Relinquished By: ______
   Received By: ______
3. Relinquished By: ______
   Received by: ______
4. Relinquished By: ______
   Received By: ______

WHITE - To accompany samples
YELLOW - Field copy

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FIGURE 3-4

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R/A Control No.
C/C Control No. ______

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REQUEST FOF .LYSIS

PROJECT NAME ______
PROJECT NUMBER ______
PROJECT MANAGER ______
BILL TO ______
______
______
PURCHASE ORDER NO. ______

DATE SAMPLES SHIPPED ______
LAB DESTINATION ______
LABORATORY CONTACT ______
SEND LAB REPORT TO ______
______
______
DATE REPORT REQUIRED ______
PROJECT CONTACT ______
PROJECT CONTACT PHONE NO. ______

Sample No.	Sample Type	Sample Volume	Preservative	Requested Testing Program	Special Instructions

TURNAROUND TIME REQUIRED: (Rush must be approved by the Project Manager.)

Normal ______ Rush ______ (Subject to rush surcharge)

POSSIBLE HAZARD IDENTIFICATION: (Please indicate if sample(s) are hazardous materials and/or suspected to contain high levels of hazardous substances)

Nonhazard ______ Flammable ______ Skin Irritant ______ Highly Toxic ______ Other ______ (Please Specify)

SAMPLE DISPOSAL: (Please indicate disposition of sample following analysis. Lab will charge for packing, shipping, and disposal.)

Return to Client ______ Disposal by Lab ______

FOR LAB USE ONLY

Received By ______ Date/Time ______

WHITE - Original, to accompany samples
YELLOW - Field copy

FIGURE 3-5

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3.6 Sampling Packaging and Shipping

Shipment of samples off-site will be done in accordance with WMCO Procedures. Samples for shipment will be packaged using package type 37A or 39, depending on hazard class determined by the preliminary screening. Overpacks will be used as much as possible to consolidate packages for shipment of samples with compatible hazard classifications.

Department of Transportation (DOT) labeling for packages will comply with the requirements of 49 CFR, parts 170-179. The labeling class requirements will be determined by the hazard class assigned to the samples during screening. All samples will be transported by a licensed, sole-usage contractor to ensure prompt delivery of samples and to provide a tracking mechanism for undelivered sample shipments. All paperwork to accompany each sample will be inserted into a Ziplock plastic bag to be enclosed with the sample.

3.7 Sample Analyses

The K-65 samples will be analyzed for physical, chemical, and radiological parameters as described in the following subsections. The proposed number of samples to be selected for each type of analysis was presented in Section 2.2.

3.7.1 Radiological and Chemical Analyses

Selected K-65 samples will be analyzed for radiological and chemical constituents to characterize the materials for the evaluation of disposal options. The required radiological analyses are listed below:

- Isotopic uranium
- Isotopic thorium
- Isotopic radium
- Pb-210
- Gamma spectroscopy
- Total uranium

All samples will also be analyzed for the following chemical parameters:

- HSL inorganics (See Table 3-2 for list of metals)
- HSL volatiles
- HSL semivolatiles
- HSL pesticides and PCBs (if positive hits, confirm by GC/MS)
- TCLP metals

Those samples found to contain organic compounds based on HSL organics analysis will be analyzed for organics by TCLP analysis.

Chemical analyses will be conducted using EPA Contract Laboratory Program (CLP) protocols when possible. CLP protocols will be modified only when conflicts arise between procedures established for handling radioactive materials and nonradioactive CLP procedures.

INORGANIC TARGET ANALYTE LIST (TAL)

Table 3-2

Analyte
Aluminum
Antinmony
Arsenic
Barium
Beryllium
Cadmium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Silver
Sodium
Thallium
Vanadium
Zinc
Cyanide

[redacted]

3.7.2 <u>Physical Analyses</u>

Physical properties of the K-65 and metal oxide residues will be determined to predict the expected behavior of the wastes during treatment and/or disposal operations. The proposed physical analyses and ASTM Standard Procedures are provided in Table 3-3.

TABLE 3-3

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
Water Content Determination	ASTM D2216-80, "Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures," <u>1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles</u>
Atterberg Limits	ASTM D4318-84, "Standard Test Methods for Liquid Limit, Plastic Limit, and Plastic Index of Soils," <u>1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles</u>
Specific Gravity Determination	ASTM D854-83, "Standard Test Method of Specific Gravity of Soils," <u>1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles</u>
Grain Size Distribution with Hydrometer Analysis	ASTM D422-63, "Particle Size Analysis of Soils," <u>1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rocks; Building Stones Geotextiles</u>

[redacted]

TABLE 3-3 (Continued)

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
One-Dimensional Consolidation	ASTM D2435-80, "One Dimensional Consolidation Properties of Soils," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles
Consolidated Undrained Triaxial with Pore Pressure	EM 1110-2-1906, "Engineering and Design, Laboratory Testing Manual," Department of the Army.
Standard Proctor	ASTM D698-78, "Test Methods of Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5 lb (2.49 kg) Rammer and 12 in (305 mm) Drop," 1987 Annual Book of ASTM Standards, Vol. 04.08 Soil and Rock; Building Stones; Geotextiles.
Modified Proctor	ASTM D1557-78, "Test Methods for Moisture Density Relationships of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 kg) Rammer and 18 in. (457 mm) Drop," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones, Geotextiles.
Maximum Index Density	ASTM D4253-83, "Test Methods for Maximum Index Density of Soils Using a Vibratory Table," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock; Building Stones; Geotextiles.

TABLE 3-3 (Continued)

ENGINEERING PROPERTIES PARAMETERS

Method Title	Reference
Minimum Index	ASTM D4254-83, "Test Methods for Minimum Index Density of Soils and Calculation of Relative Density," 1987 Annual Book of ASTM Standards Vol. 04.08 Soil and Rock, Building Stones; Geotextiles
In Situ Soils Density Determination	No ASTM Designation

[redacted]

4.0 K-65 SILOS STRUCTURAL INTEGRITY

Due to environmental elements, the K-65 silo domes have deteriorated and are considered the weakest structural components of the silos. The placement of dome covers over the structurally deficient 20-foot center portion of the domes was considered only as a temporary remedial solution (1 to 2 years). Since final remediation plans for the K-65 silos will take at least 3 years to develop and implement, additional remedial actions to provide for continued safe containment of the K-65 residues are being considered.

The continuing concern regarding the structural integrity of the silo domes was instrumental in the development of the operational procedures for the K-65 Sampling Program. The use of cranes located away from the silos was dictated by the constraint on placing heavy equipment on the domes. The specified size of the crane was based on the need to maintain a factor of safety in relation to the momentum created by the weight of the sampling unit and the resistance forces during the sample withdrawal. This will minimize the risk of the crane overturning or failure of the cantilevered beam. A repositioning of the crane for each set of samples will keep the length of the arm at a minimum.

The probability of cable failure (resulting in a possible impact force on the dome by the falling sampling apparatus) is low considering the high tensile strength of the cable. Any significant resistance will be overridden by the start-up of the vibratory action of the Vibra-Corer, or by moving the boom to correct any angle in the load line.

Any loads that are on the domes during sampling will be kept at an acceptable level. The maximum number of sampling personnel on the dome at any given time will be limited to three individuals. The maximum weight limit for personnel and equipment on the silo domes is 700 pounds (Letter from R.B. Barber, Bechtel National to J.B. Craig, DOE). Recent silo sampling operations have shown that such loads can be supported. As an additional safeguard, no personnel or other loading will be allowed within the 20-foot central portion of the dome occupied by the plywood and steel cap. This portion is considered the most susceptible to structural failure due to the reduced thickness of the concrete in this area. It is also noteworthy that the snow load assumed under the worst-case structural analysis will not be of concern during the sampling program, thereby providing an additional factor of safety in the allowable loadings. As an additional safety precaution, safety nets will be installed in the immediate walking vicinity of the silo manways to minimize personnel injury in the event of a partial silo breakthrough.

5.0 FACILITY AND EQUIPMENT REQUIREMENTS

5.1 WMCO Facilities

WMCO will provide electric utilities to the examination, administration, and lab/break trailers. The location of the trailers is described in Section 3.1. The electrical requirements are 110 VAC and 220 VAC.

WMCO will provide training for contract personnel in FMPC safety and emergency procedures. They will also provide clothing in the form of coveralls and shoes, laundry services, locker facilities, and showers.

5.2 Equipment

The Operational Readiness Review Checklist provides a detailed listing of the minimum equipment requirements for the sampling program. The required health and safety equipment is listed in Plan-001, "Site-Specific Health and Safety Plan", in Appendix B.

5.2.1 Respiratory Equipment

5.2.1.1 Personnel Certification

All subcontractor personnel using any form of respiratory protection equipment at the FMPC must be properly medically certified, trained, and fit-tested before they may use such equipment.

Documentation of the above must be submitted by the subcontractor and approved before the use of such respiratory equipment. Personnel must be certified for and fit-tested with the same equipment they will be using at the FMPC.

5.2.1.2 Respiratory Equipment Certification

All respiratory equipment used on the project must be approved by the National Institute for Occupational Safety and Health (NIOSH) and properly maintained. An adequate supply of the equipment and all necessary spare parts must be kept at the FMPC site.

6.0 QUALITY ASSURANCE

Unless different methods have been approved by virtue of being incorporated in this addendum to the FMPC RI/FS Work Plan, all work and documentation associated with the K-65 Silos Resampling and Analysis is to be performed in accordance with the FMPC Quality Assurance Project Plan (QAPP), Volume 5 of the FMPC RI/FS Task 2 Rep [redacted] Work Plan Requirements documents.

Options that will be used for Quality Control during the sampling operations include trip blanks, blind duplicates, triplicate matrix samples, equipment rinsates, and rinsate blanks.

Changes to this addendum must be approved before the changes are implemented, as required by Section 15 of the QAPP.

Specific QAPP descriptions, methods, or requirements that have been amplified, expanded or described differently in this addendum are:

- Schedule (Figure 8-1)
- Project Organization (Figure 8-2)
- Chain-of-Custody (Appendix C)
- Laboratory Analysis
- Field Procedures/Sampling Procedures (Appendix A & C)
- Equipment Calibration (Section 9.0)
- Preventive Maintenance (Section 9.0)
- Use of WMCO Procedures that impact the QAPP
- Decontamination Procedures (Section 3.4)

7.0 WASTE MANAGEMENT

Waste management, handling, and packaging requirements for the K-65 sampling program are provided in WMCO Procedure SOP-65-C-106. The generated waste will be handled as radioactive waste. These wastes will be packaged in appropriately labeled containers and transferred to WMCO for further handling and/or disposal. No liquid wastes, other than decontamination fluids, are expected to be generated during the sampling program. However, if any liquid waste is generated, it will be handled in accordance with WMCO provisions and transferred to WMCO for disposal after appropriate containment and packaging.

Individuals who will be performing and/or directing activities that produce, or have the potential to produce, waste materials will have appropriate training on WMCO waste management practices. This will ensure that the waste materials are handled properly and safely, as well as helping to minimize the volume of waste generated. These individuals will also have appropriate training and knowledge of performing waste characterizations.

8.0 MANAGEMENT PLAN

Figure 8-1 presents the proposed schedule for the sampling program.

The K-65 Sampling Management Organization governs all management responsibilities and activities for the K-65 Sampling Program as shown on the organization chart in Figure 8-2.

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FIGURE 8-1

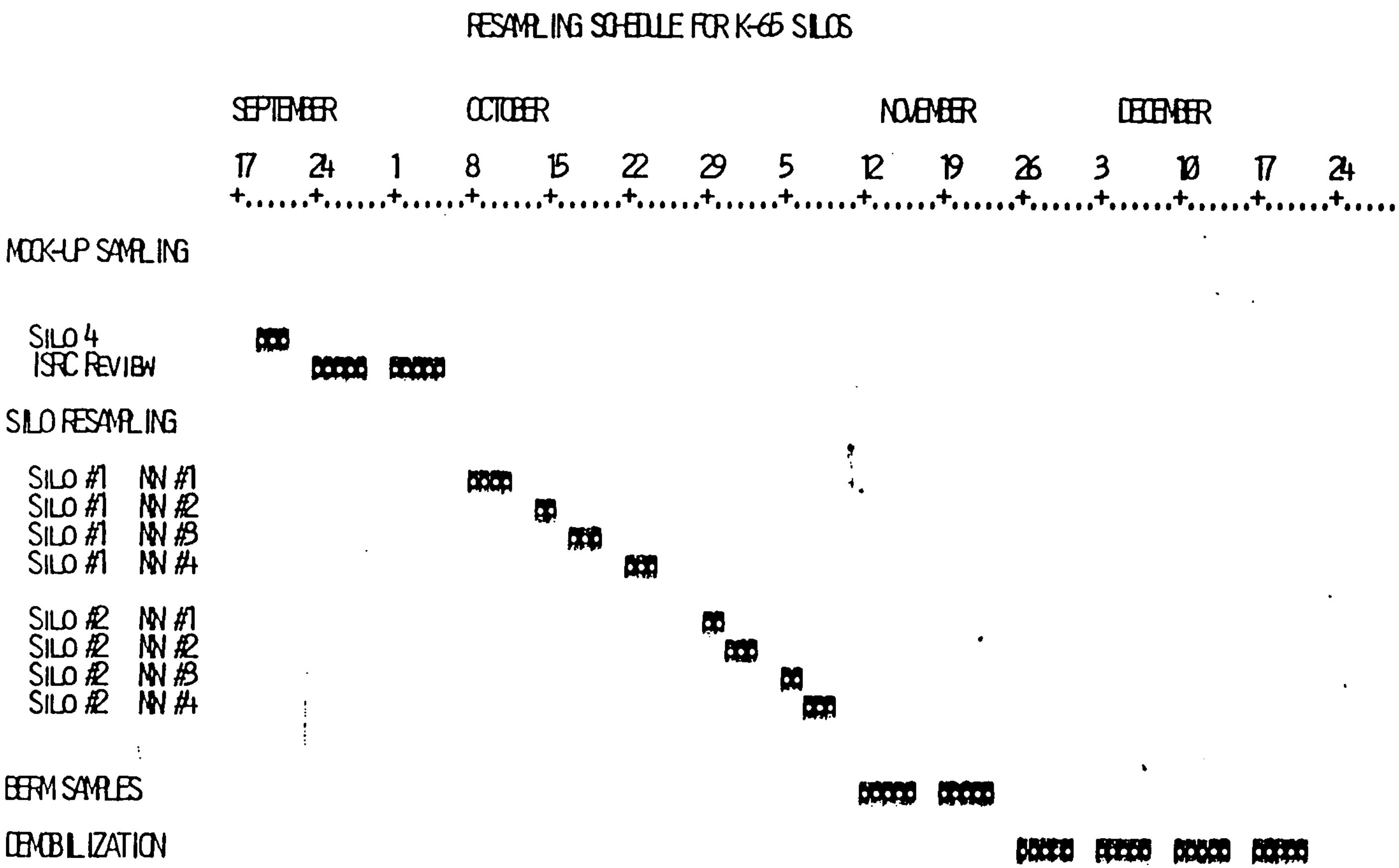

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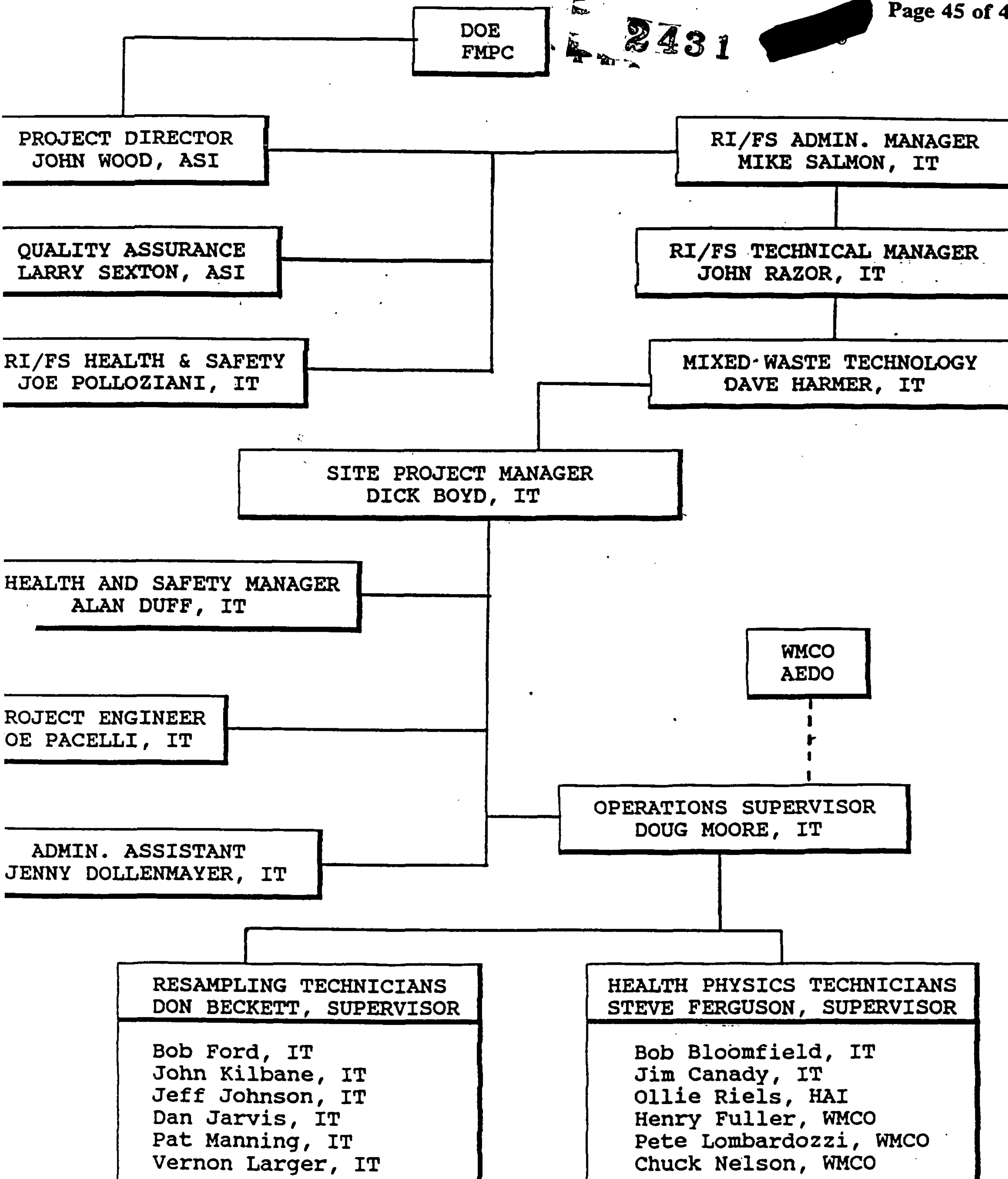
FIGURE 8-2
K-65 SILO RESAMPLING PROJECT
FEED MATERIALS PRODUCTION CENTER, FERNALD, OHIO

2431 [redacted]



8/90

———————— Project Support

------------ Incident Reporting

9.0 CALIBRATION AND PREVENTIVE MAINTENANCE

9.1 Calibration

Calibration of instruments and equipment used for the K-65 Silo Sampling will be in accordance with the QAPP, Section 8.0. Calibration requirements for instruments not addressed by QAPP, Table 8-3 are detailed in Table 9-1.

TABLE 9-1

FIELD EQUIPMENT CALIBRATION PROCEDURES

Instrument/ Equipment	Calibration Manufacturer	Calibration Reference	Frequency
Alpha Air Monitor (Model Alpha 6)	Eberline	Instruction Manual	Semi-Annual by Manufacturer (a)
Ludlum Model 177 and Model 3 Survey Meter with 44-9 GM	Ludlum	Ludlum Model 177 and Model 3 3 Survey Meter Instruction Manuals	Semi-Annual (a)

(a) Operational check daily prior to use.

9.2 Preventive Maintenance

Preventive Maintenance required for the K-65 Silo Sampling will be in accordance with Section 13 of the QAPP. Equipment for the sampling that will require Preventive Maintenance include the Vibra-Corer Sampling Device and the Vibra-Corer Power Supply. Refer to the Vibra-Corer Owner's Manual for required preventive maintenance and schedules.

10.0 FIELD ACTIVITY DAILY LOG

Members of the Project Staff working in field operations shall keep a daily log (Figure 10-1, Field Activity Daily Log) of project activities. Items to be included in the daily log, as appropriate, are:

- Field Activity Subject;
- General Work Activity;
- Unusual Events;
- Changes to plans and specifications;
- Visitors on site;
- Subcontractor progress and specifications; and
- Communication with WMCO, regulatory agencies, or others.

Copies of the daily log entries should be sent to the site manager and on-site technical manager on an approximately weekly basis. If the logs are not submitted as required, it is the responsibility of the site manager to contact the field personnel.

DAILY LOG				
	DATE			
	NO.			
	SHEET	OF		

FERNALD
RI/FS

FIELD ACTIVITY DAILY LOG

PROJECT NAME	PROJECT NO.
FIELD ACTIVITY SUBJECT:	
DESCRIPTION ON DAILY ACTIVITIES AND EVENTS:	
VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
PERSONNEL ON SITE:	
SUPERVISOR:	DATE:

[redacted]

[redacted]

APPENDIX A

DETAILED WORK PROCEDURES

[redacted]

K-65 SILOS SAMPLING PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to provide the steps for sampling K-65 Silos 1 and 2 using the Vibra-Corer Sampling Device.

2.0 APPLICABILITY

This procedure is applicable to the sampling operation at K-65 Silos 1 and 2 in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensuring that only trained personnel perform the sampling operation.

3.1.2 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.3 Provides operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensures sampling materials and equipment are available for operators usage.

OSR> 3.1.5 Ensures Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> 3.1.6 Ensures pocket dosimeters and TLDs are worn by all personnel involved in the sampling operations. (Finger Ring TLDs shall be worn by personnel handling samples).

3.1.7 Initiate and Implement Radiation Work Permit.

OSR> 3.1.8 Reports exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifies the IT Project Manager and WMCO Assistant Emergency Duty Officer (AEDO) of the circumstance.

3.1.9 Ensure a safety net has been placed and tied down around the manway to be sampled.

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure nonconformances to the IT Supervisor.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

4.0 DEFINITIONS

4.1 Vibra-Corer Sampling Device - Solids sampling equipment consisting of an cable-driven head assembly connected to a pipe barrel with a threaded penetrating probe containing inner LEXAN sleeve used to extract long core samples. If required, a cutter/catch assembly located at the bottom of the pipe barrel is used to penetrate and retain the sample residues.

4.2 Remote Throttle Control - A small wire cable within a reinforced nylon casing used for adjusting the throttle of the Vibra-Corer Power Supply. This will be used while on the silo dome when the power supply is suspended by the crane.

4.3 Air Vent Tube - Tygon tube attached to the Vibra-Corer Head and inserted into the Manway Glove Bag so that air pressure will not build up within the sampling pipe.

4.4 Pipe Sleeving - Wire reinforced neoprene coated polyester fabric which contains airborne radionuclides and minimizes radon gas dispersion during the sampling operation and during transport of the Vibra-Corer after the sample is extracted.

4.5 Manway Glove Bag - Plastic bag containing glove ports, which is attached to the silo manway and is used to contain airborne radionuclides and minimize radon dispersion during sampling operation.

4.6 Safety Net - A 4" mesh polypropylene rope net to be placed around each manway to be sampled to ensure personnel safety in the event of a dome puncture.

4.7 IT Supervisor - For the purposes of this procedure, the word "Supervisor" refers to IT Supervisor in charge of the silo sampling.

4.8 Project Manager - The Project Manager is the senior IT member of the K-65 Resampling Team.

4.9 Operations Technician/Personnel - IT Personnel performing the sampling operations.

4.10 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.11 Crust Retrieval Device - Three foot long 6" diameter PVC tube with a cap on one end and a rope handle on the other. This device is to be used for the retrieval of the top two feet of the silo material.

5.0 REFERENCES

5.1 DWP-004, "Mock Silo Sampling Operation"

5.2 DWP-003, "Breathing Air System"

5.3 WMCO SOP 65-C-106, "Silo Waste Handling"

5.4 FMPC 704, "Minor Event Reporting"

5.5 "Operational Safety Requirements for the Sampling and Analysis of the Materials in K-65 Silos 1 and 2".

5.6 WMCO Procedure RES-01-001, "Radon Treatment System Operation".

5.7 Plan-001 - "Site-Specific Health and Safety Plan".

5.8 DWP-007, "K-65 Silos Net Application".

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

OSR> **6.1 Safety system involved with this operation is the Radon Treatment System.**

6.2 At no time shall personnel walk on or place equipment on the center cap of the silo.

6.3 Personnel on the domes shall not walk off of the safety nets around manways unless tied off to the crane.

6.4 Safety glasses with side shields shall be worn unless other eye protection is specified.

OSR> **6.5** Respiratory protection provided by the IT Supervisor shall be worn.

OSR> **6.6** Anti-contamination clothing shall be worn when working on top of the silos.

6.7 Leather-palm gloves shall be worn when handling rough, sharp-edged, or contaminated material.

6.8 Nitrile gloves shall be worn when using the manway bag.

6.9 HEPA type filter vacuum cleaners or a vacuum system approved by WMCO IRS&T with a current (tested within last 6 months) DOP penetration test sticker shall be used for cleaning.

6.10 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 Area.

OSR> **6.11** Operator exposure as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mRem/week, per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> **6.12** No sampling work with the manway uncovered shall be conducted on top of silos when the surface radiation is greater than 100 mr/hr.

OSR> **6.13** The number of personnel on the surface of the silos shall not exceed three and the maximum equipment/ personnel load shall not exceed 700 pounds.

6.14 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately by reported to the IT Supervisor.

6.14.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.14.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.14.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.15 Operate the Breathing Air System per DWP-003.

[redacted]

6.16 All 120 volt 15 & 20 amp circuits shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walk ways.

6.17 All portable lights shall meet NEC 305-4 (f) requirements and/or explosive gas testing shall be performed.

6.18 Disposal of contaminated items/equipment shall be in accordance with WMCO SOP-65-C-106, "Silo Waste Handling".

7.0 PROCEDURE

NOTE

A mock sampling operation shall be performed per DWP-004 on Silo 4 prior to sampling Silo Nos. 1 and 2

7.1 Pre-Operational Start-up.

7.1.1 If required, the IT Supervisor shall instruct the Operations Personnel to assemble the sampling barrels by completing steps 7.1.1.1 through 7.1.1.3.

7.1.1.1 Connect LEXAN tubes together and insert into the sampling barrel casing.

NOTE

If instructions in Steps 7.1.1.2 through 7.1.1.4 are seemed inappropriate by the Supervisor or if sampling barrels have already been assembled, proceed to Step 7.1.2.

7.1.1.2 Place the catcher with the tines in an upward position inside the cutter, if required.

7.1.1.3 Thread cutter assembly onto sampling barrel and tighten with two pipe wrenches.

7.1.2 As notified by the IT Supervisor, mark sampling barrels by completing steps 7.1.2.1 through 7.1.2.5. If sampling barrels are marked, proceed to Step 7.1.3.

7.1.2.1 Starting at the bottom of the assembled sampling barrel, mark the outer casing in one foot increments using a permanent ink marker by drawing a circle completely around the casing.

NOTE

Mark the entire 40 foot casing

7.1.2.2 Wrap 2 inch wide tape around the barrel at each foot marking.

NOTE

Ensure bottom of tape is placed at the foot marking.

7.1.2.3 Numerically identify each one foot marking on the tape using a permanent ink marker.

NOTE

Numbering shall start at the bottom of the cutting shoe as "O" feet.

7.1.2.4 Place 4 inch wide clear, adhesive tape over each foot marking.

7.1.2.5 Every 5 feet, wrap 4 inch red adhesive tape above the tape.

7.1.3 As notified by the IT Supervisor, encase the sampling barrel in pipe sleeving by completing Steps 7.1.3.1 through 7.1.3.2. If the sampling barrels have been encased in pipe sleeving proceed to Item 7.2.

7.1.3.1 Slide the pipe sleeving (45 foot length) over the end of the sampling barrel.

7.1.3.2 Tape the sleeve to the upper portion of the barrel casing using plastic vinyl tape. Tighten a hose clamp over tape.

7.2 Rigger and Operations Technician shall ready the Vibra Corer.

WARNINGS

The crane operator/rigger must complete a routine inspection of the crane at the beginning of each sampling operation shift.

CAUTION

CHECK WITH THE IT SUPERVISOR TO ENSURE VIBRA CORER HEAD IS BEING CONNECTED TO THE CORRECT LOAD LINE FOR THE MANWAY TO BE SAMPLED.

7.2.1 The rigger shall attach the crane lines to the sampling device with the Vibra Corer Head and drive cable attached.

7.2.2 The rigger shall also attach a 3/4" rope of predetermined length above the headache ball so that the other end can be attached to the second headache ball from the man lift.

7.2.3 The rigger shall signal the crane operator to slowly raise the sampling device off the flatbed truck to a vertical position, one to two feet off the ground.

7.2.4 The rigger shall disconnect the lower rigging from the sampling barrel assembly and attach it to the Vibra-Corer Power Supply with two tag lines attached.

7.2.5 The rigger shall then direct the crane operator to raise the Vibra-Corer Power Supply so that it can be connected to the drive cable.

- **7.2.5.1** Connect drive cable to power supply.
- **7.2.5.2** Connect loose end of the 3/4" rope above the power supply's headache ball.

7.2.6 Operations personnel shall start the power supply and check to ensure the throttle cable is working properly.

7.3 The Operations Technicians shall remove Manway Cover.

OSR> **THE RADON TREATMENT SYSTEM SHALL BE OPERATED BEFORE REMOVAL OF THE MANHOLE COVER TO ENSURE THE SILO SURFACE RADIATION LEVEL IS BELOW 75 MR/HR.**

OSR> **THE SILO SURFACE RADIATION LEVELS SHALL BE LESS THAN 75 MR/HR, RADIOLOGICAL SAFETY APPROVAL MUST BE OBTAINED, AND DIFFERENTIAL PRESSURE FROM THE MANWAY VENT PIPE MUST BE NEGATIVE OR ZERO PRIOR TO REMOVAL OF COVER AND SAMPLING.**

7.3.1 Remove the hose clamp connecting the Radon Treatment System piping to the radon system vent pipe, install containment bag.

7.3.2 Separate Radon System vent Piping from vent pipe inside containment bag. Twist and tape joint between pipes. cut tape in the center and separate the containment.

7.3.3 The manway glove bag shall be checked for leaks prior to use by slightly inflating the bag and checking for any leakage.

7.3.4 Place manway glove bag over the selected manway.

CAUTION

EXPLOSION-PROOF LIGHTING SHALL BE USED AND/OR EXPLOSIVE GAS TESTING SHALL BE PERFORMED.

7.3.5 Insert into the manway glove bag a droplight, wiping materials, retractable knife, and tools specified by the IT Supervisor.

7.3.6 Tape and/or attach with a hose clamp the manway end of containment glove bag securely to the skirt of the manway flange. An RST shall inspect glove bag installation.

7.3.7 Remove the C-Clamps securing the cover to the manhole.

7.3.7.1 If the sound of escaping gas is detected, re-secure C-clamps, evacuate the area and notify the IT Supervisor.

7.3.7.2 Do not proceed with sampling operation until authorization is given by IT Supervisor.

WARNING

IF GAS IS ESCAPING, IMMEDIATELY EVACUATE THE AREA

7.3.7.3 Three individuals are required for step 7.2.8 or two people with the assistance of the crane if the three technicians weight plus materials are greater than 700 pounds.

7.3.8 Carefully slide the manway cover over to create an edge for manual lifting.

7.3.9 Lift the cover and place inside the manway glove bag over to the side on a padded surface.

7.3.10 Lower drop light into the silo and secure with hook on manway flange.

7.3.11 Inspect the surface area directly below the manway for old containment bags or plastic debris.

7.3.11.1 If plastic debris is present, lower pronged bag removal device into manway.

7.3.11.2 Retrieve the debris and remove from silo and place inside manway bag.

7.3.12 Upon notification by the supervisor, lower camera assembly into Silo and place end bracket over manway opening. If camera is not used, proceed to 7.3.

7.4 Sampling (See Figure 1)

7.4.1 With the Supervisor's concurrence, the rigger shall signal the crane operator to slowly raise the sampling device and the power supply and to move them so that the sampling device is directly over the manway to be sampled and the power supply in near the berm.

7.4.2 Operations personnel shall guide the tag lines to the power supply so not to impede movement of the sampling barrel.

7.4.3 The crane operator shall lower the sampling device over the selected manway until the containment sleeve can be attached to the Manway Glovebag.

7.4.4 Operations personnel shall seal the pipe sleeving to the Manway Glove Bag with plastic vinyl tape at the lowest point on the pipe.

7.4.5 Operations personnel shall use a utility knife to cut the seal surrounding the area of the containment sleeve from inside manway glove bag.

7.4.6 The Air Vent Tube shall be inserted into the Manway Glove Bag and secured with tape.

7.4.7 Crane operator shall carefully lower the sampling device through the containment sleeve opening until it is approximately one foot from the surface of the K-65 waste.

7.4.8 On the dome, two operations technicians shall guide the sampling barrel so not to be in line with a previously sampled location. Another operation technician will take hold of the Remote Throttle Control from the berm.

7.4.9 When conditions are correct and sampling can proceed, operations personnel on the dome shall instruct the crane operator to slowly lower the sampling device into the material until it stops moving under its own weight.

7.4.10 If the sampling device will not penetrate the residue, the IT Supervisor will notify the throttle operator to activate the vibrating mechanism of the sampling device.

7.4.11 Vibra Corer Malfunction

7.4.11.1 If Vibra Core equipment malfunctions, stop operations and report incident to the supervisor. Describe operation prior to failure of equipment.

CAUTION

DO NOT PROCEED UNTIL DIRECTION FROM THE SUPERVISOR HAS BEEN GIVEN AND AN AUTHORIZATION TO PROCEED HAS BEEN RECEIVED

7.4.11.2 If the head is defective, transport the Vibra Corer to the laydown area. Remove, save, and label any sample collected. Remove and decontaminate sampler head and casing. Replace the head with an operating unit.

7.4.11.3 Attach the crane hook to the sampler head and hoist above manhole and continue sampling operation.

7.4.12 Technician shall start vibrating mechanism and set the throttle as directed by the Supervisor.

7.4.13 After the vibrating mechanism has been activated the crane operator will be instructed to slowly lower (approx. 30 sec. per foot) the sampling barrel to a depth of two feet.

7.4.13.1 Foot markings shall be at the manway flange opening.

7.4.14 When the two foot depth has been reached, the IT Supervisor will instruct the operations technician with the Remote Throttle Control to stop the vibrating mechanism.

7.4.15 The operations technician on the dome shall notify the crane operator to raise the sampling barrel so that only three feet remain inside the silo.

7.4.16 Retrieve two-foot of silo crust material.

7.4.16.1 Lower crust retrieval device into the manway opening so it is below the sampling barrel.

7.4.16.2 Guide the crust retrieval device over the end of the sampling barrel until the cutting shoe is inside.

7.4.16.3 The operations technician holding the crust retrieval device will direct the technician controlling the power supply to lightly vibrate the Vibra Corer, causing the material to slowly evacuate the sampling barrel.

7.4.16.4 After crust material has been removed, the vibrations shall be stopped.

7.4.16.5 The crust retrieval device, with crust material inside, will be lifted into the manway glovebag.

7.4.16.6 Take radiation dose rate readings and cap the open end of the crust retrieval device.

7.4.16.7 Remove crust retrieval device using the pass through sleeve.

7.4.17 Operations personnel on the dome shall instruct the crane operator to lower the Vibra Corer until it is a few inches from the material surface.

7.4.18 Operations personnel shall guide the sampling barrel so that it is directly over the same hole it had been removed from previously.

7.4.19 The crane operator shall be instructed to slowly lower the Vibra Corer until it has reached the same depth that it had stopped at before.

7.4.20 The vibrating mechanism of the Vibra Corer shall be engaged again by the operations technician on the berm.

7.4.21 After the vibrating mechanism has been activated, the crane operator will be instructed to slowly lower the sampling barrel to a designated depth of 33 feet.

7.4.21.1 Foot markings shall be read at the manway flange opening.

7.4.22 When the designated depth has been reached, the Supervisor will instruct the throttle operator to stop the vibrating mechanism. The IT Supervisor shall document the depth of the Vibra-corer in the project log.

7.4.23 Operations technicians shall crimp and seal the air vent tube as close to the Vibra Corer head as possible.

7.4.23.1 Cut air vent tube below the crimp.

7.4.23.2 Quickly tape over open ends.

7.4.24 With the concurrence of the IT Supervisor, the rigger shall signal the crane operator to start removal of the sampling device and the raising of the power supply from the silo. As the sampling device is withdrawn from the manway, a radiation survey shall be performed by the RST on the sampling device. If gamma radiation levels exceed 200 mr/hr, notify the IT supervisor to evaluate additional ALARA considerations.

CAUTION

SAMPLING DEVICE SHALL BE REMOVED SLOWLY FROM SILO

CAUTION

DO NOT OPERATE THE VIBRATING MECHANISM DURING REMOVAL OF SAMPLING DEVICE

NOTE

As the barrel is raised, wipe the exterior to reduce bulk contamination

7.4.24.1 If the sampling device cannot be easily removed, activate the vibrating mechanism.

7.4.25 Operations personnel shall ensure containment sleeve is unfolding and following the barrel movement.

7.4.25.1 As the device nears the top of the silo, steady the barrel as necessary to prevent excessive swinging.

7.4.26 When the sampling device has cleared the top of the manway opening a minimum of 3 feet, the crane operator shall stop removal of crane line.

7.4.27 Operations personnel shall crimp and seal the containment sleeve below the corer barrel using plastic vinyl tape. [redacted]

7.4.28 Operations personnel shall cut the containment sleeve at the center of the taped seal and tape and J-seal the exposed ends.

7.4.29 The tag lines holding the power supply shall be untied and used to guide the unit so not to entangle with the sampling barrel.

7.4.30 Crane operator shall slowly raise the sampling device to clear the railing on the silo roof.

7.4.31 The rigger shall signal the crane operator to move the sampling device and power supply next to the elevated work platform so that the power supply can be shut off and disconnected.

7.4.32 Operations personnel shall steady end of core barrel as necessary during transport of sampling device to flatbed trailer.

7.4.33 The crane operator shall lower the power supply with the Remote Throttle Control attached to the ground.

<u>CAUTION</u>

SLOWLY LOWER POWER SUPPLY TO THE GROUND

7.4.34 Rigger shall disconnect load line from the power supply and connect to the lower end of the sampling barrel.

NOTE

This must be done so as not to disturb the integrity of the pipe sleeving

7.4.35 Crane operator shall carefully position sampling device above the flat bed trailer and slowly lower the device horizontally, positioning the top of the core barrel and head assembly against the trailer bed and inside the core trough.

7.5.36 When the sampling device is securely in the trough, rigger shall signal crane operator to hold the position.

7.4.37 The rigger shall disconnect the sampling device from the crane. 000354

7.4.38 Repeat steps 7.4.1 through 7.4.37 as directed by the IT Supervisor if additional samples are to be collected from the same manway. [redacted]

7.4.39 An RST shall survey the core exterior to determine contamination levels prior to transport.

7.4.40 IT Supervisor shall notify WMCO Transportation to transport truck to Examination Trailer.

7.5 Replacement of Manway Covers

7.5.1 If residue is present on manway cover or sealing surface, wipe from the outside of the flange inward, so material falls into the silo.

7.5.2 Replace gasket material on sealing surface of cover.

7.5.3 Carefully lift cover by hand and carry from holding area to flange. Lower cover into position.

NOTE

The IT Supervisor shall document the closing of the manway in the project logbook

7.5.4 Tighten C-clamps securely to manway cover.

7.5.5 Remove the crust retrieval device using the pass through sleeve.

7.5.6 Segregate waste and equipment such as paper towels and tools, etc.

7.5.7 To ensure material will not fall back onto silo dome, pull separated materials into independent glove sleeves and tape sleeves from outside the glove bag.

7.5.8 If loose solids are present, remove solids using paper towels.

7.5.9 After allowing approximately 4 hours to elapse for the decay of radon progeny, carefully umbilical the glovebag and remove the glove bag from the manway.

7.5.9.1 Place glove bag into a radioactive material waste box.

7.5.10 RST shall survey for loose surface contamination.

7.5.10.1 Further decontamination efforts will be performed by operations personnel using a foaming cleaner and paper towels as dictated by contamination survey results.

7.5.11 Place containment bag and used Anti-C Clothing in "Radioactive Waste" container per WMCO Procedure SOP 65-C-106.

8.0 APPLICABLE FORMS

Figure 1 - "Silo Sampling Operations"

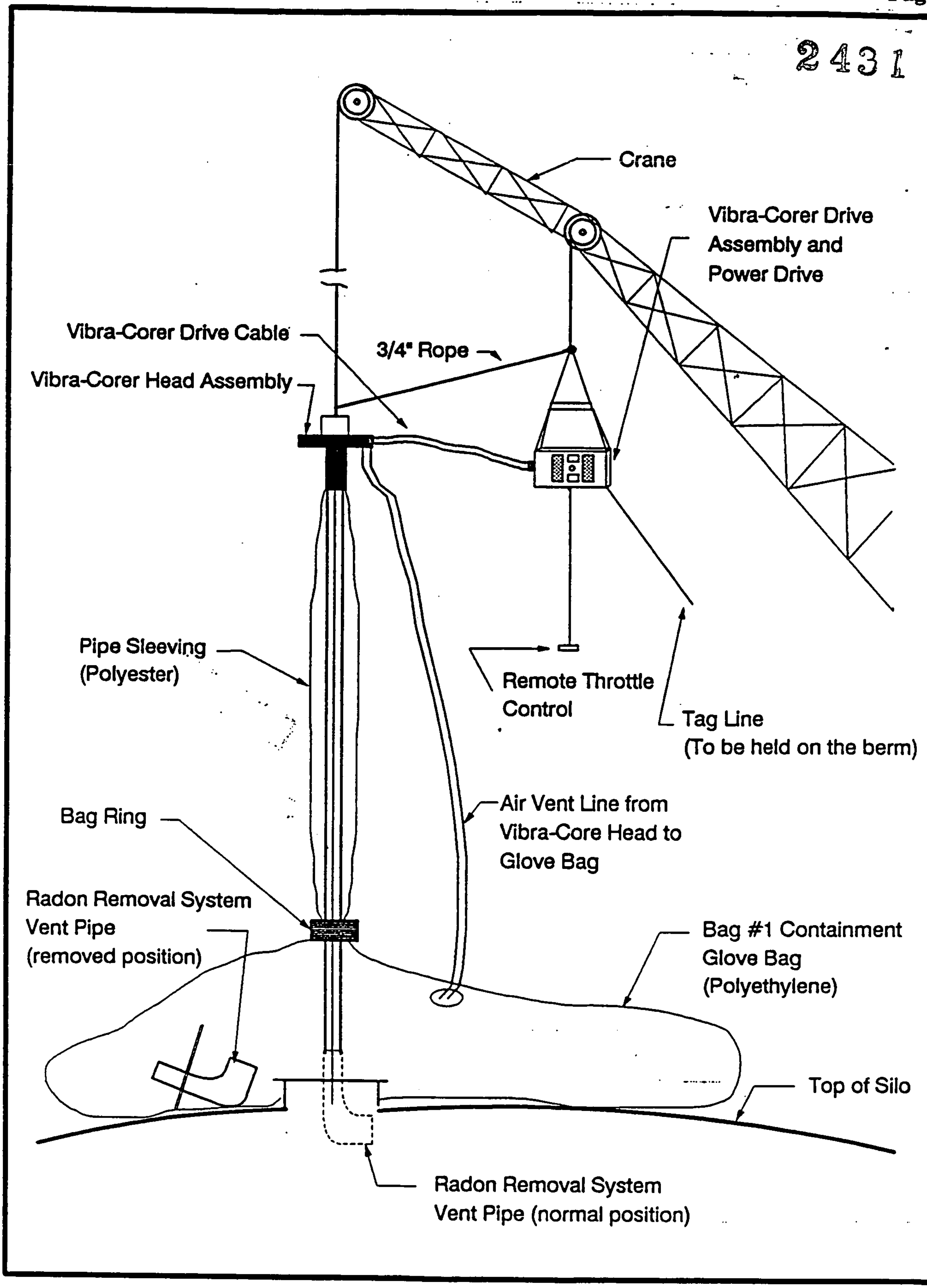


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FIGURE 1. SILO SAMPLING OPERATION

[redacted]

SAMPLE CORE HANDLING PROCEDURE

1.0 PURPOSE

The purpose of this document is to establish the procedure for removing the sample core from the Vibra-Corer sampling device and cleaning, inspecting, sectioning, and packaging the sample core.

2.0 APPLICABILITY

This procedure is applicable to sample core handling at the Silo Area.

3.0 RESPONSIBILITIES

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Contacting IT/WMCO Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.2 Provide operators with the required respiratory protection and anti-contamination clothing.

3.1.3 Ensure that only trained personnel perform this procedure.

3.1.4 Ensure sectioning and/or packaging equipment is available.

3.1.5 Initiate and implement Radiation Work Permit.

OSR> 3.1.6 Reporting exceptional circumstances not addressed by this SOP in a "Minor Event Report" (Report to FMPC-704) and notifying the IT Project Manager and the Assistant Emergency Duty Officer of the circumstances.

3.1.7 The IT Supervisor is responsible to assure the ventilation system is operating prior to personnel entering the sample trailer.

OSR> 3.1.8 Ensures pocket dosimeters and TLDs are worn by all personnel involved in sampling operations. (Finger Ring TLDs shall be worn by personnel handling samples).

3.2 IT Operators shall be responsible for the following:

3.2.1 Compliance with this procedure.

3.2.2 Report unusual occurrences to the IT Supervisor.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

3.4 The IT Analytical Technician shall be responsible for assisting with the sectioning, labeling, and sample collecting of core sections.

3.4.1 IT Analytical Technician shall be responsible for reporting unusual circumstances to the IT Supervisor and AEDO.

3.5 WMCO Transportation shall be responsible for transporting sampling equipment to the WMCO decontamination area.

4.0 DEFINITIONS

4.1 IT Supervisor - For the purposes of this procedure, the word "supervisor" refers to the IT Supervisor in charge of the sampling.

4.2 Radiation Safety Technician (RTS) - IT/WMCO Health Physics Personnel supporting sampling operations.

5.0 REFERENCES

5.1 DWP-003, "Breathing Air System"

5.2 SOP 65-C-105, "Preparation of Silo Samples for Long Term Storage" [redacted]

5.3 SOP 65-C-106, "Silo Waste Handling"

5.4 FMPC-704, "Minor Event Reporting".

5.5 Operational Safety Requirements for the Sampling and Analysis of the materials in the K-65 Silos 1 and 2.

5.6 Plan-001 - "Site-Specific Health and Safety Plan.

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A defined safety system is not involved.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified by WMCO IRS&T.

OSR> 6.3 Personnel shall wear respiratory protection provided by the supervisor.

OSR> 6.4 Anti-contamination clothing shall be worn when handling residues from the K-65 Silos.

6.5 Leather-palm gloves shall be worn when handling drums/boxes/containers, operating equipment, and when handling rough, sharp-edged, or contaminated material.

6.6 HEPA type filter vacuum cleaners with knock-out drum or a vacuum system approved by WMCO IRS&T with a current (tested within last 6 months) DOP penetration test sticker shall be used for cleaning.

OSR> 6.7 Personnel exposure as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mR/week per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit 3.0 Rem/year.

6.8 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT Supervisor.

6.8.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to Radiological Safety for evaluation and the WMCO AEDO.

6.8.2 The involved employees shall report to WMCO Medical Services at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.8.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

[redacted]

6.9 A Radiation Work Permit is required prior to handling sample cores.

6.10 A ventilation system with a roughing filter and HEPA filter in line will be operated while using the airlock or during personnel inhabitation of the sampling trailer. A continuous air monitor (CAM) will be installed on ventilation system exhaust to monitor for radioactivity release.

6.10.1 The ventilation system approved by WMCO IRS&T will be required to have a current (tested within the last 6 months) DOP penetration test for the HEPA filter sticker.

6.10.2 The ventilation system will have the capabilities of a minimum of six air changes per hour.

6.11 At no time during operation of the inspection trailer shall more than one door of an airlock be open at the same time.

7.0 PROCEDURE

7.1 Removing the lexan tube from the Vibra Corer barrel.

7.1.1 Move the Vibra-Corer barrel through the equipment airlock to the entrance of the Examination Trailer.

7.1.2 Operate Breathing Air System per DWP-003.

7.1.3 Unscrew the lower "cutting shoe unit" of the Vibra-Corer and place the unit in "radioactive waste" plastic bag per WMCO Procedure SOP 65-C-106.

7.1.3.1 When the radioactive waste bag is full, tape the bag closed and place in a metal box per WMCO Procedure SOP 65-C-106.

7.1.4 Place a plastic cap on the open end of the LEXAN plastic tube and tape in place.

7.1.5 Cut plastic containment sleeving at the area around 20 ft. mark on the Vibra-Corer barrel.

7.1.6 Push back the sleeving exposing the coupling joint at the 20 ft. mark on the Vibra-Corer barrel.

7.1.7 Place plastic sheeting and a catch basin below the exposed joint.

[redacted]

NOTE

If there is a possibility of liquid present in the sample, extra caution must be implemented to prevent the spread of contamination.

7.1.8 Remove the bottom Vibra-Corer barrel section from the top section.

7.1.9 Remove the coupling holding the lexan tube together, and place this coupling in the radioactive waste bag as per WMCO procedure SOP-65-C-106.

7.1.10 Cap and tape all the ends of the lexan tube exposed.

7.1.11 Pull the lexan tube out of the bottom section of the Vibra-Corer barrel into the Examination Trailer.

7.1.12 Move the bottom section of the Vibra-Corer barrel onto the next cradle on the flat-bed trailer.

7.1.13 If sample material is present in the lexan tube in the top section of the Vibra-Corer barrel, pull the lexan tube out of the barrel into the Examination Trailer.

NOTE

Each time a cut is made on the lexan tube, a new sawblade will be used.

7.1.14 Cut off the excess lexan tube 1.5 ft. above the top of the sample material. Cap and tape exposed lexan tube.

7.1.15 Cover all exposed ends of the Vibra-Corer barrels.

7.1.16 Close the rear doors of Examination Trailer.

7.2 Cleaning and Inspecting Cores

NOTE

The RST shall monitor contamination, airborne and radiation levels continuously throughout sample core handling

7.2.1 Mist deionized water on paper toweling, wipe down the exterior of the lexan tube with the damp paper towels to remove any gross contamination.

7.2.1.1 Place paper toweling used for step 7.2.1 in the radioactive waste bag as per WMCO SOP-65-C-106 procedure. and manway location.

7.2.2 Obtain a sample numbering label (Refer to Figure 5) with the Silo No. and manway location.

7.2.3 The IT Analytical Technician shall affix the label to the top of the clean lexan tube.

7.2.4 The IT Analytical Technician shall measure the length of the sample core, and record this in the sectioning log.

7.2.4.1 The IT Analytical Technician shall mark the top of the tube.

7.2.5 The IT Analytical Technician shall inspect and videotape the core.

7.2.6 The IT Analytical Technician shall note that videotaping has been done in the project log book.

7.2.7 During completion of inspection, video recording and radiological scanning, the LEXAN encased core shall remain in the inspection trough.

7.3 Sectioning and Labeling Core Sections

NOTE

An equipment rinsate sample shall be performed on all analytical sampling equipment prior to sampling.

7.3.1 The IT Analytical Technician shall record the following information in the "Sectioning Plan", Figure 1.

7.3.2 Using a permanent marker, identify the top and bottom of the core sample as indicated in the Sectioning Plan.

7.3.3 Check the "Sectioning Plan" (See Figure 1) for sectioning information.

7.3.4 Using a permanent marker, identify the sample core sections on the LEXAN liner. Mark the top of each section with an arrow.

7.3.4.1 On northwest and southwest manway samples mark the area to be used for the high radiation samples.

7.3.4.2 All sections shall be marked 12 to 18 inch lengths depending on sample recovery.

7.3.4.3 Mark zones A, B, C on northwest and southwest manway samples, with red vinyl tape at the top and bottom of each zone.

7.3.5 The IT Analytical Technician shall check the manhole identification tag number on the lexan tube against the tag number of the sectioning log form.

7.3.5.1 Identify and mark section of the core for engineering analysis for northeast, northwest, and southeast manway sample cores.

7.3.6 Turn on the HEPA filtered vacuum cleaner and place the suction end in a position to vacuum the dust produced while cutting.

7.3.7 Cut through the LEXAN liner along the line marking the top of the core. Minimize loss of sample when cutting and capping by holding the entire liner securely and making a clean cut.

<u>CAUTION</u>

DO NOT ATTEMPT TO COLLECT LOST SAMPLE IN ANY CORE SECTION AS CROSS CONTAMINATION OF LAYERS COULD RESULT

NOTE

If sample contains liquid, a catch basin may be placed below the area to be cut.

7.3.8 Recap the top end of the LEXAN liner with a plastic cap and seal the end with plastic vinyl tape.

7.3.9 Cut through the LEXAN liner at the next section marker using a new blade for each cut.

7.3.9.1 Cut, tape and label 5-inch core sections identified as geotechnical samples. Set these samples aside.

7.3.9.2 For zoned sample cores keep the cut sections of each zone together.

7.3.10 Securely cap and tape adjoining ends of the liner exposed by each cut.

7.3.11 After capping, rotate the core section to an upright position.

7.3.12 Wipe each section with paper towels and affix a sample label near the top of the core section.

7.3.13 Sample labels (See Figure 2) assigned to the core shall be prepared by the IT Analytical Technician.

7.3.14 The IT Technician shall record the unique core sample number and core manhole tag number on the sample label and complete the appropriate line on the "Sample Collection Log" (See Figure 3) and the "Chain-of-Custody Record" (See Figure 4).

7.3.15 Protect the label with a overlay of clear tape.

7.3.16 Mark the Silo No., Manway Location, Zone and Section No. on each section with permanent markers.

7.3.17 Southwest core samples will be archived, therefore proceed to step 7.6 on southwest core samples.

7.4 Collecting Samples of Core Sections for Analysis.

7.4.1 Place plastic and blotter paper on the sample workup table. Place the proper amount of mixing bowls and other materials needed on the sample workup table as directed by the IT Analytical Technician.

7.4.2 Obtain the correct number of sample bottles and place these on the sample workup table.

NOTE

A QC blind duplicate sample will be taken from a zone composite from the northwest core on Silo #2. QC triplicate samples will be taken from the southeast core of section sample in Silo #1 and a northeast core section sample of Silo #2.

7.4.3 The IT Analytical Technician shall attach sample bottle labels to the sample bottles.

NOTE

The sample bottle label shall duplicate the sample core label number.

7.4.4 The IT Analytical Technician shall record the core sample label number in the Sample Collection Log.

7.4.5 Place plastic and blotter paper on top of the work area.

NOTE

A new piece of plastic and blotter paper will be used for each core section. Do not used material spilled for analytical samples.

7.4.6 Remove the tape sealed caps from the lexan core section.

7.4.7 Remove from 1 to 2 inches of material from each open end of the core section, place material removed in a radioactive waste container per WMCO Procedure SOP-65-C-106.

7.4.8 Using a stainless steel pipe sampler, insert the sampler into the center of the core section.

7.4.9 Place pipe sampler into a stainless steel mixing bowl, remove the material from the sampler into the mixing bowl.

7.4.9.1 Repeat steps 7.4.8 and 7.4.9 with the opposite end of the core section.

7.4.9.2 Repeat steps 7.4.8 to 7.4.9 as directed by the IT Analytical Technician until all sections of the zone have been completed as required for the silo core at hand.

NOTE

Latex gloves must be changed each time a new section/zone sample is handled.

7.4.9.3 For northwest, northeast, and southeast core samples that are receiving chemical analysis, before each zone is composited, 2.3 grams must be removed from each section and placed into the sample bottle labeled HSL Volatiles.

7.4.10 For northwest and southeast core samples that are receiving chemical analysis, each section with in each zone will be composited to form a zone composite. From the each zone composite a core composite from all zones shall be made.

7.4.10.1 For northwest and southeast samples that are receiving engineering analysis, in addition to the 5" section in step 7.3.9.1, 333.33 grams of material from the horizontal strata composite must be collected.

NOTE

All composite samples will be a homogeneous mixture of the sections required within the zone. All mixing will be done on the sample workup table. Only one composite will be mixed at a time, all sections shall be composited on a weight (mass) basis, opposed to that of a volume basis.

7.4.10.2 For northwest and southeast core samples, that are receiving treatability analysis, 250 grams of the core composite is required.

000367

7.4.10.3 For the northwest and southeast core samples, a single high-radiation sample will be taken from the area indicated [redacted] step 7.3.4.1. This sample will be 30 grams.

7.4.10.4 For the northeast core samples requiring engineering analysis the same requirements applies as in that of step 7.4.10.1.

7.4.10.5 There will be only 1 zone for the northeast core samples, requiring chemical analysis. Each section of the core will be composited into a zone composite.

7.4.10.6 For the northeast core samples that are receiving treatability analysis, 250 grams from the zone composite is required.

7.4.11 Before placing mixing bowls containing sample material on work bench, wipe the outside of the bowls with damp paper towels.

7.4.12 Place paper toweling into the radioactive waste container, as per WMCO SOP-65-C-106 Procedure.

7.4.13 Mix all samples requiring composite.

NOTE

If any liquid is present in the sample material, collect a 40 ml VOA bottle of this liquid. Mix the rest of the liquid into the material to be composited for that zone/strata. Record this in the sample collection log.

7.4.14 All sample cores requiring chemical analysis shall have 30 gram aliquots placed into the sample bottles as directed by the IT Analytical Technician.

7.4.15 Place sample aliquots as mentioned in steps 7.4.10.1 through 7.4.10.6 into the proper sample bottles as directed by the IT Analytical Technician.

7.4.16 Place all items not to be reused from the silo core sampling into the radioactive waste container as per WMCO SOP-65-C-106 Procedure.

7.4.17 Any item that will be reused will be decontaminated following RI/FS Work Plan Addendum SAP Section 3.4.

000368

7.4.18 Vacuum any loose, spilled material with HEPA vacuum.

7.4.19 IT Analytical Technician shall check sample numbers against sample collection log.

7.4.20 Place any unused sample material from the mixing bowls into 1 liter Amber bottles labeled for long-term storage.

7.4.21 Mist deionized water onto paper towels, wipe down the outside of all bottles containing silo core sample material.

NOTE

If samples contain liquids, the sample bottle caps should be taped to the sample bottles using electrical tape.

7.4.22 Dry sample bottles with paper towels, place all paper toweling used in steps 7.4.28 and 7.4.29 in a radioactive waste container as per WMCO SOP-65-C-106 Procedure.

7.4.23 The RST shall monitor sample bottles for radiation/contamination and record this reading on the sample bottle labels. This step should be performed in a low-background area, if practical.

7.4.24 If the RST finds contamination, repeat steps 7.4.22 and 7.4.23 as necessary.

7.4.25 Place custody tape on each sample bottle and cap. If the samples are from the southwest manway to be archived, custody tape will be placed over both caps on the lexan tube.

7.4.26 Clean up work area, all materials used for sampling shall be considered radioactive waste and disposed of in a radioactive waste container as per WMCO SOP-65-C-106 Procedure. Vacuum up any loose material or dust generated during sampling.

7.5 Packaging Sample Bottles for Shipment.

7.5.1 Place blotter paper on work table area.

7.5.2 Place sample bottles to be shipped for analytical purposes on the work table.

7.5.3 Place the sample bottle in a plastic sample bag and heat seal the bag.

7.5.3.1 Label 1 qt. empty can the same as the sample bottle.

000369

7.5.4 Pour packing material into a 1-qt. empty can. Place bagged sample bottle in can.

7.5.5 Pour packing material around and on top of bagged sample bottle in can. Secure lid on can.

7.5.6 Repeat steps 7.5.3 through 7.5.5 until all sample bottles and the engineering samples are packaged for shipment.

7.5.7 The RST shall monitor the shipping cans for radiation and record reading on can label. This step should be performed in a low-background area, if practical.

7.5.8 Place custody tape over the cap and can.

7.5.9 Put any paper, gloves, etc. used in repackaging the sample bottles in the radiation waste container as per WMCO SOP-65-C-106.

7.5.10 Using the HEPA filtered vacuum cleaner, vacuum dust that may have occurred from packing procedures.

7.5.11 The Analytical Technician will notify the IT Supervisor that the shipping containers are ready for transfer to Analytical Laboratory. WMCO will complete the final packaging for shipment of all samples.

NOTE

Analysis on Engineering and Treatability samples will be conducted in WMCO facilities.

7.6 Repackaging Core Sections

7.6.1 Clean the core section with deionized water and paper towels. Dry with paper towels. Monitor the core section for loose contamination.

7.6.2 Place the core section in a plastic sample bag and heat seal the bag.

7.6.3 Place bagged core section in long-term storage containers, on end, top up with packaging material as per WMCO Procedure SOP-65-C-105.

7.6.3.1 IT Supervisor will check to make sure that storage container, is properly labeled in accordance with its contents.

7.6.4 Roll up the disposable paper in the repackaging work area.

7.6.5 Place paper, used work gloves in the "Radioactive Waste" plastic bag per WMCO Procedure SOP 65-C-106.

7.6.6 Using the HEPA filtered vacuum cleaner, remove visible dust. Turn off vacuum cleaner when finished.

7.6.7 Notify IT Supervisor that core sections are ready for long-term storage.

7.7 Decontamination of Equipment

7.7.1 If sampling equipment is to be reused, notify IT Supervisor that sampling equipment is ready for movement to designated decontamination area.

7.7.2 IT Supervisor shall request WMCO Transportation to move sampling equipment for decontamination.

7.7.3 WMCO shall perform a gross decontamination as per WMCO Procedure SOP-1-C-915.

7.7.4 Equipment shall be transported back to site by WMCO transportation by direction of IT Supervisor.

7.7.5 General sampling equipment shall receive additional decontamination as prescribed in Section 3.4, decontamination procedures, as directed by the IT Supervisor.

7.7.6 Analytical sampling equipment shall receive additional decontamination as prescribed in Section 3.4, decontamination procedures, as directed by the IT Analytical Technician.

NOTE

An equipment rinsate shall be performed on all analytical sampling equipment using deionized water as directed by the IT Analytical Technician.

8.0 DISPOSAL OF SAMPLING EQUIPMENT

8.1 When the IT Supervisor or IT Analytical Technician determine that equipment is no longer suitable for sampling, disposal of this equipment shall follow WMCO Procedure SOP-65-C-106.

NOTE

The RST shall monitor contamination, airborne and radiation levels periodically throughout equipment disposal handling.

8.2 Cover entire work area with plastic sheeting. Place tools needed for disposal in work area.

8.3 Decontaminate equipment prior to cutting with an approved cleaner, then wipe down with paper towels.

8.4 Cut the containment sleeving and lexan tubes into 3 to 6 ft. lengths depending on size of the container.

8.5 Place cut lengths as a unit in a metal container that is lined with plastic and uncalcined diatomaceous earth per WMCO Procedure SOP-65-C-106.

8.6 Cut metal Vibra-Corer barrels into 3 to 6 ft. lengths depending on the size of the container.

8.7 Place cut lengths as a unit in a metal container that is lined with plastic and uncalcined diatomaceous earth per WMCO Procedure SOP-65-C-106.

8.8 Smaller analytical sampling equipment will be disposed of in radiation waste bags as per WMCO Procedure SOP-65-C-106.

8.9 Place paper toweling, work gloves, hacksaw blades, plastic sheeting or any other items used in procedure in a radiation waste bag as per WMCO Procedure SOP-65-C-106/

8.10 Notify IT Supervisor that disposal work has been completed and that waste containers may be moved.

8.11 IT Supervisor will notify WMCO Transportation that waste containers are ready to move to WMCO holding facilities.

9.0 APPLICABLE FORMS

9.1 Figure #1, "Sectioning Plan"

9.2 Figure #2, "Analytical Sample Bottle Label"

9.3 Figure #3, "Sample Collection Log"

9.4 Figure #4, "Chain-of-Custody Record"

9.5 Figure #5, "LEXAN Tube Label"

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PAGE ____ OF ____
CHECKED BY ____

SECTIONING PLAN

DATE STARTED: ____
TIME STARTED: ____
SILO NO. ____
MANWAY LOCATION: ____

DATE COMPLETED: ____
TIME COMPLETED: ____
TOTAL LENGTH OF CORE: ____

ZONE	SECTION	LENGTH OF SECTION	NOTES	FOR ARCHIVE PURPOSES

CORE SECTIONS ARE TO BE APPROXIMATELY 18 INCHES IN LENGTH

SIGNATURE ____ DATE/TIME ____

SECTIONING PLAN
Figure 1

[redacted]

2431

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K65 RESIDUES ANALYTICAL SAMPLE

COLLECTOR	______	ID NO:	______
DATE COLLECTED:	______	SILO NO.:	______
TIME COLLECTED:	______	MANWAY:	______ ______
GROSS WEIGHT:	______	ZONE	______ ______
TARE WEIGHT:	______	SECTION	______
SAMPLE WEIGHT:	______		

[illegible]

ANALYTICAL SAMPLE BOTTLE LABEL
Figure 2

[redacted]

Field Form
Page of

FIGURE 3

Sample Collection Log

Computer Entry	Date	I.
1st Key		
2nd Key		
ManVer		

Task

Field Check by ______________ Date __________

Unique Sample Number	Well / Boring ID No.	Collectors Initials	Collection Date			Collection Time		Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	General Comments
			MM	DD	YY	HH	MM									

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FERNA(
RI/FS

CHAIN-OF-CUSTODY ...ORD

R/A Control No. ______

C/C Control No. 00150

PROJECT NAME/NUMBER ______ LAB DESTINATION ______

SAMPLE TEAM MEMBERS ______ CARRIER/WAYBILL NO. ______

Sample Number	Sample Location and Description	Date and Time Collected	Sample Type	Container Type	Condition on Receipt (Name and Date)	Disposal Record No.

Special Instructions: ______

Possible Sample Hazards: ______

SIGNATURES: (Name, Company, Date and Time)

1. Relinquished By: ______

Received By: ______

2. Relinquished By: ______

Received By: ______

3. Relinquished By: ______

Received by: ______

4. Relinquished By: ______

Received By: ______

WHITE - To accompany samples
YELLOW - Field copy

000377

2431

INTERNATIONAL TECHNOLOGY CORPORATION

2431

K65 RESIDUES

Collector: ______	I.D. No.: ______
Date Collected: ______	Silo No.: ______
Time Collected: ______	Manway: ______
	Zone: ______
	Section: ______

LEXAN TUBE LABEL
Figure 5

[redacted]

BREATHING AIR SYSTEM PROCEDURE

1.0 PURPOSE

To provide the procedure for operating and monitoring the Breathing Air System.

2.0 APPLICABILITY

This procedure is applicable to the operation of the Breathing Air System during silo sampling and sample core handling in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.2 Providing personnel with the required respiratory protection and anti-contamination clothing.

3.1.3 Ensuring that only trained personnel perform the steps of this procedure.

3.1.4 Initiating and implementing Radiation Work Permit.

OSR> 3.1.5 Reporting exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifying the IT Project Manager and WMCO AEDO of the circumstances.

3.2 IT Operators shall be responsible for complying with this DWP and reporting any unusual occurrences to the IT Supervisor or in the Supervisors absence, the IT Project Manager and WMCO AEDO.

4.0 DEFINITIONS

4.1 Breathing Air System - A twenty-foot tube trailer containing approximately 45,000 $ft.^3$ of breathing air used to supply personnel through a regulator and manifold system for the sampling process.

4.2 IT Supervisor - For the purposes of this procedure, the word "Supervisor" refers to the IT Supervisor in charge of the silo sampling.

5.0 REFERENCES

Plan-001, "Site-Specific Health and Safety Plan"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A defined safety system is not involved.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified by IRS&T.

OSR> **6.3** Respiratory protection provided by the IT Supervisor shall be worn when required.

6.4 A sampling crew member shall be specifically assigned to monitor air pressures.

6.5 All breathing air connections shall be surveyed for contamination by an RST prior to connection to the system. Connections found contaminated shall be properly disposed.

6.6 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT Supervisor and the AEDO. The Supervisor shall immediately report the circumstance of possible radioactive materials intake to Radiological Safety for evaluation. The involved employees shall report to Medical Services at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample. The Supervisor shall consider the circumstances to be a Minor Event and shall immediately complete a "Minor Event Report" per FMPC-704.

7.0 PROCEDURE

<u>7.1</u> <u>Set-up</u>

7.1.1 Attach the high/manifold pressure regulating valve to the "male" trailer connection.

7.1.2 Check to ensure the Manifold Pressure Regulating Valve is closed.

7.1.3 Connect the Main Breathing Air Line to the Pressure Regulating Valve.

NOTE

Ensure all connections of the Breathing Air Line matrix have been tightened.

7.1.4 Slowly open one of the four main air valves at the rear of the tube trailer.

7.1.5 Record the Main Pressure Gauge reading in the "Breathing Air System Log" (See Figure 2).

7.1.5.1 If the Main Pressure Gauge reading is less than 500 psig, notify the IT Supervisor.

NOTE

Full compressed air cylinders are 2800 psi pressure

7.2 <u>Monitoring</u>

7.2.1 Adjust Manifold Pressure Regulating Gauge to read as dictated by the pressure chart (See Figure 1)

7.2.2 Record the main and manifold pressure gauge readings every 15 minutes on the "Breathing Air System Log".

7.2.3 If the main pressure drops below 500 psig during the silo sampling operation during the sample core handling procedure, complete the following:

7.2.3.1 Notify IT Supervisor of the low pressure situation.

7.2.3.2 Notify airline users of a possible air flow interruption.

7.2.3.3 Quickly close the open "main air valve" located at the rear of the tube trailer.

NOTE

The closing of one valve and the opening of another should take about twenty seconds and the airline users have approximately two minutes of air in their suits.

7.2.3.4 Slowly open the next in line "main air valve".

7.2.3.5 Notify airline users of the reestablishment of air service and confirm there was not an interruption.

7.2.3.6 Tag out valve of the empty air tubes.

7.3 Shutdown

7.3.1 At the end of each daily sampling/core handling operation, close main pressure valve and pressure regulating valve.

7.3.1.1 If directed by the IT Supervisor, disconnect airlines from tube trailer and cap.

8.0 APPLICABLE FORMS

8.1 Figure 1, "Pressure Chart"

8.2 Figure 2, "Breathing Air System Log"

FIGURE 1

PRESSURE CHART

Length (Feet)	No. of Sections	Pressure Range/(psig)
25-50	1 or 2	20-34
75-100	1-4	25-45
125-175	2-6	30-50
200-275	2-6	38-55

[redacted]

[redacted]

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BREATHING AIR SYSTEM LOG DATE			
TIME (every 15 min.)	MAIN PRESSURE (must be greater than 500 psi)	MANIFOLD PRESSURE (target = see Figure 1)	INITIALS

BREATHING AIR SYSTEM LOG
Figure 2

[redacted]

K-65 MOCK SILO SAMPLING OPERATION PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to provide the steps for the mock sampling of Silo No. 4 using the Vibra-Corer Sampling Device.

2.0 APPLICABILITY

This procedure is applicable to the mock sampling operation at Silo No. 4 in the Waste Storage Area.

3.0 RESPONSIBILITIES

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensures only trained personnel perform the mock sampling operation.

3.1.2 Contact Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.3 Provide operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensure sampling materials/equipment are available for operators.

3.1.5 Ensure Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> 3.1.6 Ensure pocket dosimeters and TLDs are worn by all personnel.

3.1.7 Initiate and implement Radiation Work Permit.

OSR> 3.1.8 Report exceptional circumstances not addressed by this Procedure in a "Minor Event Report" - (Refer to FMPC-704) and notifying the WMCO Assistant Emergency Duty Officer (AEDO) and IT Project Manager of the circumstances.

3.1.9 Ensure a safety net has been placed and tied down around the manway to be used for the mock run.

2431

3.1.10 The Supervisor shall be responsible for documenting completed mock-up training.

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure non-conformances to the IT Supervisor.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation and contamination) specified by procedure and/or as instructed.

3.3.4 Reporting any unusual occurrences to the IT Supervisor and/or WMCO AEDO.

4.0 DEFINITIONS

4.1 Vibra-Corer Sampling Device - Solid sampling equipment consisting of an cable-driven head assembly connected to a pipe barrel with a threaded penetrating probe containing inner LEXAN sleeve used to extract long core samples. If required, a cutter/catcher assembly located at the bottom of the pipe barrel is used to penetrate and retain the sample residues.

4.2 Remote Throttle Control - A small wire cable within a reinforced nylon casing used for adjusting the throttle of the Vibra-Corer Power Supply. This will be used while on the silo dome when the power supply is suspended by the crane.

4.3 Air Vent Tube - Tygon tube attached to the Vibra-Corer Head and inserted into the manway glove bag so that air pressure will not build up within the sampling pipe.

4.4 Pipe Sleeving - Wire reinforced neoprene coated polyester fabric which contains airborne radionuclides and minimizes radon gas dispersion during the sampling operation and during transport of the Vibra-Corer after the sample is extracted.

4.5 Manway Glove Bag - Plastic bag containing glove ports, which is attached to the silo manway and is used to contain airborne radionuclides and minimize radon dispersion during sampling operation.

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4.6 Safety Net - A 4" mesh polypropylene rope net to be placed around each manway to be sampled to ensure personnel safety in the event of a dome puncture.

4.7 IT Supervisor - For the purposes of this procedure, the word "supervisor" refers to the IT supervisor in charge of sampling.

4.8 Project Manager - The Project Manager is the Senior IT Member of the K-65 Resampling Team.

4.9 Operations Technician/Personnel - IT Personnel performing the sampling operation.

4.10 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.11 Crust Retrieval Device - Three foot long 6" diameter PVC tube with a cap on one end and a rope handle on the other. This device is to be used for the retrieval of the top two feet of the silo material.

5.0 REFERENCES

5.1 DWP-001, "K-65 Silo Sampling Operation"

5.2 DWO-003, "Breathing Air System"

5.3 WMCO SOP 65-C-106, "Silo Waste Handling"

5.4 FMPC 704, "Minor Event Reporting"

5.5 "Operational Safety Requirements for the Sampling and Analysis of the Materials in K-65 Silos 1 and 2".

5.6 Plan-001 - "Site Specific Health and Safety Plan".

5.7 DWP-007, "K-65 Silos Net Application"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 A life-line or other safety device providing an equivalent level of protection specified by WMCO IRS&T shall be worn on top of Silo 4.

6.2 At no time shall personnel walk on or place equipment on the 20 foot diameter center section of the silo dome.

6.3 Personnel on the domes shall not walk off of the safety nets around manways unless tied off to the crane.

6.4 Safety glasses with side shields shall be worn unless other eye protection is specified.

6.5 Respiratory protection provided by the IT Supervisor shall be worn on top of Silo 4, if required.

6.6 Anti-contamination clothing shall be worn when working on top of the Silo 4, if required.

6.7 Leather-palm gloves shall be worn when handling rough, sharp-edged, or contaminated material. Nitrile gloves shall be worn when using the manway bag.

6.8 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 area.

OSR> 6.9 Operator exposure as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mRem/week per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.10 The number of personnel on the surface of the silo shall be limited to three and the maximum equipment/personnel load shall be limited to 700 pounds.

6.11 Operate the Breathing Air System per DWP-003.

6.12 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately by reported to the IT supervisor.

6.12.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.12.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.12.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.13 All 120 volt 15 & 20 amp. circuits shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walkways.

6.14 All portable lights shall meet NEC 305-4 (f) requirements and/or explosive gas testing shall be performed.

7.0 Activities to be Simulated during the Mock Run

7.1 RTS ducting removal

7.2 Use of the "plug" for previously sampled locations.

7.3 Tying down of the safety nets to the berm.

7.4 The use of the modified Manway glove bags.

7.4.1 Some health physics coverage can not be completed as planned for silos 1 and 2 because of the lack of special ports for instrumentation.

7.4.2 Crane assistance for manway removal.

7.4.3 Pass through of larger items, i.e., crust retrieval device.

8.0 PROCEDURE

8.1 Pre-Operational Start-up

8.1.1 If required, the IT Supervisor shall instruct the operations personnel to assemble the sampling barrels by completing steps 8.1.1.1 and 8.1.1.2.

8.1.1.1 Connect LEXAN tubes together and insert into the sampling barrel casing.

8.1.1.2 Thread cutter assembly onto sampling barrel and tighten with two pipe wrenches.

8.1.2 As specified by the IT Supervisor, mark sampling barrels by completing steps 8.1.2.1 through 8.1.2.5. If sampling barrels are marked, proceed to step 8.1.3.

8.1.2.1 Starting at the bottom of the assembled sampling barrel, mark the outer casing in one foot increments using a permanent ink marker by drawing a circle completely around the casing.

NOTE

Mark the entire 40 foot casing

2431 [redacted]

8.1.2.2 Wrap 2 inch wide tape around the barrel at each foot marking.

NOTE

Ensure bottom of tape is placed at the foot marking

8.1.2.3 Numerically identify each one foot marking on the tape using a permanent ink marker.

NOTE

Numbering shall start at the bottom of the cutting shoe as "O" feet

8.1.2.4 Place 4 inch wide clear, adhesive tape over each foot marking.

8.1.2.5 Every 5 feet, wrap 4 inch red adhesive tape above the tape.

8.1.3 The IT Supervisor shall specify the encasement of the sampling barrel in pipe sleeving by completing steps 8.1.3.1 through 8.1.3.2. If sampling barrels have been encased in sleeving, proceed to Item 8.2.

8.1.3.1 Slide the pipe sleeving (45 foot length) over the end of the sampling barrel.

8.1.3.2 Tape the sleeve to the upper portion of the barrel casing using plastic vinyl tape. Tighten a hose clamp over tape.

8.2 Rigger and operations technician shall ready the Vibra Corer.

WARNING

The crane operator/rigger must complete a routine inspection of the crane at the beginning of each sampling operation shift

[redacted]

CAUTION

Check with the IT Supervisor to ensure Vibra Corer head is being connected to the correct load line for the manway to be sampled.

8.2.1 The rigger shall attach the crane lines to the sampling device with the Vibra Corer Head and drive cable attached.

8.2.2 The rigger shall also attach a 3/4" rope of predetermined length above the headache ball so that the other end can be attached to the second headache ball from the man lift.

8.2.3 The rigger shall signal the crane operator to slowly raise the sampling device off the flatbed truck to a vertical position, one to two feet off the ground.

8.2.4 The rigger shall disconnect the lower rigging from the sampling barrel assembly and attach it to the Vibra Corer Power Supply with two tag lines attached.

8.2.5 The rigger shall then direct the crane operator to raise the Vibra-Corer Power Supply so that it can be connected to the drive cable. Connect drive cable.

8.2.5.1 Connect drive cable to power supply.

8.2.5.2 Connect loose end of the 3/4" rope above the power supply's headache ball.

8.2.6 Operations Personnel shall start the Power Supply and check to ensure the throttle cable is working properly.

8.3 The Operations Technicians shall remove Manway Cover.

8.3.1 The manway glove bag shall be checked for leaks prior to use by slightly inflating the bag and checking for any leakage.

8.3.2 Place manway glove bag over the selected manway. [redacted]

8.3.3 Three individuals are required to perform step 8.2.8.

8.3.4 Lift the cover and place inside the manway glove bag over to the side on a padded surface.

CAUTION

EXPLOSION-PROOF LIGHTING SHALL BE USED AND/OR EXPLOSIVE GAS TESTING SHALL BE PERFORMED

8.4 Sampling (See Figure 1)

8.4.1 With the IT Supervisor's concurrence, the rigger shall signal the crane operator to slowly raise the sampling device and the Power Supply, and move them so that the sampling device is directly over the manway to be sampled.

8.4.2 Operations Personnel shall guide the tag lines to the Power Supply so not to impede movement of the sampling barrel.

8.4.3 The crane operator shall lower the sampling device over the selected manway until the containment sleeve can be attached to the pipe sleeving.

8.4.4 Operations personnel shall seal the pipe sleeving to the manway glovebag with plastic vinyl tape at the lowest point on the pipe.

8.4.5 The Air Vent Tube shall be inserted into the Manway Glove Bag and secured with tape.

8.4.6 Operations personnel shall use a utility knife to cut the seal surrounding the area of the containment sleeve from inside manway glove bag.

8.4.7 The crane operator shall carefully lower the sampling device through the containment sleeve opening until it is approximately twelve feet into the silo (to simulate top of the waste in Silos 1 & 2).

8.4.8 On the dome, two operations technicians shall guide the sampling barrel to simulate avoiding a previously sampled location and to prevent binding of the pipe sleeving. At the same time, another operation technician will take hold of the remote throttle control, from the elevated work platform.

8.4.9 The Operations Technician shall instruct the crane operator to slowly lower the sampling device to a designated depth of 33 feet 6 inches. [redacted]

NOTE

Keeping the Vibra-Corer Power Supply at idle will suffice for this mock operation

8.4.10 Operations Technicians shall crimp and seal the air vent tube as close to the Vibra Corer head as possible.

8.4.10.1 Cut air vent tube below the crimp.

8.4.10.2 Quickly tape over open ends.

8.4.11 With the Supervisors concurrence, the rigger shall signal the crane operator to start removal of the sampling device, and the raising of the Power Supply from the silo.

CAUTION

SLOWLY REMOVE SAMPLING DEVICE FROM SILO

8.4.12 Operation personnel shall ensure containment sleeve is unfolding and following the barrel movement.

8.4.13 As the barrel is raised, wipe the pipe to simulate contamination removal.

8.4.13.1 As the device nears the top of the silo, steady the barrel as necessary to prevent excessive swinging.

8.4.14 When the sampling device has cleared the top of the manway opening a minimum of 3 feet, the crane operator shall stop removal of crane line.

8.4.15 Operations personnel shall crimp and seal the containment sleeve below the corer barrel using plastic vinyl tape.

8.4.16 Operations personnel shall cut the containment sleeve at the center of the taped seal and tape and J-seal the exposed ends.

8.4.17 The tag lines holding the Power Supply shall be used to guide the unit so not to entangle with the sampling barrel.

8.4.18 The crane operator shall slowly raise the sampling device and Power Supply to clear the railing on the silo roof.

8.4.19 The rigger shall signal the crane operator to move the sampling device and Power Supply next to the elevated work platform so that the Power Supply can be shut off and disconnected.

8.4.20 Operations personnel shall steady end of core barrel as necessary during transport of sampling device to flatbed trailer.

8.4.21 The crane operator shall lower the Power Supply with the Remote Throttle Control attached to the ground.

<u>CAUTION</u>

SLOWLY LOWER
POWER SUPPLY
TO THE GROUND

8.4.22 Rigger shall disconnect load line from the Power Supply and connect to the lower end of the sampling barrel.

8.4.23 The crane operator shall carefully position sampling device above the flatbed trailer and slowly lower the device horizontally positioning the top of the core barrel and head assembly against the trailer bed and inside the core trough.

8.4.24 When the sampling device is securely in the trough, rigger shall signal crane operator to hold the position.

8.4.25 The rigger shall disconnect the sampling device from the crane.

8.4.26 Repeat steps 8.2.1 through 8.4.25as directed by IT Supervisor if additional samples are to be collected from the manway.

8.5 Replacement of Manway Covers

8.5.1 Replace gasket material on sealing surface of cover.

8.5.2 Carefully lift cover by hand and carry from holding area to flange. Lower cover into position and secure in place.

8.5.3 Remove tape around manway opening on remaining manway bag and remove manway bag and contents.

8.5.4 Dispose of used Anti-C Clothing in "Radioactive Waste" bag.

[redacted]

9.0 APPLICABLE FORMS

Figure 1, "Silo Sampling Operation".

[redacted]

2431

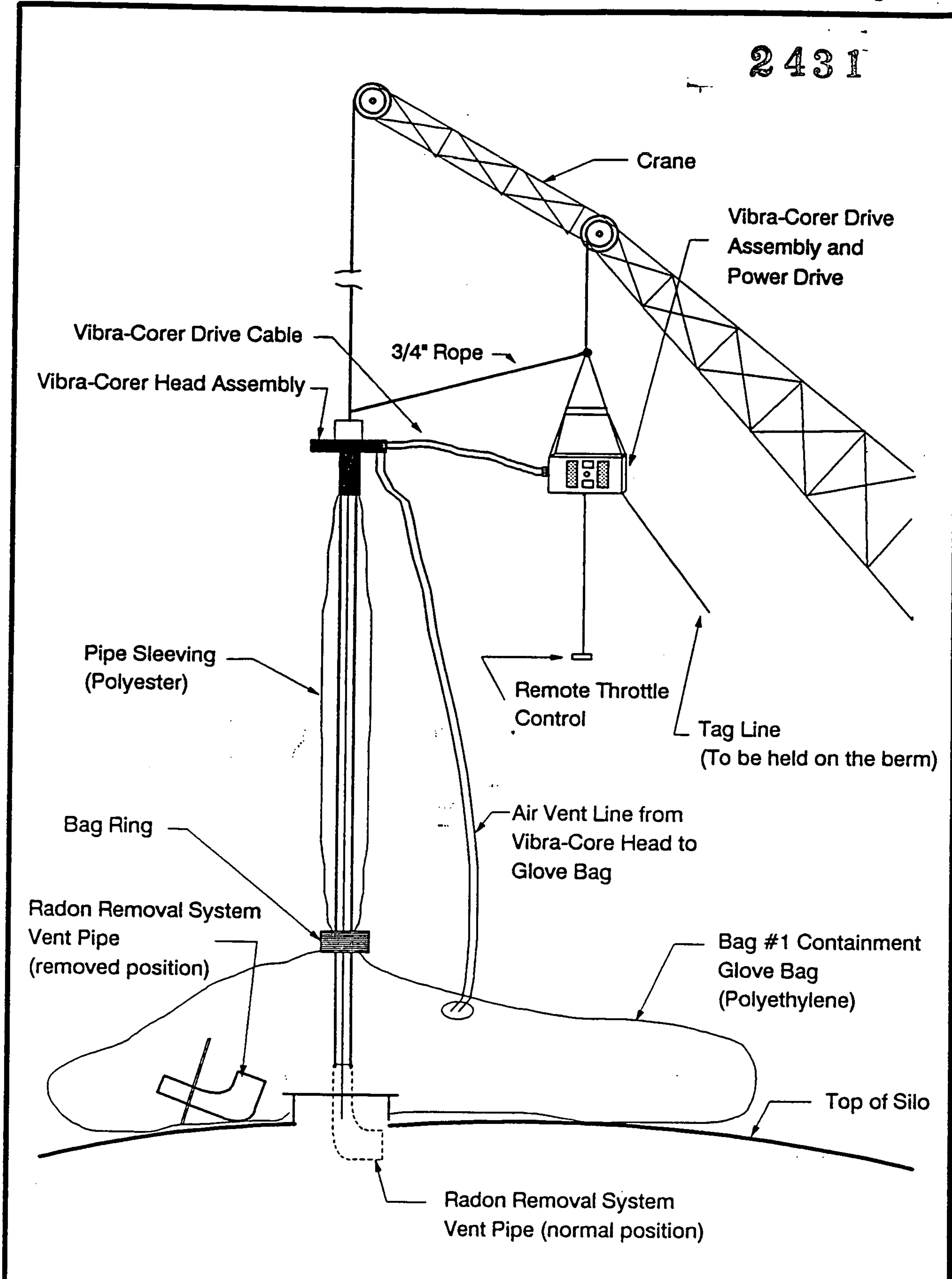


FIGURE 1. SILO SAMPLING OPERATION

[redacted]

000396

RADON MONITORING AND SAMPLING CHECKLIST FOR K-65 SILOS

1.0 OVERVIEW

This procedure addresses the Radon Monitoring Plan for the sampling of the K-65 Silos. Training on this procedure will be conducted for the Radiological Safety Technicians on the Radon Monitoring Plan. This training session will be documented. Training of the operations personnel will be conducted on the K-65 Silo Sampling Procedures and will be documented in the project files.

2.0 SITE PREPARATION PRIOR TO STARTING THE SAMPLING OPERATION

Section 1.0 of the checklist which follows this procedure is intended as a checklist for items that must be completed each work day prior to starting the sampling of the K-65 Silos. The appropriate person must sign the checklist Signature Sheet in the K-65 Silo Sampling Checklist (Attachment 1) for each step in Section 1.0 at the beginning of each work day. The checklist also identifies Operational Safety Requirements (OSR) for the sampling efforts. The IT Supervisor is responsible for obtaining all signatures. All work performed inside the K-65 High Radiation Area during the site preparation must be done under the cognizance of an RST and the IT Supervisor. All Health and Safety requirements will be documented on the Radiation Work Permit (RWP). All radiation readings taken by the RST will be documented on Health Physics forms. Acceptability of these readings will be noted in the K-65 Silo Sampling Checklist. WMCO will operate the Radon Reduction System and is responsible for OSR requirements to that system's operation.

2.1 Prior to Starting the Sampling Operation

NOTE

Any sampling work on the silos must be initiated between 4:00 a.m. and 2:00 p.m.

2.1.1 Prior to starting the initials equipment staging, the Radon Treatment System must be operated with sufficient cool down period, usually two hours, so the radon daughters that have plated out on the inside of the piping have decayed to safe levels approved by the RST. Also, it is the responsibility of the IT Supervisor to assess weather conditions and its impact on radon concentration prior to initiating sampling activities.

000397

OSR> 2.1.2 Each day, prior to any workers entering onto the silo dome, the RST is to take radiation dose readings on the surface of the dome. See Table 1, page [redacted] 3 of 3 for Location Numbers 24-31. Each reading should be documented with the date, time, silo number, location, dose rate and RST signature. If the dose rates are above 100 mrem/hr, the Radon Treatment System must be operated (see WMCO Radon Treatment System Operation Plan) prior to starting the sampling operation.

OSR> 2.1.3 Each work day, the IT Supervisor must make sure that proper anti-contamination clothing, protective gloves, full-face air purifying, and full-face forced air respirators and SCBA equipment are available at the construction site in quantities sufficient for the job. The IT Supervisor is responsible for supplying the anti-contamination clothing, protective gloves, full-face air purifying respirators, full-face forced air respirators, SCBA equipment, and additional safety gear.

2.1.4 Prior to the initial equipment staging and before each work day, the IT Supervisor is to make sure that the following items are located at the construction site and functioning properly:

1) Portable Eyewash Bath
2) K-65 Emergency Phone
3) Emergency Pull Box
4) 2 X ABC Fire Extinguisher
   (at least 10 lbs)
5) First Aid Kit
6) Radios

2.1.5 Each work day, an RST must check to make sure that the RGM-2 units or equivalent around the silos are operating properly and that all air samplers including the WLM units that will be used by the RST during the sampling are operating properly and are located in the proper locations (See Section 4.0).

2.1.6 Each work day, prior to removing any manway cover or flange assembly, the IT Supervisor is responsible for having the breathing air equipment and air lines located in the proper place and functioning properly. The IT Supervisor will determine the wind speed and direction from Security (6295). If the wind speed is excessive as determined by the IT Supervisor, sampling activities will stop until the wind has subsided.

2.1.7 Also, if a thunderstorm or severe weather is eminent, sampling activities will not begin or continue and will follow shutdown steps outlined in Table 7.

2.1.8 Sampling activities will not begin unless the following minimum personnel are present:

Crane Spotter (1)
Crane Operator (1)
Sample Technicians (2)
IT Supervisor (1)

2.1.9 The RST will check each person prior to entering the K-65 high radiation area during site preparation to see if the Self-Reading Pencil Dosimeters (SRPD) and Thermo Luminescent Dosimeters (TLD) are being properly worn, if the anti-contamination clothing is being properly worn by each person. The requirements for entering the high radiation area for each person during site preparation will be the same as the requirements set for each person during the staging of equipment (see Section 3.1). All personnel who handle the silo materials shall wear Finger Ring TLDs.

3.0 SILOS SAMPLING

Section 2.0 of the checklist is intended as an overview that will be followed during the sampling operations. The plan includes requirements that must be met by all personnel during the staging of the equipment. All items listed in Section 2.0 must be completed with the Checklist Signature Sheet filled out before starting the sampling operation. All work performed inside the K-65 high radiation area during the equipment staging must be done under the cognizance of an RST and the IT Supervisor. All Health and Safety requirements will be documented on the IT Radiation Work Permit (RWP).

3.1 Protection Requirements for Personnel Section 3.1 explains the requirements in protective clothing, radiation monitoring devices, and respiratory protection that will be met by each person entering the K-65 high radiation area during the sampling operation. The RST will check each person prior to gaining access in the high radiation area to assure all the following requirements have been met.

3.1.1 Before entering the K-65 high radiation area, each person must be wearing the proper anti-contamination clothing. Each person will be wearing disposable anti-contamination suit and hood. The hands will be covered by rubber gloves with cloth liners that are approved by the RST. Work gloves will be placed over the rubber gloves when handling equipment and tools. Nitrile gloves will be worn when working in the manway glove bag or when exposed to high levels of radon gas. Each worker will be wearing the proper safety boots. Each worker shall have the anti-contamination suit properly taped at the wrist, ankle, zipper, and hood so no flesh is exposed. All openings or tears in the anti-contamination clothing will be taped closed with duct tape and approved by the RST.

OSR> 3.1.2 Each person entering the K-65 high radiation area must be wearing a TLD and SRPD badges properly. The RST will read the SRPD each time a person exits the high radiation area or at a minimum of every two hours to assure each individual is within the allowable whole body exposure limits. The allowable whole body exposure limits for personnel involved with the equipment staging will be 300 mrem/week. Personnel who will handle silo sampling material shall wear Finger Ring TLDs. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

3.1.3 While the manway covers are secured, each person will, at a minimum, properly wear a full-face air purifying respirator when inside the high radiation area.

3.1.4 When the manway covers are ready to be removed, each person in the K-65 high radiation area must be wearing a full-face forced air respirator and will continue to wear this respirator until all manway covers are secured again.

3.1.5 When the manway covers are ready to be removed, each person outside the K-65 high radiation area up to 50 meters or 164 feet from the high radiation area must, as a minimum, wear a full-face air purifying respirator. Each person while in this area will continue to wear any respirator until all manway covers are secured again. Personnel beyond 50 meters from the K-65 high radiation area are not required to wear any respiratory protection.

3.1.6 If the breathing air equipment malfunctions while the manway covers are removed, all personnel will immediately leave the K-65 high radiation area and replace the full-face forced air respirator with a full-face air purifying respirator up to 50 meters or 164 feet from the high radiation area. At any time when the supplied air is disconnected, cover connection ends with tape or plastic. A smear sample will be taken by the RST before the connections can be re-used to ensure no contamination was present. These readings will be documented in Table 5 Radiological Survey Report (FMPC-OSH-1933-1). The IT Supervisor will inspect the breathing air equipment to see if the equipment can be repaired quickly. If not, personnel must reinstall and secure the cover on the manway using SCBA equipment.

3.1.7 The following criteria for respiratory protection will be followed for Working Level (WL) grab sampling during the sampling operations:

0 to 0.075 WL: No respirator is required
0.075 to 16.5 WL: Full-face air purifying respirator
16.5 to 660 WL: Full-face forced air respirator
greater than 660 WL: SCBA equipment

3.2 K-65 SILOS DOME LOAD LIMITATIONS

Section 3.2 explains the load limitations for each silo dome surface and dome cap. Each person must be familiar with these limitations and must follow these limitations throughout the project.

3.2.1 All equipment and material supplies must be staged in such a way that no forces act on the berm within three feet of the silo walls. Staging of equipment and material supplies must be accomplished in such a way that no weight is placed on the 12 inch PVC piping for the radon treatment system.

OSR> 3.2.2 The maximum amount of combined personnel and equipment load that can ever be placed on the silo surface (excluding the dome cap) during the sampling cannot exceed 700 pounds and all weight applied by the equipment will be distributed to avoid point loading.

OSR> 3.2.3 No more than three people total are allowed on the silo dome. A minimal amount of workers should be on the dome surface at all times. At no time will personnel be allowed on the dome center cap area.

3.3 MANWAY COVER REMOVALS

NOTE

Prior to the manway covers being removed, all personnel must be in the proper respirator, anti-contamination clothing, and TLD and SRPD badges as described in Section 3.1

OSR> 3.3.1 The RST must have taken radiation dose rates on the surface of the dome at the four manways per silo prior to removing any manway cover. If any dose rate is above 100 mrem/hr, no manway cover will be allowed to be removed. The Radon Treatment System will have to be operated before any manway cover can be removed.

OSR> 3.3.2 During the sampling operation, dose rates will be taken every two hours at locations 24-27 (when sampling Silo 1) and 28-31 (when sampling Silo 2) and will be documented in Table 1 Radiation Survey Results.

3.3.3 Prior to removing the manway, a manometer will be attached to the silo by the IT Supervisor to check the pressure inside the silo. If the silo is pressurized, the removal of the manway covers will not begin. The pressure inside the silo must be at equilibrium or in a vacuum prior to proceeding with the removal to the manway pipe covers. Log pressure readings in Table 3.

4.0 RADON MONITORING

Two short-term interpretation monitoring techniques will be employed during the sampling of each silo while the manway covers are removed. Each of the two techniques area discussed in Sections 4.1 - 4.2 The monitoring locations are shown in Table 1 Radiation Survey Results, page 3 of 3.

4.1 WORKING LEVEL GRAB SAMPLING

Working Level grab samples will be collected using a portable, battery powered air pumps with a small filter located next to the manways. Working Level grab samples will be collected immediately after the manway covers are removed and during the sampling operation. The Working Level grab samples will be used to determine if the proper respiratory protection is being used for that area. These samples will be taken in accordance with WMCO Procedure EM-2-020, "Environmental Radon Monitoring".

The Working Level grab samples will be collected in the immediate vicinity of the manways, at the base of the berm downwind, and at the Work Area during the sampling operation. All Working Level grab samples will be taken downwind at the designated spots. The Working Level grab samples will be taken, before start of work, hourly when the manway covers are removed, and at 2 hours after the sampling has been completed and the manways have been covered and secured for a silo.

[redacted]

4.2 RADON GAS MONITORS (RGM-2)

4.2.1 Continuous radon gas monitoring is conducted at the K-65 fenceline using alpha scintillation devices known as RGM-2 or equivalent devices. The location of the RGMs are approximately east and west of each of the K-65 Silos' fenceline as shown in Table 1, Radiation Survey results (Page 3 of 3).

4.2.2 Determine the average of the maximum readings for each of the RGM-2 units for the prior month. Record these values and an average of the values under the column entitled "Operating Limits" in Table 6, "Radon Gas Monitor Readings".

4.2.3 Every hour while the manway covers are off, the RGM-2 unit readings will be checked and recorded in Table 6 Radon Gas Monitor Readings.

4.2.4 If the average RGM-2 unit readings for one hour or readings from an individual RGM-2 unit for two consecutive hours exceed the average of the maximum individual RGM-2 readings from the previous month, the following actions shall be taken:

4.2.4.1 Reinstall the manway covers.

4.2.4.2 The RST should immediately take downwind Work Level grab samples to verify and measure whether any radon release had occurred.

4.2.4.3 Do not proceed with sampling or restart the radon treatment system without approval from an RST.

Silo Number______
Manway Location___

K-65 SILO SAMPLING CHECKLIST

To be signed and dated when completed. All tables referred to this checklist are attached as example only except for Table 3 Manometer Readings. The RST's will document all radiological data in their logs. Copies of these logs will be subsequently reproduced and placed in project file.

1.0 Preparations

>OSR 1.1 The K-65 Radon Reduction System has been operated to reduce radiation levels on the silo dome to less than 75 mR/hr. When surface radiation levels climb to 100 mR/hr, sampling operations will be suspended and the Reduction System reactivated.

IT Supervisor	Date	Time

>OSR 1.2 Two gamma specific radiation meters readings in units of mR/hr are placed on the silo dome during sampling operations. Instruments are to be monitored every two hours during sampling operations and results recorded in supervisor's logbook. Meters have been calibrated within six months of the start of sampling and have been response checked within the last 30 days.

IT Supervisor	Date	Time

1.3 Safety equipment present:

__ Anti-C clothing
___ Gloves (Nitrile and Latex/Rubber)
___ Full-face air purifying respirators/cartridges
___ Full-face air-supplied respirators & air tanks charged & ready
___ SCBA equipment

IT Supervisor	Date	Time

Silo Number_______
Manway Location___

1.4 Additional safety items:

___ Portable eyewash bath	___ Emergency Telephone
___ K-65 Emergency Pull Box	___ Radios
___ 2-Fire Extinguisher	___ First Aid Kit

_______________ _______________ _______________
IT Supervisor Date Time

1.5 At least 4 Radon Gas Monitors (RGM -2 or equivalent) have been checked that they are operating properly and are at proper locations. Air samplers are properly placed and operational.

_______________ _______________
IT Supervisor Date

1.6 Wind Direction ____________ Wind Speed _______________ No ensuing thunderstorm - otherwise shutdown sampling operations per Table 7.

_______________ _______________
IT Supervisor Date

>OSR 1.7 a. Minimum manpower required present to begin sampling.

Crane Spotter (1)
Crane Operator (1)
Sample Technicians (2)
IT Supervisor (1)

b. Minimum manpower to transport samples.

Truck Driver (1)
Sample Technicians (2)

_______________ _______________
IT Supervisor Date

[redacted]

Silo Number_______
Manway Location___

>OSR 1.8 All personnel wear all required clothing and safety equipment.

____ a. Anti-C Clothing/Hoods/Booties
____ b. Respirators
____ 1. Air-purifying full-face - silo manways closed
____ 2. Air-supplying - silo manways open
____ c. Pencil dosimeters (SRPD)
____ d. Badge dosimeters (TLD)
____ e. Finger ring dosimeters (TLD)

RST ________________ Date ________________

1.9 WMCO Security notified at (6295).

________________ ________________
IT Supervisor Date

1.10 WMCO EOC notified.

________________ ________________
IT Supervisor Date

1.11 WMCO Public Affairs notified.

________________ ________________
IT Supervisor Date

1.12 Crane is properly located.

________________ ________________
IT Supervisor Date

1.13 Radiation Work Permit in place.

________________ ________________
IT Supervisor Date

[redacted]

Silo Number_______
Manway Location___

>OSR 1.14 Personnel exposures are limited to 300 mR/wk, and 3.0 R/yr. (site), 5.0 R/yr (DOE)

________________ ________________
IT Supervisor Date

1.15 Breathing air system is available and is operated per DWP-003 - Breathing Air System. Pressures are monitored and recorded every 15 minutes.

________________ ________________
IT Supervisor Date

>OSR 1.16 Entrance to the Radon Treatment System is properly posted and access restricted. System external ducting has been inspected for integrity.

________________ ________________
IT Supervisor Date

>OSR 1.17 Maximum number of personnel on the silo dome is limited to three (3) or less.

________________ ________________
IT Supervisor Date

1.18 Personnel involved in sampling operations have completed the required training, including WMCO Radiation Worker Training.

________________ ________________
IT Supervisor Date

OSR> 1.19 OSR Violations and other DOE reportable events will be reported in accordance with FMPC-703, "Unusual Occurrence Reporting" and FMPC-704, "Minor Event Reporting System".

________________ ________________
IT Supervisor Date

OSR> 1.20 Silo safety net(s) installed per DWP-007, K-65 Silo Safety Net Application.

________________ ________________
IT Supervisor Date

Silo Number_______
Manway Location___

2.0 Sampling Operations

2.1 Sample Points are properly marked with metal tags wrapped around the manway nozzles with metal wires.

IT Supervisor	Date

2.2 Sampling Equipment has been prepared per DWP-001, Silo Sampling.

IT Supervisor	Date

2.3 Acceptable Working Level grab sample before start of work taken and tabulated in Table 2 Air Sample Report.

RST	Date

2.4 Manometer readings acceptable for Flange Removal tabulated in Table 3.

Reading	Technician/Date/Time

2.5 Radon gas monitors (RGM-2 or equivalent) checked and recorded hourly in Table 6 when manway covers are off in Table 1 Radiation Survey Results. An average for one reading or an individual reading for two consecutive readings cannot exceed average of maximum individual readings for the previous month.

RST	Date

>OSR 2.6 Dome surface dose rates taken every two hours at locations 24-27 (when sampling Silo 1) and 28-31 (when sampling Silo 2) and recorded in Table 1 Radiation Survey results.

RST	Date	Time

[redacted]

Silo Number_______
Manway Location___

2.7 Acceptable Working Level grab sample will be taken every hour tabulated in Table 2 Air Sample Report when manway cover is removed.

______________ ______________ ______________
IT Supervisor Date Time

2.8 Remove Manhole Flange, and set up containment bag per DWP-001, Silo Sampling. Time of manway removal will be documented in the Supervisor's Logbook.

______________ ______________
IT Supervisor Date

2.9 Obtain samples of residues per DWP-001, Silo Sampling.

______________ ______________
IT Supervisor Date

2.10 Replace manway cover per DWP-001, Silo Sampling.

______________ ______________ ______________
IT Supervisor Date Time

2.11 Acceptable Work Level grab samples tabulated in Table 2 Air Sample Log.

______________ ______________ ______________
IT Supervisor Date Time

OSR> 2.12 Pencil dosimeters read at a minimum of every two hours and recorded in Dosimeter log at the end of the workday or upon exit of controlled area. Airline connections smear surveyed documented in table 5 prior to reentry to control area.

______________ ______________
RST Date

2.13 Remove containment bag per DWP-001, Silo Sampling.

______________ ______________
IT Supervisor Date

Silo Number_______
Manway Location___

2.14 Transport of Equipment is per CIO C88-146.

IT Supervisor ______ Date ______

2.15 Conduct initial on-site core handling and inspection per DWP-002, Sample Core Handling.

IT Supervisor ______ Date ______

2.16 Section and package the sample cores per DWP-002, Sample Core Handling.

IT Supervisor ______ Date ______

2.17 Acceptable Working Level grab samples taken before, after and every two hours during the sectioning of the cores documented in the Table 2 Air Sample Log.

RST ______ Date ______

>OSR 2.18 Pencil dosimeters read at a minimum of two hours and documented in Dosimeter Log.

IT Supervisor ______ Date ______

2.19 At end of each day, printout from Radon Monitoring Equipment attached to Radiation Survey Forms.

IT Supervisor ______ Date ______

2.20 Store the cored sections in Archive Storage per WMCO Procedures.

IT Supervisor ______ Date ______

Silo Number_______
Manway Location___

2.21 Working Level Samples are taken two hours after sampling (manways closed) documented in Table 2 Air Sample Report.

__________________ __________________
IT Supervisor Date

[redacted]

2431

Silo Number ________
Manway Location ______

TABLE 1. RADIATION SURVEY RESULTS

RADIATION SURVEY RESULTS

		Background	Start	2nd Hour	4th Hour	6th Hour	8th Hour
	TIME						
NUMBER	LOCATION			GAMMA READING			
1	TAPE MARK, WEST K-65 FENCE						
2	TAPE MARK, WEST K-65 FENCE						
3	TAPE MARK, WEST K-65 FENCE						
4	TAPE MARK, WEST K-65 FENCE						
5	TAPE MARK, WEST K-65 FENCE						
6	TAPE MARK, WEST FENCE, TREATMENT SYSTEM						
7	TAPE MARK, WEST FENCE, TREATMENT SYSTEM						
8	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
9	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
10	TAPE MARK, NORTH FENCE, TREATMENT SYSTEM						
11	ROOF OF TREATMENT SYSTEM						
12	ROOF OF TREATMENT SYSTEM						
13	ROOF OF TREATMENT SYSTEM						
14	TAPE MARK, EAST FENCE, TREATMENT SYSTEM						
15	TAPE MARK, EAST FENCE, TREATMENT SYSTEM						
16	TAPE MARK, EAST K-65 FENCE						
17	TAPE MARK, EAST K-65 FENCE						

DATE: ____________

BY: ____________

Instrument: ____________

Serial No.: ____________

K-65 SILO SAMPLING CHECKLIST

[redacted]

Silo Number ________
Manway Location ________

TABLE 1. RADIATION SURVEY RESULTS Page 2 of 3

RADIATION SURVEY RESULTS

NUMBER	LOCATION	Background	Start	2nd Hour	4th Hour	6th Hour	8th Hour
	TIME						
			GAMMA READING				
18	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
19	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
20	12" DIAMETER PIPE, WEST SIDE, TOP OF BERM						
21	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
22	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
23	12" DIAMETER PIPE, EAST SIDE, TOP OF BERM						
24	CONTACT, SILO ·' DOME SURFACE						
25	CONTACT, SILO #1 DOME SURFACE						
26	CONTACT, SILO #1 DOME SURFACE						
27	CONTACT, SILO #1 DOME SURFACE						
28	CONTACT, SILO #2 DOME SURFACE						
29	CONTACT, SILO #2 DOME SURFACE						
30	CONTACT, SILO #2 DOME SURFACE						
31	CONTACT, SILO #2 DOME SURFACE						

DATE: ________

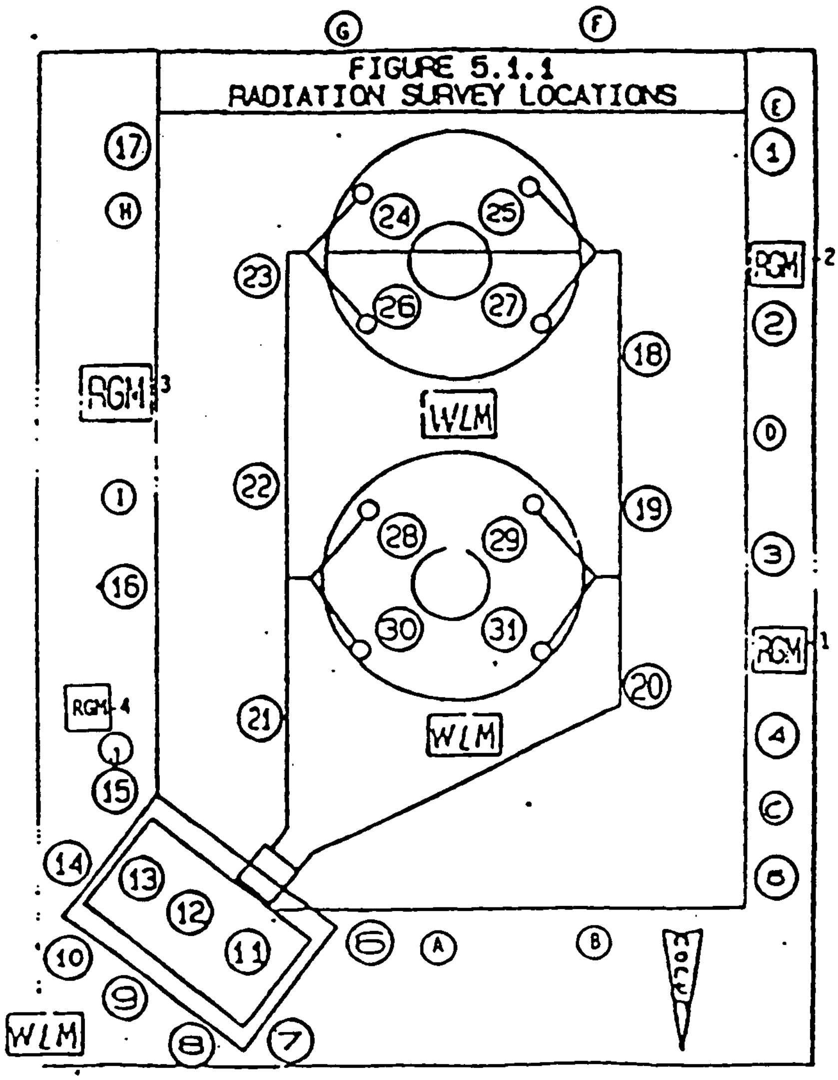
BY: ________

Instrument: ________
Serial No.: ________

[redacted]

Silo Number ________
Manway Location ________

TABLE 1. RADIATION SURVEY RESULTS Page 3 of 3



K-65 SILO SAMPLING CHECKLIST

[redacted]

[redacted]

Silo Number ____________
Manway Location ____________

TABLE 2. AIR SAMPLE REPORT

FMPC

AIR SAMPLE REPORT

SAMPLE COLLECTION DATA

☐ BZ ☐ GA

SAMPLE COUNT RECORD

REFERENCE ONLY

OTHER SAMPLE DATA

GA SAMPLE DATA

BZ SAMPLE DATA

K-65 SILO SAMPLING CHECKLIST

[redacted]

000415

Silo Number ___________
Manway Location _______

TABLE 3
MANOMETER READING

DATE	TIME	READING (INCHES)	TECHNICIAN
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------
-----	-----	---------	----------

NOTE: Pressure readings on the manometer must read zero or indicate a vacuum prior to manway removal.

[redacted]

Silo Number ________
Manway Location ________

TABLE 4. DIRECT READING DOSIMETER LOG

FMPC
RADIATION PROTECTION RECORDS
DIRECT READING DOSIMETER LOG — SHORT TERM USE

PERIOD COVERED: ________ TO ________

NAME	BADGE NUMBER	DOSIMETER SERIAL NO.	ISSUED			RETURNED			TOTAL DOSE (mR)	SIGNATURE
			RANGE (mR)	DATE	TIME	RANGE (mR)	DATE	TIME		

REFERENCE ONLY

K-65 SILO SAMPLING CHECKLIST

2431

[redacted]

Silo Number ____________
Manway Location ____________

TABLE 5. RADIOLOGICAL SURVEY REPORT

FMPC
RADIOLOGICAL SURVEY REPORT

Date | Time: | Page of

☐ ROUTINE ☐ SPECIAL REQUEST ☐ RWP ☐ INCIDENT

FOLLOW-UP SURVEY ATTACHED ☐ YES ☐ NO
SURVEY MAP ATTACHED ☐ YES ☐ NO

☐ ALPHA ☐ BETA-GAMMA ☐ OTHER

☐ CONTAMINATION ☐ RADIATION ☐ OTHER

REFERENCE ONLY

K-65 SILO SAMPLING CHECKLIST

[redacted]

000418

2431

[redacted]

Silo Number ________
Manway Location ________

TABLE 6. RADON GAS MONITOR READINGS

RADON GAS MONITOR READINGS

	TIME	Operating Limits	Start	1st Hour	2nd Hour	3rd Hour	4th Hour
RGM-1							
RGM-2							
RGM-3							
RGM-4							
RGM Average							

RST: ________
Serial No.: ________
Location: ________
Time: ________

K-65 SILO SAMPLING CHECKLIST

[redacted]

[redacted]

TABLE 7. OPERATIONAL SHUTDOWN STEPS

The following steps will be taken if inclement weather is ensuing, an abnormal occurrence is experienced, or minimum manpower required become unavailable.

STATUS	SHUTDOWN STEPS
During preparation stage (before manhole cover removal)	Stop preparation activities. Store all sampling items in secure location.
Vibra-Corer is being lifted by crane into silo.	Have crane operator stop movement of Vibra-Corer and lower Vibra-Corer onto flatbed trailer. Replace manhole cover per DWP-001.
Vibra-Corer is being removed from the silo.	Continue removal of the Vibra-Corer and have the crane operator replace the unit on the flatbed trailer. Replace manhole cover per DWP-001.
Vibra-Corer is being transferred to the flatbed after sampling.	Continue positioning of the Vibra-Corer onto the flatbed. Replace manhole cover per DWP-001.

[redacted]

SET-UP AND POSITIONING OF THE CRANE PROCEDURE

1.0 PURPOSE

This procedure defines the progression of steps to be followed during setup and positioning of the crane used to support the Vibra-Corer Sampler during sampling of the K-65 Silos 1 and 2. The crane must be used to eliminate undue stress and weight on the domed roofs of the silos by the sampling equipment. The crane must be relocated three times during the sampling program.

2.0 APPLICABILITY

This procedure applies to setup and positioning of the crane used during sampling of the FMPC K-65 Silos 1 and 2. The mock sampling run on Silo 4 will also be performed in accordance with this procedure.

3.0 RESPONSIBILITIES

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensure this procedure is performed with only properly trained personnel who are experienced use of the stated equipment.

3.1.2 Contact Radiological Safety to determine the appropriate respiratory protection for the process being performed.

OSR> 3.1.3 Provide operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensure Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> 3.1.5 Ensure pocket dosimeters and TLDs are worn by all personnel.

3.1.6 Initiate and implement Radiation Work Permit.

OSR> 3.1.7 Report exceptional circumstances not addressed by this procedure in a "Minor Event Report" - (Refer to FMPC-704) and notifying the Assistant Emergency Duty Officer (AEDO) and IT Project Manager of the circumstances.

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure non-conformances to the IT Supervisor and AEDO.

OSR> 3.3 Radiation Safety Technicians (RST) shall be responsible for:

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation and contamination) specified by procedure and/or as instructed.

3.3.4 Reporting any unusual occurrences to the IT Supervisor and/or AEDO.

4.0 <u>DEFINITIONS</u>

4.1 Vibra-Corer Sampling Device - Solid sampling equipment consisting of a cable-driven head assembly connected to a pipe barrel with a threaded penetrating probe containing inner LEXAN sleeve used to extract long core samples. If required, a cutter/catcher assembly located at the bottom of the pipe barrel is used to penetrate and retain the sample residues.

4.2 IT Supervisor - For the purposes of this procedure, the word "supervisor" refers to the IT Supervisor in charge of sampling.

4.3 Project Manager - The Project Manager is the senior IT member of the K-65 Resampling Team.

4.4 Operations Technician/Personnel - IT Personnel performing the sampling operation.

4.5 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.6 Rigger - IT Personnel designated by the IT Supervisor to provide signals to the crane operator, control of suspended loads and making all necessary attachments of load lines to loads.

4.7 Crane Operator - Subcontracted personnel responsible for proper operation, upkeep and maintenance of the crane and all associated equipment.

5.0 REFERENCES

5.1 Occupational Safety and Health Standards for Construction Industry, 29 CFR Part 1926.

5.2 Plan-001, "IT Site-Specific Health and Safety Plan".

5.3 WMCO Maintenance Work Instruction CRA-001, Cranes and Hoists Inspection.

5.4 DWP-001, "Sampling Procedures".

5.5 DWP-004, "Mock Silo Sampling Procedure".

5.6 FMPC-704, "Minor Event Reporting".

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 Setup, inspection, and operation of the crane must be per OSHA standards, Sections 1910.180, 1926.550, and all relevant national consensus standards (i.e., ANSI). Load testing must be performed and documented in accordance with WMCO Maintenance Work Instruction CRA-001, "Cranes and Hoists Inspection" and verified by the Supervisor.

OSR> 6.2 Protective clothing and dosimetry will be worn in accordance with Plan-001, "Site-Specific Health and Safety Plan".

6.3 Accessible areas within the swing radius of the rotating superstructure of the crane will be barricaded to prevent an employee injury.

6.4 Crane clearance from any electrical distribution or transmission lines will be maintained in accordance with the following OSHA requirements and approved by WMCO Fire and Safety:

- Lines rated 5kV or below, minimum clearance between the lines and any part of the crane or load will be 10 feet.

- Lines rated over 5kV, minimum clearance will be 10 feet plus 0.4 inch for each kV over 5kV, or twice the length of the line insulator, but not less than 10 feet.

[redacted]

2431

- In transit with no load, the equipment clearance will be a minimum of 4 feet for voltages less than 50kV; 10 feet for voltages over 50kV, up to and including 345kV; and 16 feet for voltages between 345kV and 750kV.

6.5 The crane is being used to support the weight of the sampling equipment and to minimize stresses to the domed roofs of the silos. The limited structural integrity of the silos should be considered throughout the sampling program and particularly during the operation of the crane. At no time should the crane load rest on the surface of the dome.

6.6 At no time should personnel walk on or equipment be laced on the center cap of the silo.

6.7 Review of safety and operational procedures has taken place with personnel involved.

6.8 Safety glasses with side shields shall be worn unless other eye protection is specified.

OSR> 6.9 Respiratory protection provided by the IT Supervisor shall be worn as dictated by conditions and procedures.

OSR> 6.10 Anti-contamination clothing shall be worn as dictated by conditions and procedures.

6.11 Leather-palm gloves shall be worn when handling rough, sharp-edged, or contaminated material.

6.12 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 area.

OSR> 6.13 Operator exposures as determined from self-reading pocket dosimeters (SRPD) shall not exceed 300 mRem/week per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.14 The number of personnel on the surface of the silo shall be limited to three and the maximum equipment/personnel load shall be limited to 700 pounds.

6.15 Operate the Breathing Air System per DWP-003.

000424

6.16 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorption shall immediately be reported to the IT

[redacted]

Supervisor.

6.16.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.16.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.16.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.17 All 120 volt 15 & 20 amp. circuit shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walkways.

7.0 PREREQUISITES

7.1 Safety and radiation training for all workers in accordance with procedures of WMCO and the contractor.

7.2 Fuel truck located for fueling crane at its three positions per Figure 1.

7.3 Crane components for assembly and maintenance on site.

7.4 Adequate access and travel roads around the silos.

7.5 Tool truck, small assembly crane, and other equipment required for primary crane assembly per sub-contractor's recommendations.

7.6 Electrical transmission lines which cross the travel route of crane de-energized or moved sufficiently out of the way per OSHA requirements during crane movement.

7.7 Security fence breached at locations per Figure 1.

8.0 PROCEDURES

8.1 Locate crane components, small assembly crane, and required general tools in the assembly area.

8.2 Barricade accessible areas within swing radius of the rotating superstructure per sub-contractor's recommendations.

8.3 Assemble crane per manufacturer's instructions.

8.4 Fill fuel tank with fuel oil. Be sure to ground both systems properly prior to fuel transfer.

8.5 Inspect equipment, machinery, and cable prior to use. Make repairs or replacements as required before proceeding. Notify the IT Supervisor of any unusual circumstances. Perform and document load testing per WMCO Maintenance Work Instruction, CRA-001, "Cranes and Hoists".

8.6 Locate crane sequentially beginning with position No. 1 per Figure 1.

NOTE

Crane will be relocated three times throughout the sampling program. It should travel along the routes designated in Figure 1. Travel route and access area should be barricaded when relocating the crane

8.7 Set outriggers, if applicable.

8.8 Position boom above corresponding sequential manhole per Figure 1 to establish correct positioning.

NOTE

The IT Supervisor will inspect crane position and give authorization to proceed. Record authorization in the project logbook

8.9 Swing boom to a location designated in Procedure DWP-001, "Silo Sampling" or DWP-004, "Mock Silo Sampling" as appropriate for hook up to sampler. Secure crane, do not proceed without confirmation from the Supervisor.

9.0 APPLICABLE FORMS

Figure 1, "Sampling Area Lay-Out/Crane Route"

[redacted]

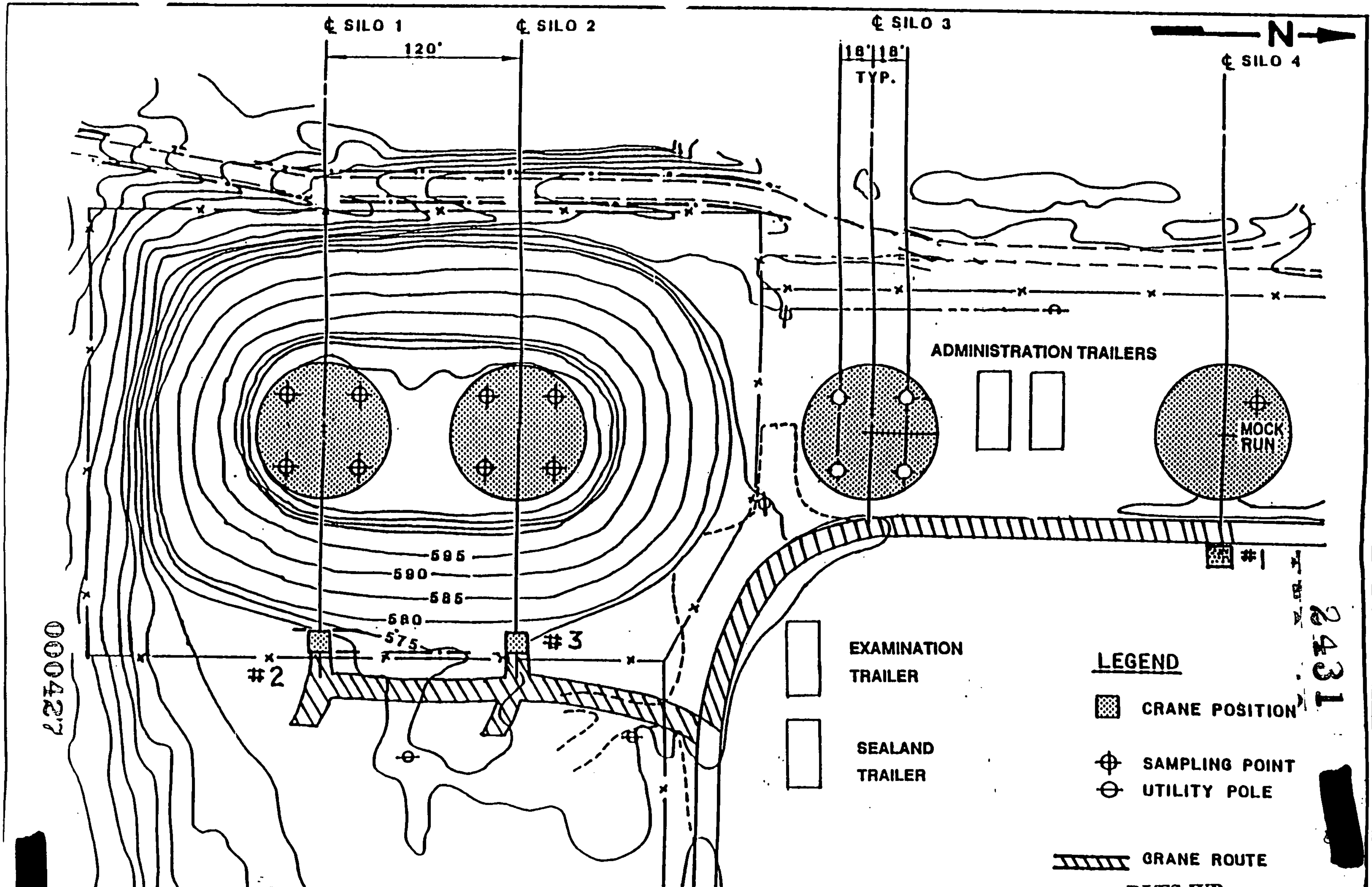


FIGURE 1. SAMPLING AREA LAY-OUT/CRANE ROUTE

RI/FS-WP
Addendum-DWP-006
Date: 09/17/90
Page 7 of 7

[redacted]

K-65 SILOS SAFETY NET APPLICATION

1.0 PURPOSE

The purpose of this procedure is to provide the steps for applying safety nets to the domes of the K-65 silos 1 and 2.

2.0 APPLICABILITY

This procedure is applicable to the safety net application on the domes of the K-65 Silos 1 & 2 in the Waste Storage Area.

3.0 RESPONSIBILITY

3.1 The IT Supervisor shall be responsible for the following:

3.1.1 Ensuring that only trained personnel perform the net application.

3.1.2 Contacting Radiological Safety to determine the appropriate respiratory protection for the process being performed.

3.1.3 Provides operators with the required respiratory protection and anti-contamination clothing.

3.1.4 Ensures nets and equipment are available for technicians usage.

3.1.5 Ensures Radiation Safety is notified and performs the required radiation monitoring and measurements during this operation.

OSR> **3.1.6 Ensures pocket dosimeters and TLDs are worn by all personnel involved in the sampling operations.**

3.1.7 Initiate and Implement Radiation Work Permit.

OSR> **3.1.8 Reports exceptional circumstances not addressed by this DWP in a "Minor Event Report" (Refer to FMPC-704) and notifies the IT Project Manager and WMCO Assistant Emergency Duty Officer (AEDO) of the circumstance.**

[redacted]

3.2 All personnel shall be responsible for complying with this procedure and reporting any abnormal condition and/or procedure non-conformances to the IT Supervisor.

OSR> **3.3 Radiation Safety Technicians (RST) shall be responsible for:**

3.3.1 Reading and recording personnel Self-Reading Pocket Dosimeters (SRPD) at a minimum of two-hour intervals.

3.3.2 Recording the end-of-day readings in the RST Log.

3.3.3 Performing all monitoring (airborne, radiation, and contamination) specified by procedures and/or as instructed.

3.3.4 Reporting any unusual circumstances to the IT Supervisor and/or WMCO AEDO.

4.0 DEFINITIONS

4.1 Safety Net(s)-double strand 0.158 inch polypropylene mesh rope and 0.625 inch frame rope with a 4 inch opening. The Safety Net(s) outside dimensions are 15' x 30'. These nets are to be used as a safety device to minimize personnel injury in the event of a silo structural break.

4.2 Fall Arrest Block - Self-contained spring loaded drum with up to 39 feet of retractable cable. This unit has a braking system much like a seat belt and will lock in the event of a sudden jerk caused by a trip or fall. The Fall Arrest Block will be connected between one of the cranes headache balls and a full body harness worn by personnel on the silo domes. The block will be used during Safety Net application and RTS ducting removal.

4.3 RTS Ducting Glove Bag - Plastic bag containing glove ports which is attached to the RTS ducting at the silo manway connection, to contain airborne radionuclides during ducting removal.

4.4 IT Supervisor - For the purposes of this procedure, the word "Supervisor" refers to IT Supervisor in charge of the silo sampling.

4.5 Project Manager - The Project Manager is the senior IT member of the K-65 Resampling Team.

4.6 Operations Technician/Personnel - IT Personnel performing the sampling operations.

4.7 Radiation Safety Technician (RST) - IT/WMCO Health Physics Personnel supporting sampling operations.

4.8 Tie-Down Posts - 1 1/2" I.D. pipe cut to length to secure safety nets.

5.O REFERENCES

5.1 DWP-003, "Breathing Air System"

5.2 WMCO SOP 65-C-106, "Silo Waste Handling"

5.3 FMPC 704, "Minor Event Reporting"

5.4 Plan-001 - "Site-Specific Health and Safety Plan"

5.5 DWP-006, "Set-up and Positioning of the Crane"

6.0 INDUSTRIAL HEALTH AND SAFETY REQUIREMENTS

6.1 At no time shall personnel walk on or place equipment on the center cap of the silo.

6.2 Safety glasses with side shields shall be worn unless other eye protection is specified.

6.3 A Fall Arrest Block shall be used when applying a safety net.

OSR> **6.4 Respiratory protection provided by the IT Supervisor shall be worn.**

OSR> **6.5 Anti-contamination clothing shall be worn when working on top of the silos.**

6.6 Leather-palm gloves shall be worn when handling rough, sharp-edged or contaminated material.

6.7 Nitrile gloves shall be worn when using the RTS ducting glove bag.

6.8 A Radiation Work Permit and full-time radiological coverage is required for work performed within the K-65 Area.

[redacted]

OSR> 6.9 Operator exposure as determined from Self-Reading Pocket Dosimeters (SRPD) shall not exceed 300 mRem/week, per individual. Individual dose limits shall not exceed the DOE limit of 5.0 Rem/year or the site limit of 3.0 Rem/year.

OSR> 6.10 The number of personnel on the surface of the silos shall not exceed three and the maximum equipment/personnel load shall not exceed 700 pounds.

6.11 Any circumstance which could have resulted in an intake of radioactive materials by inhalation, ingestion or absorportion shall immediately by reported to the IT Supervisor.

6.11.1 The IT Supervisor shall immediately report the circumstance of possible radioactive materials intake to WMCO IRS&T for evaluation.

6.11.2 The involved employee shall report to WMCO IRS&T at the end of their shift or as directed to submit a urine sample and again report at the start of their next shift to submit another urine sample.

6.11.3 The IT Supervisor shall consider the circumstance to be a minor event and shall immediately complete a "Minor Event Report" per FMPC-704.

6.12 Operate the Breathing Air System per DWP-003.

6.13 All 120 volt 15 & 20 amp circuits shall be protected by GFCI. All electrical cords shall not be permitted to be on the ground or in walk ways.

7.0 PROCEDURE

7.1 Set-up crane per "DWP-006" at Silo 1 as it would be for silo sampling.

7.1.1 Move to Silo 2 Crane Pad after completing safety net applications of Silo 1.

7.2 After materials have been gathered for RTS ducting removal, the crane operator shall move the crane boom over the berm near manway where safety net is to be applied.

7.3 Operations Technicians on silo berm shall signal the crane operator to lower the headache ball so Fall Arrest Blocks can be attached.

7.3.1 Snap shackles of the Fall Arrest Blocks into headache ball hook.

NOTE

Check with the IT Supervisor to ensure
the correct load-line for corresponding manway location

7.4 Snap the other end of the Fall Arrest Blocks to the full-body harness worn by operation technicians on dome.

7.5 <u>Removal of RTS Ducting</u>

NOTE

Visually inspect RTS manway isolation
valve and ensure it is in
the shut position

7.5.1 Place RTS ducting glove bag around manway connection with screw driver inside.

7.5.2 Tape and seal glove bag around ducting connection.

7.5.3 Loosen hose clamp around RTS ducting with the screw driver.

7.5.4 Carefully separate RTS ducting from manway connection.

7.5.5 Gather center of the glove bag, twist and tape.

7.5.6 Cut tape in the center and separate the glove bag.

7.5.7 Move the RTS ducting so not to interfere with the safety net application.

7.6 Egress to berm area and gather safety net.

NOTE

Ensure net is folded for easy application to the dome to minimize radiation exposure

7.7 Application of Safety Net to Silo Dome (See Figure 1)

7.7.1 Carefully unfold safety net with tie lines attached.

7.7.2 Lay three foot net opening over manway flange so that it lies flat on the dome.

7.7.3 Stretch net out to ensure its position is satisfactory.

7.7.4 Egress to silo berm

7.8 Unsnap Fall Arrest Blocks from full-body harnesses.

7.9 Signal crane operator to lower Fall Arrest Blocks to ground outside silo area.

7.10 Rigger shall connect seven tie down posts to the load-line.

7.11 Crane operator shall set the tie-down posts on the berm.

7.12 <u>Tie-Down of Safety Net</u>

7.12.1 Drive tie-down posts into the berm at designated locations so tie lines can be attached.

7.12.2 Attach one end of the 1/2 ton come-a-longs to tie-down posts.

7.12.3 Attach free end of come-a-long to loops in tie lines.

7.12.4 Tighten tie lines using the come-a-longs until safety net is sufficiently stretched out.

7.13 <u>Replacement of RTS Ducting</u>

7.13.1 Acquire a new RTS ducting glove bag

[redacted]

[redacted]

7.13.2 Retrieve RTS ducting from where it was placed for safety net application.

7.13.3 One operations technician shall hold the ducting near the manway connection and the other shall place the glove bag over the covered ends.

7.13.4 Tape and seal glove bag.

7.13.5 Carefully remove the tape and old glove bag covers from both ends of the ducting so they are open within the glove bag.

7.13.6 Carefully slide the RTS ducting onto the manway connection.

7.13.7 Replace hose clamp and tighten

7.13.8 Remove tape and RTS glove bag from connection.

7.13.9 Seal open end of used RTS glove bag and dispose of per WMCO Procedure SOP-65-C-106.

7.14 Repeat steps 7.2 through 7.13.9 until all eight safety nets have been applied to the silo domes.

8.0 APPLICABLE FORMS

Figure 1 - "Silo Safety Net (Typical)"

[redacted]

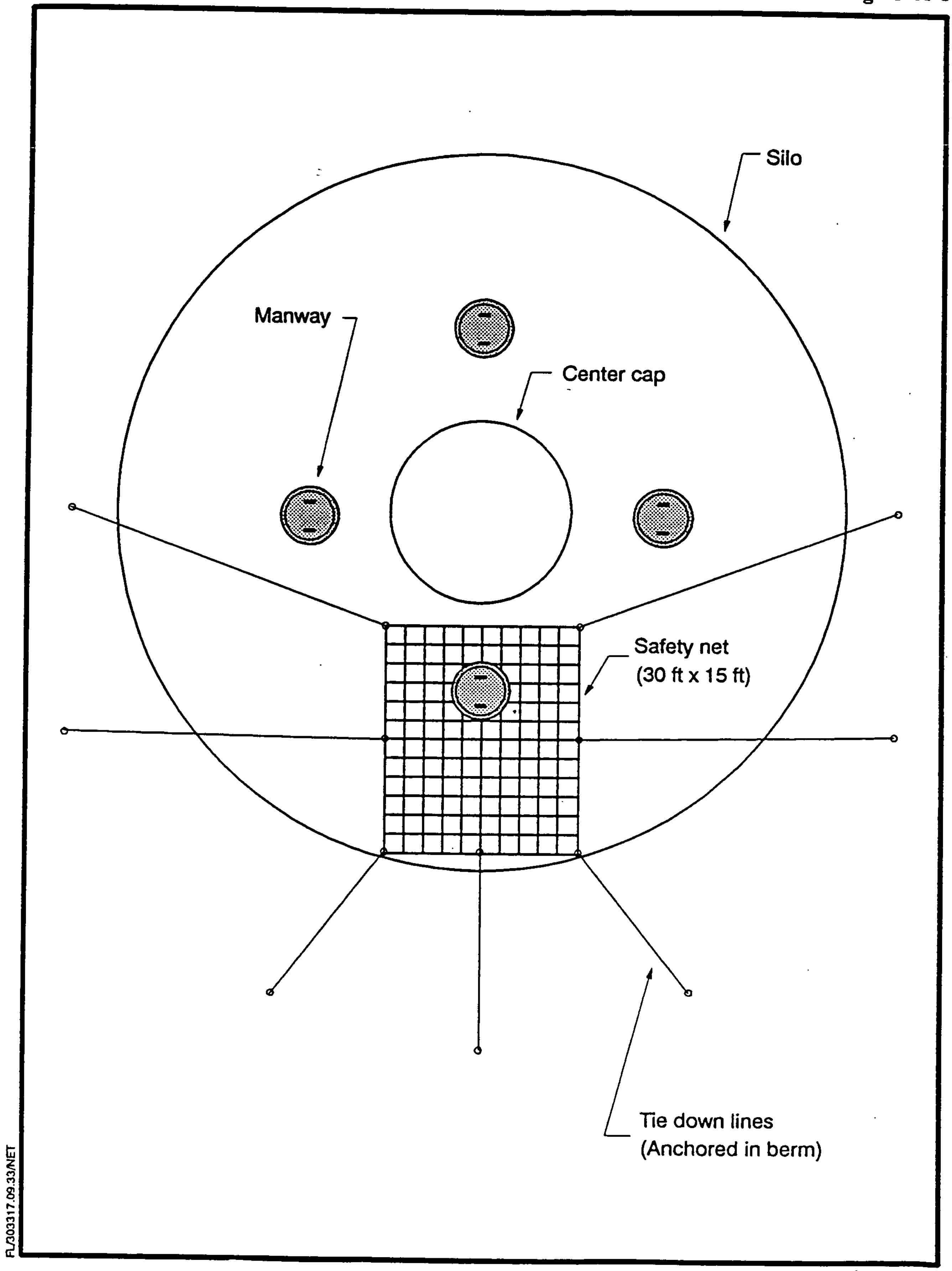


FIGURE 1 SILO SAFETY NET (TYPICAL)

2431 [redacted]

APPENDIX B

PROGRAM PLANS

000436 [redacted]

2431 [redacted]

SITE SPECIFIC HEALTH AND SAFETY PLAN

for the

FEED MATERIALS PRODUCTION CENTER

SAMPLING OF THE K-65 SILOS 1 AND 2

[redacted]

000437

[redacted]

Table of Contents 2431

1.0 Introduction 1

1.1 Policy 1
1.2 Site Arrangement/Route to WMCO Infirmary 1

2.0 Site History 5

3.0 Task Specific Hazard Assessment 7

3.1 Physical Hazards 7
3.2 Chemical/Radiological Hazards 8
3.3 Routes of Entry 8
3.4 Will Site Activities 9
3.5 Physical Hazards 9

4.0 Monitoring 9

4.1 Goals 9
4.2 Monitoring Equipment and Frequency of Monitoring Airborne Radioactive Contaminant monitoring (Internal Radiation Hazard) 9

4.2.1 Radon Monitoring 10
4.2.2 Working Level Grab Sampling 10
4.2.3 Long-Live Airborne Radioactivity Sampling 10
4.2.4 Continuous Air Monitors (CAMS) 10

4.3 External Radiation Hazard Monitoring 10

4.3.1 Radiation Surveys 11
4.3.2 Personnel Dosimetry 11

4.4 Surface Contamination 11
4.5 Containment 12

5.0 Personal Protective Equipment 13

6.0 Site Access 14

000438

6.1 Site Control 14
6.2 Bioassay Program 14
6.3 Medical Monitoring 16
6.4 Training Requirements 16

[redacted]

2431

7.0 Exposure Symptoms . . . . [redacted]

8.0 Site Entry Procedures 17

9.0 Emergency Contact List 18

10.0 Site Existing Procedure 18

- 10.1 Contamination Detection 18
- 10.2 Decontamination 19

11.0 Sampling Derived Wastes 19

12.0 Confined Space Entry 20

13.0 Personal Protective Equipment 20

- 13.1 Level-B 20
- 13.2 Level-C 21
- 13.3 Level-D 21

14.0 Calibration of Monitoring Equipment 22

15.0 Heat Stress 22

16.0 Area Emergencies/Contingency Plan 25

17.0 Chemical/Radiological Releases And Spill Containment 26

000439

[redacted]

1.0 INTRODUCTION

The Advanced Sciences, Inc. (ASI)/IT Corporation (IT) Team has been tasked by the Department of Energy (DOE) to perform the K-65 Silo Resampling effort at the Feed Materials Production Center (FMPC) in Fernald, Ohio. The FMPC is currently operated by Westinghouse Materials Company of Ohio (WMCO) for the DOE. K-65 Silo History is presented in Section 2.0.

The K-65 Silo residue will be sampled utilizing a Vibra Corer Sampler (primary method) or by combining both a Vibra Corer Sampler and a hollow stem auger (alternate method). The purpose of this sampling is to obtain an undisturbed and representative samples to provide reliable and defendable data for the Remedial Investigation/Feasibility Study (RI/FS) for cost effective and safe remedial actions.

This Site Specific Health and Safety Plan (HSP) applies specifically to the IT/ASI resampling effort. Copies of this plan with applicable procedures attached will be distributed to each member of the sampling team and will be reviewed in pre-sampling training sessions.

1.1 Policy

All reasonable precautions will be taken by IT and it's subcontractors to ensure Health and Safety of workers and the general public in a cost-effective manner. IT and its subcontractors will comply with all federal, state, local, and DOE Health and Safety Regulations and Requirements. Evidence of compliance will be provided by the monitoring records generated from this program.

All personnel that participate in the resampling effort and will work at the K-65 area are required to read, understand and comply with the provisions of this HSP and area required to sign the consent form presented in Figure 1-1.

1.2 Site Arrangement/Route to WMCO Infirmary

Figure 1-2 details the site arrangement of support trailers and anticipated exclusion areas. Figure 1-3 designates the route to be taken to the WMCO Infirmary in the event of a medical emergency.

[redacted]

Figure 1-1
Health and Safety Plan Consent Form

This Site-Specific Safety Plan was produced for the use of IT employees and IT subcontractors. It was intended for the Feed Materials Production Center, Fernald, Ohio and for:

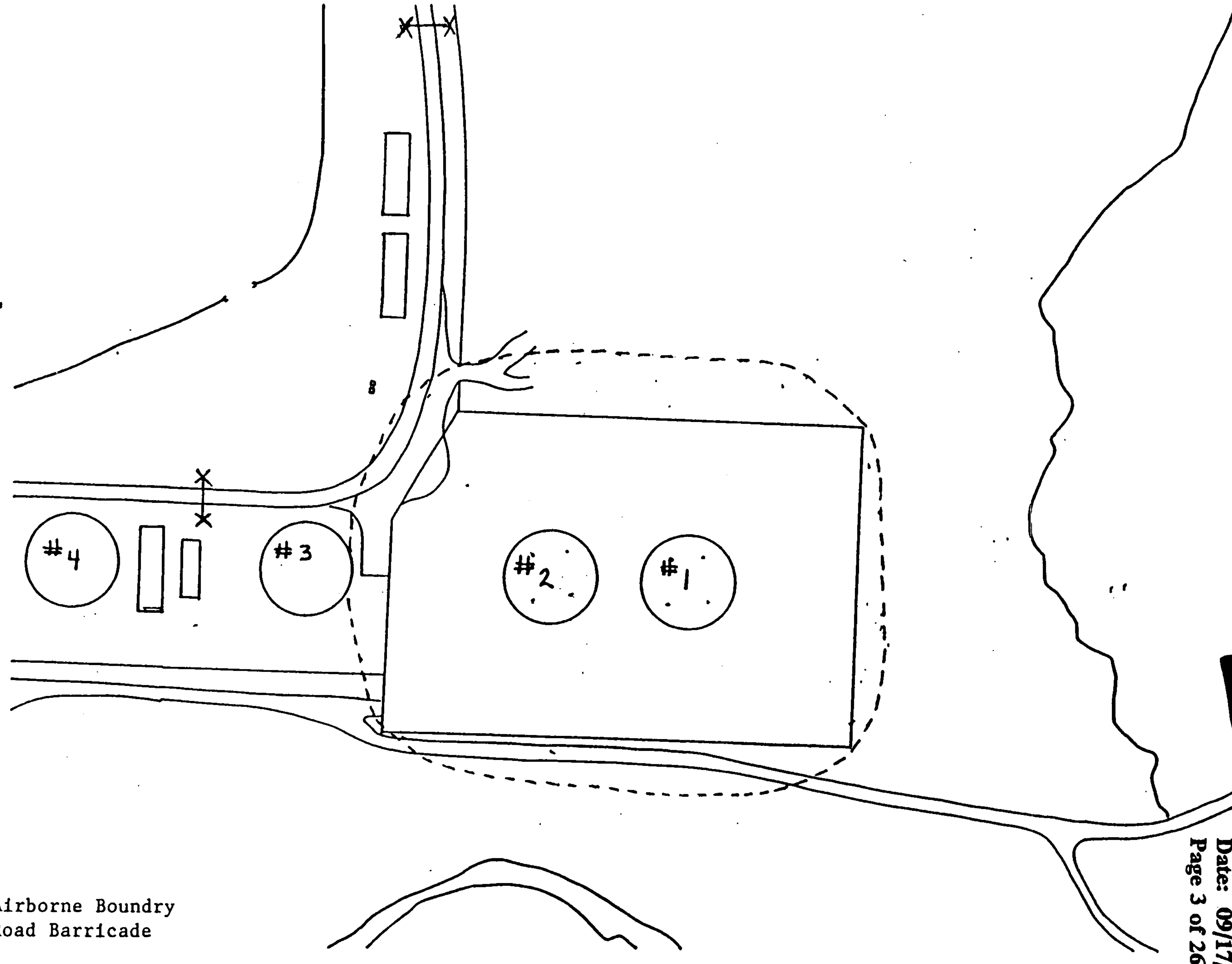
K-65 Silo Resampling using a Vibra Corer Sampler (primary method) or using the alternate method.

The undersigned persons have read and understood the attached Site-Specific Safety Plan and agree to follow its provisions* 1:

Name (lettered)	Signature	Date

*1 Compliance with the provisions of this HSP may be audited through announced or unannounced site visits. Be sure that you are implementing the provisions of the safety plan and documenting the reasons of the Safety Plan and documenting the reasons for [redacted] field actions/changes when they area necessary.

2431



--------- = Airborne Boundry
X-------X = Road Barricade

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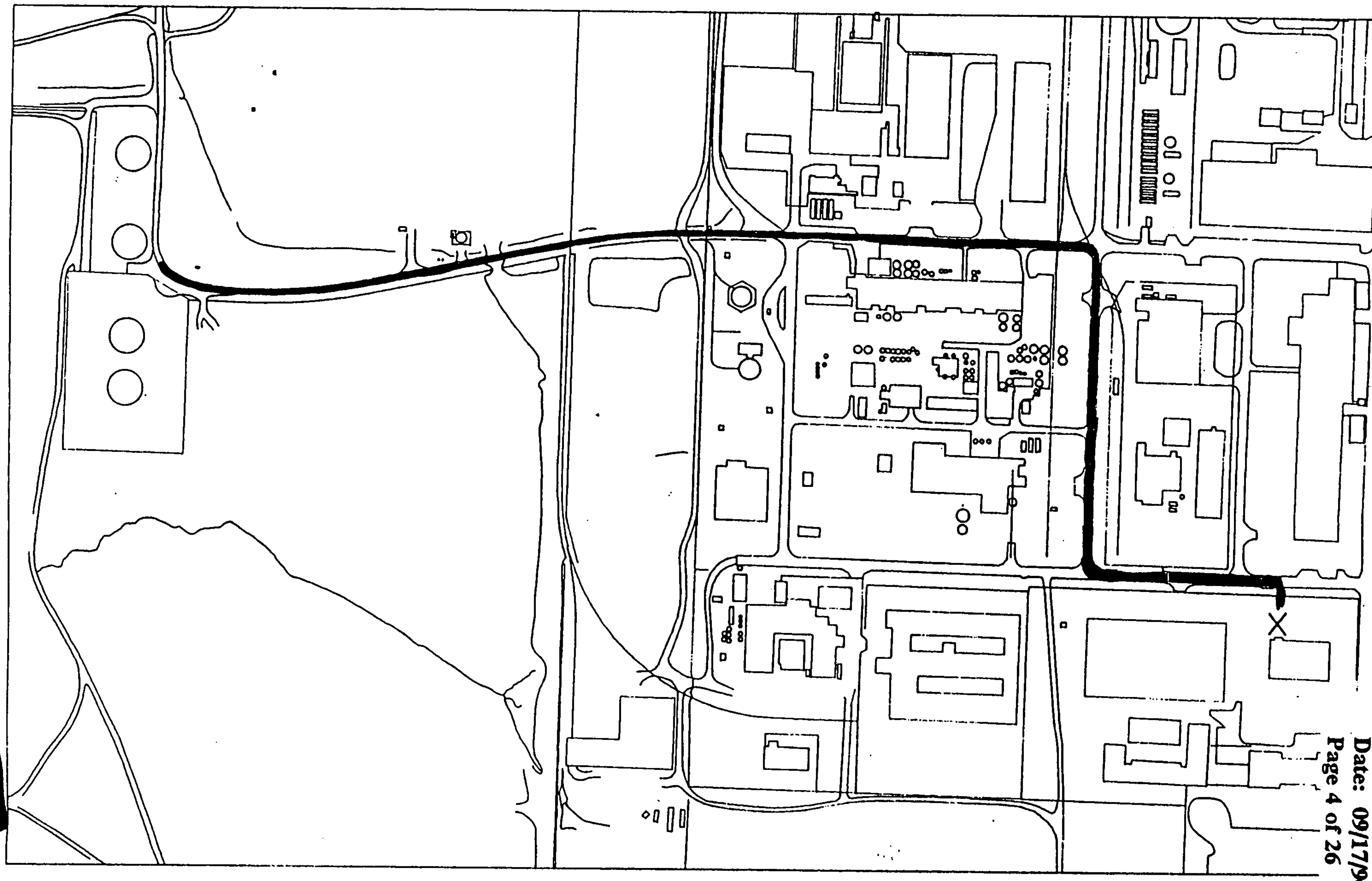
FIGURE 1-3



ROUTE TO WMCO INFIRMARY

2431

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2.0 SITE HISTORY

The silos to be sampled are located west of the Production Area within the Plant Security Fence. The two reinforced concrete K-65 Silos were constructed in 1951 and 1952. The silos are cylindrical, 36 feet high (26 feet and 8 inches at the dome well) and 80 feet in diameter and are covered with a concrete dome.

The K-65 Silos (Silos 1 and 2) are used for the storage of radium-bearing residues formed as by-products of uranium ore processing. The K-65 Silos received the waste residues primarily between 1952 and 1958. The sources include slurry from the FMPC; 25,000 drums from a plant in St. Louis, Missouri; and 6000 drums from Niagara Falls, New York. The K-65 Silos also received a small quantity of soil excavated from a drum-handling area previously located to the east of and adjacent to, Silo 3.

The FMPC slurry was reported to contain an average concentration of radium of 311 mg per ton; the St. Louis drums, an average radium concentration of 500 mg per ton; and the New York drums, an average radium concentration of 624 mg per ton. Based on these values, it is estimated that the K-65 Silos may contain as much as a combined total of 4.6 kg, or approximately 4600 Ci, of radium. This value differs from previous estimates of between 1.6 and 1.7 kg of radium in the silos.[1] The silos are also estimated to contain 11,200 kg of uranium. Radon flux measurements made in 1984 at various locations on the dome exterior ranged from 13 pCi/M^2/sec to greater than 3 X 10^7 pCi/m^2/sec.

Table 2-1 provides analytical results from three previous sampling efforts of the refined slurry.

Approximately 40 percent of the waste is composed of silicates. Other constituents comprising 1 percent or more of the waste include calcium, iron, magnesium and lead. No data are available regarding organic constituents.

The materials in the K-65 Silos have continuously generated radon gas. The gas accumulates under the silo dome, where it decays or escapes to the environment. The silos exchange gas with the surrounding atmosphere by diffusion through the concrete and release through existing cracks in the concrete. Gamma exposure rates were measured near the storage silos in 1986 and 1987 by Weston and WMCO, respectively. The results show a radiation field from Silos 1 and 2. More detail on the strength of the field can be found in the Addendum No. 2 to the Remedial Investigation/Feasibility Study (RI/FS) Health and Safety Plan (Revision 3), dated June 6, 1988.

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[1]"Feasibility Investigation for Control of Radon Emission from the K-65 Silos," WMCO, July 10, 1987, Section 2.2.2.

2431

TABLE 2-1

Characteristics of K-65 Residues

Radionuclides	Silo 1 pCi/g	Silo 2 pCi/g	Average pCi/g
Am-241	0	2	0.9
Th-228	425	568	496.5
Th-230	29700	28000	28850.0
Th-232	436	614	525.0
Ra-226	145000	74400	109700.0
Ra-228	1570	715	1142.5
Pb-210	83800	167000	125400.0
U-234	676	885	780.5
U-235/236	46	52	49.1
U-238	636	784	710.0
U-Total (ppm)	1910	2350	2130.0

Inorganics	ppm	ppm	ppm
Aluminum	811.1	1229.2	1020.1
Antimony	0.0	2.3	1.1
Arsenic	49.9	427.5	238.7
Barium	4031.4	3866.5	3949.0
Beryllium	1.6	2.5	2.1
Cadmium	3.6	6.8	5.2
Calcium	4112.9	61301.7	32707.3
Chromium	61.6	38.3	49.9
Cobalt	767.9	820.2	794.0
Copper	266.3	457.2	361.7
Iron	21538.6	16990.0	19264.3
Lead	59742.9	18792.2	39267.5
Magnesium	3130.0	4688.3	3909.2
Manganese	105.2	204.2	154.7
Mercury	0.8	1.0	0.9
Nickel	1380.6	974.4	1177.5
Potassium	319.6	185.8	252.7
Selenium	156.7	87.8	122.3
Silver	11.0	10.2	10.6
Sodium	5361.4	1625.5	3493.5
Thallium	0.2	0.6	0.4
Vanadium	126.3	155.5	140.9
Zinc	53.8	53.2	53.5
Cyanide	1.9	1.8	1.8

000445

[redacted]

Note: Data from 1989 WMCO Sampling - Data currently being validated

As early as 1956, external deterioration of the K-65 Silos was observed. By 1963, large areas of concrete spalling occurred, exposing reinforcing wires which corroded and cracked. In 1964, an asphaltic sealant was applied to the external walls, and an earthen embankment was constructed around the silos to counterbalance the internal load and to reduce direct radiation from the residues in the silos. A structural evaluation of the silos (Camargo, 1985) concluded that the base slabs and walls are structurally stable under existing static loads and have a life expectancy of 5 to 10 years. The centermost 20- foot diameter portion of the dome was determined to be structurally unsound for any load greater than the existing static dead load, and there is no assigned life expectancy. Severe dome cracks have a high probability of eventually occurring due to weathering processes and may lead to partial dome collapse.

Several interim stabilization projects have recently been implemented on Silos 1 and 2. A radon removal system has been installed to reduce radon gas levels in the dome during recent and future remediation activities. The center dome portion has been covered with a 30-foot diameter plywood cap to provide secondary containment in the event of collapse of this section. The exterior dome surfaces have also been coated with rigid foam to provide weather protection and insulation.

3.0 Task Specific Hazard Assessment

The following hazard assessment is based on historical information. The field team routinely reassesses the hazards before starting work to insure that conditions have not changed. All newly identified hazards will be addressed with the IT Health and Safety Department to determine the degree of hazard and if any changes to the Safety Plan are needed. No hazardous concentrations of organic chemicals are expected. Monitoring for exposures to chemicals, such as lead and silicates, will not be necessary because of the very low expected exposures. The on-site Health and Safety Officer will determine if chemical monitoring is necessary once operations begin.

3.1 Physical Hazards

- Radiological Hazards
  - External
  - Internal
- Work on Silo Domes
- Heat Stress
- Crane Operations
- Noise

3.2 Chemical/Radiological Hazards

Contaminant	DAC[4]	Action Limit	Action
Radium-226	$3E^{-10}$ uCi/ml	$7.5E^{-11}$ uCi/ml	APR[1]
Thorium-230	$3E^{-12}$ uCi/ml	$7.5E^{-13}$ uCi/ml	APR[1]
Uranium-235/238	$2E^{-11}$ uCi/ml	$5.0E^{-12}$ uCi/ml	APR[1]

Contaminant	Action Limit	Action
Radon-222	0-0.075 WL	None
	0.075 - 16.5 WL	APR[1]
	16.5 - 660 WL	SAR[2]
	> 660 WL	SCBA[3]

Contaminant	PEL[5]
Lead	50 g/m^3
Silicates	100 g/m^3 (respirable dust)

1) APR - Air Purifying Respirator
2) SAR - Supplied Air Respirator
3) SCBA - Self-Contained Breathing Apparatus
4) DAC - Derived Air Concentration
5) PEL - Permissable Exposure Level

* NOTE: For long-lived alpha activity where the radionuclides are unknown, the Action Limits specified for Thorium-230 shall be used.

3.3 Routes of Entry

All of the identified work site contaminants are gaseous or particulate in nature. The primary routes of entry are inhalation and ingestion. Direct contact may result in exposure if compounds are water soluble, therefore residue will be handled as if soluble compounds are present.

3.4 Will Site Activities:

Disturb Surface Soil? Yes
Disturb Subsurface Soil? No
Use Heavy Equipment? Yes
Enter Confined Space? No
Disturb Containerized Matter? Yes
Sample Surface Water? No
Sample Lagoons? No
Use Boat? No
Involve Radioactivity? Yes
Involve Trenches? No

3.5 Physical Hazards

All crane operations shall be in accordance with OSHA regulations contained in 29 CFR part 1926.

In accordance with the recent (April 1990) structural analysis performed by Bechtel National, Inc., no more than three (3) individuals or a combined equipment and personnel load of seven hundred (700) pounds will be allowed on silo domes. Safety nets will be installed as per DWP-007, K-65 Silo Safety Net Application, as an added safety precaution to minimize personnel breakthrough on the silo domes.

4.0 Monitoring

4.1 Goals

Air monitoring will be performed to insure that contaminant concentrations in the breathing zone do not exceed the concentrations specified by established exposure levels. The air monitoring program will consist of radon and radon progeny monitoring and monitoring for long-lived particulates, such as Radium-226 and Thorium-230.

IT policy requires engineering controls or the use of Personnel Protective Equipment (PPE) to limit on-site exposures to the action limits values. It is advisable to keep exposures to chemicals as low as possible since there is insufficient data to predict the combined effects of most chemical mixtures.

4.2 Monitoring Equipment and Frequency of Monitoring
Airborne Radioactive Contaminant Monitoring
(Internal Radiation Hazard)

Several methods will be employed to monitor for airborne contaminants for this project. A description of these methods and the instrumentation required is given below.

4.2.1 Radon Monitors

Continuous radon gas monitoring will be provided by WMCO at the K-65 fenceline using alpha scintillation devices known as RGM-2 and/or similar devices to be specified by WMCO. Hourly while manway covers are removed, the RGM-2 readings are checked and recorded per DWP-005 - Radon Monitoring and Sampling Checklist for K-65 Silos. Action limits for the RGM-2 and Actions to be taken are delineated in DWP-005, Section 4.2.

4.2.2 Working Level Grab Sampling (Radon Progeny)

Working Level Grab Samples will be collected utilizing a portable, battery powered air pump (BZA) with a 37 mm membrane filter with an 8 mm pore size. At a minimum, grab samples will be taken before start of work, upon removal of manway covers, hourly when covers are removed, at 2 hours after manways are covered, and hourly during sample core handling in the sample trailer. Samples shall be drawn in the vicinity of the manways and downwind from the manway or in the work area during sample core handling. Samples should be taken in the worker's breathing zone to draw samples representative of the air to which the worker is exposed. Grab samples will be taken and calculated per WMCO Radon Air Sampling Procedure.

4.2.3 Long-Lived Airborne Radioactivity Sampling

As determined by the Health Physics Department, samples will be drawn to determine the amount of long-lived airborne radioactivity to which workers are exposed. This may be performed by recounting the grab samples discussed in 4.2.2 above or by obtaining a high-volume air sample.

Samples are to be recounted 5 days after they are drawn. High-volume samples and grab sample long-lived counts will be in accordance with WMCO procedure SP-P-35-026-Occupational Air Sampling.

4.2.4 Continuous Air Monitors (CAMs)

Eberline Alpha-6 continuous air monitors calibrated for Radon-222 progeny will be used as required to support sampling operations. The Alpha-6 will specifically be used to monitor the ventilation system exhaust from the sampling trailer. Alpha-6 CAMs will be operated in accordance with the Eberline Alpha-6 CAM Technical Manual.

4.3 External Radiation Hazard Monitoring

4.3.1 Radiation Surveys

External radiation hazards are identified by Health Physics Personnel as they perform the survey required for the Radiation Work Permit. A Health Physics Technician will monitor exposures in all areas which exceed the 2 mR/hr action limit. Measures such as increasing shielding, increasing distance or reducing exposure time will be taken to minimize exposures in keeping with good ALARA (As Low As Reasonably Achievable) practices. Radiation areas and high radiation areas will be posted and controlled in accordance with DOE Order 5480.11. Additional requirements for radiation surveys during sampling operations are described in DWP-005, Radon Monitoring and Sampling Checklist for K-65 Silos. Radiation surveys shall also be performed during operations in which radiation levels could vary significantly (i.e. Vibra Corer Removal, Sample Core Handling, Radon Reduction System Operation).

4.3.2 Personnel Dosimetry

All personnel involved in the sampling operations are required to wear personnel dosimetry when at the work site. Personnel will be issued Self-Reading Pocket Dosimeters (SRPDs) and Thermoluminescent Dosimeters (TLDs). Personnel exposure will be controlled by SRPD readings so as not to exceed 300 mR/wk. SRPD readings shall be recorded daily at a minimum and more frequently as operating procedures dictate. TLDs shall be read on a monthly basis or more frequently as SRPD readings dictate (80% of weekly exposure limit). Personnel who will handle sample material shall wear Finger Ring TLDs supplied by WMCO. Personnel are limited to whole body exposures of 5.0 Rem/year (DOE) and 3.0 Rem/year (site).

4.4 Surface Contamination

As described in Section 5.0, IT personnel will wear protective clothing as dictated by site procedures and radiation work permits for Contamination Areas. Supplemental, disposable outer-clothing will be donned upon entrance to and removed upon exit from Contamination Areas to prevent spread of contamination.

Contamination exposure to workers inside Contamination Areas will be controlled through several measures, as follows:

- Frequent area contamination monitoring.
- Use of respiratory protection and protective clothing.

[redacted]

- Administratively limiting removable contamination levels, as follows:

  -Removable surface contamination will be limited to the following:

  Breakroom and Office Trailers (surveyed daily)

  100 dpm/100 cm^2 beta-gamma
  20 dpm/100 cm^2 alpha

  Once the levels are reached, the area will be decontaminated.

  Work Areas

  500 cpm alpha > background - Use Air Purifying Respirator
  5000 cpm beta-gamma>background - Use Air Purifying Respirator

4.5 <u>Containment</u>

Physical containment of radioactive material will be maintained in two levels (primary and secondary) whenever practicable. Primary containment will consist of existing storage vessels, Vibra-Corer, Sample Trailer and drums/boxes. Secondary containments will be temporary enclosures constructed around the primary containments. In most cases, secondary containments will allow Operators access to work areas. These areas will be ventilated when possible with a draft fan/filtration system to carry away and trap fugitive radionuclides.

Secondary containments consist of temporary room enclosures, glovebags, and sleeving which will allow operators entry and access to the radioactive materials. The boundaries formed on erection of these containments will serve two functions -- physically, as negative pressure enclosures when ventilated, and administratively, as Contamination Areas.

Tent-type airlocks will be erected on the sampling trailer to control contamination during trailer entry/exit. Several secondary containments will be installed for sampling operations. Tent containments will be field constructed using a steel frame and vinyl sheeting construction. Glove bags will be erected on the silo manways to provide containment during Vibra Corer Sampling. The Vibra Corer itself, will be sleeved in plastic during sampling operations.

Contamination Areas will be limited in size to maximize ventilation effectiveness and minimize efforts to control and eventually decommission contaminated areas. All entrances and exits are designed to minimize transient or casual exposure. All areas entrances and exits will be posted with the appropriate warning information and if needed, roped off.

5.0 Personal Protective Equipment

All employees in the sampling operation will wear the following personal protective equipment:

ITEM	PPE NEED	JUSTIFICATION
APR	Y	Required if action levels are exceeded
Supplied Air Respirator	Y	Required if action levels are exceeded or for work on dome with manway cover removed
Cartridges - Combination OV, AG, HEPA	Y	
Hearing Protection	Y	Required if action levels are exceeded (85 db)
Hard Hat	Y	Minimum Requirement
Plastic Booties	Y	
Totes	O	Optional
Gloves	Y	
Inner Gloves	Y	
Leather-Palm Gloves	Y	For handling sharp edges

[redacted]

ITEM	PPE NEED	JUSTIFICATION
Nitrile Gloves or equivalent	Y	For use in glovebag or when exposed to high radon levels
Plain Tyvek	Y	For work not involving radon exposure
Saranex Tyvek (sealed seams)	Y	For work on silo dome
Process Coverall	Y	
Safety Glasses	Y	Minimum Requirement
Safety Goggles	N	Optional
Safety Shoes	Y	Minimum Requirement

6.0 Site Access

6.1 Site Control

A Site Control Program has been developed to control worker exposure to radioactive and hazardous materials and to prevent the spread of contamination. The FMPC Site Access is controlled by WMCO Security. Access to the K-65 Silo Area is also controlled by WMCO Security. Site maps posted at various locations identify the various areas of contamination encountered at the FMPC.

The K-65 Sampling Work Site will have access restricted during operations via road blocks and boundary ribbon. Only properly authorized and trained personnel will be allowed access. One access/egress control point area will be established for the sampling area. Personnel will be required to read and sign the Radiation Work Permit (RWP) Figure 6-1, wear the proper dosimetry (TLD and SRPD), and proper protective clothing.

6.2 Bioassay Program

A bioassay program will be implemented to monitor employees for internal radiation exposure, to provide guidance to the Health and Safety Staff on internal exposure control, and to determine the amount and distribution of internally deposited radioactive material should an intake occur as a result of project operations.

RADIATION WORK PERMIT

CORPORATION

RWP NUMBER

QUESTED BY | DATE

TASK DESCRIPTION:

MANHOURS IN AREA ________ NUMBER OF WORKERS ________

SURVEY FREQUENCY	HEALTH PHYSICS REQUIREMENTS COMPLETED BY
REMARKS:	GENERAL AREA DOSE RATE mR/hr — DATE/ TIME OF SURVEY
	JOB SPECIFIC DOSE RATE — DATE/ TIME OF SURVEY
	CONTAMINATION LEVEL dpm/100cm^2
	AIRBORNE ACTIVITY (uCi/ml or WL)

ANTI-C's	RESPIRATORY PROTECTION	MONITORING
☐ HOOD	☐ FULL FACE ☐ BUBBLE SUIT	☐ TLD
☐ BUBBLE SUIT	☐ ORGANIC VAPOR CARTRIDGE	☐ EXTREMITY TLD
☐ COVERALLS	☐ PARTICULATE CARTRIDGE	☐ TLD and SRPD
☐ PLASTIC SLIP ONS	☐ SUPPLIED AIR	
	☐ SCBA	☐ ________
☐ RUBBER BOOTS	**MISC**	**SPECIAL**
☐ COTTON GLOVES	☐ SAFETY GLASSES	☐ ________
☐ RUBBER GLOVES	☐ FACE SHIELD	☐ ________
☐ LAB COAT	☐ SAFETY SHOES	☐ ________
☐ PLASTIC SUIT	☐ HARD HATS	☐ ________

PROTECTION REQUIREMENTS, SPECIAL INSTRUCTIONS ________

ADDITIONAL INSTRUCTIONS AND REQUIREMENTS: (SHIELD, DECONTAMINATION, HEPA FILTERS, ETC...) ________

000454 [redacted]

HP TECHNICIAN ________ DATE ________ TERMINATION DATE ________

HP SUPERVISOR ________ DATE ________

FIGURE 6-1

All individuals who work with radioactive materials as part of this project or who frequent any project area where there is a significant probability of intake will participate in the bioassay program.

The bioassay program for this project will be composed of three standard bioassay methods: Analysis of air monitoring data, in-vivo gamma spectrometry (whole body/lung counting), and urinalysis.

Air samples for radioactive materials will be taken as required by approved procedures. 24-Hour urine samples shall be obtained prior to start of sampling activities for a baseline and at project completion. Whole body counts shall be performed after the initial entry into the silos to determine if respiratory protection is adequate.

6.3 Medical Monitoring

In accordance with 29 CFR 1910.120 OSHA requirements, all IT and subcontractor field personnel are required to participate in a medical monitoring program which includes:

- A Baseline Medical Examination
- Annual Medical Examination
- Medical Examinations may be required after potential exposures
- Respirator Physical

6.4 Training Requirements

All IT and subcontractor personnel assigned to site tasks will be trained in accordance with the K-65 Silo Sampling Training Plan and will meet OSHA and Site-Specific Training requirements including:

- 40 Hour OSHA Training
- 8 Hour Annual Refresher Training
- 8 Hour Supervisory Training (Supervisors)
- 24 Hour Supervised Field Experience
- Review of Site-Specific Hazards and Procedures (Tailgate Safety Meetings)
- WMCO Radiation Safety Training
- Respirator Training and Fit Test
- K-65 Silo Sampling Project Detailed Work Procedures
- K-65 Silo Sampling Project, Mock-up Training

7.0 Exposure Symptoms

Exposure to low levels of radioactivity do not produce acute exposure symptoms. Such exposures may cause delayed effects such as cancer. Since any radiation exposure may involve some degree of risk, exposures are to be kept As Low As Reasonable Achievable, (ALARA).

8.0 Site Entry Procedures

___ The site crew will radio CONTROL daily to establish radio contact, location, start time and stop time.

___ Procure Radiation Work permit, for daily operations.
- Identifies degree of radiological hazard
- Limits allowable work time.
- Specifies minimum PPE requirements

___ All equipment is required to undergo a safety inspection by WMCO Fire and Safety Personnel upon initial entry to the FMPC.

___ Perform tailgate meeting to familiarize team with site specific hazards. Identify contamination zones and break area. Discuss alternate communications signals (if applicable).

___ Rezero and issue SRPD's

___ Calibrate instruments and log calibrations.

___ Visually scan the site for signs of contamination.

___ Perform respirator check out and fit test prior to use.

___ Enter potentially contaminated areas with monitoring.

___ Monitor for radiation using radiation meters for alpha and beta/gamma.

___ Use buddy system.

Teams of at least two individuals will be used for all activities within a Contamination Control Area. Team members will monitor each other for signs of heat stress or other distress and will render aid, if required.

NOTE: The IT Site Safety Officer and any member of the Field Team have the authority to stop work when imminent or serious safety hazards or conditions exist. Restart of work will be allowed only after the hazard or condition has been abated or reduced to a level deemed acceptable by the SSO (or his designated representative) and Project Manager.

[redacted]

9.0 Emergency Contact List

Fire	- 738-6511 or RADIO CONTROL
Ambulance	- 738-6511 or RADIO CONTROL
Hospital	- 738-6511 or RADIO CONTROL
WMCO Industrial Hygiene	- 738-6207 or Radio 357
WMCO Radiation Safety	- 738-6889 or Radio 355
WMCO Fire & Safety	- 738-6235 or Radio 303
Utility Engineer (AEDO)	- Radio 202
Department of Energy	- 738-6009

Project Contacts

IT Project Manager - Dick Boyd (W) 1-646-5068 (H) 851-3627
Beeper - (800) SKY PAGE - PIN # 2673610

IT Health & Safety - Alan Duff (W) 1-646-5068 (H) 851-3627
Beeper - (800) SKY PAGE - PIN # 2673609

IT Ops. Supervisor - Doug Moore (W) 1-646-5068 (H) 742-3401
Beeper 736-4972

WMCO Health Physics Supervisor - Steve Ferguson (W) 738-8906
Beeper 844-7147

10.0 Site Exiting Procedure

10.1 Contamination Detection

All site personnel are required to decontaminate themselves and then confirm the effectiveness of the decontamination. The effectiveness will be determined by frisking with a hand-held radiation monitor. A Radiation Safety Technician (RST) shall monitor any visitors to the site.

Personnel monitoring will be performed using portable survey instruments equipped with either a GM Detector (Beta/Gamma) or a Zinc Sulfide Scintillation Detector (Alpha). For beta/gamma monitoring, the detector will be held within 1/2 inch of the surface being frisked and surveyed at a rate of 2 to 3 inches per second. Background levels while frisking for beta/gamma contamination must be less than 300 counts per minute (cpm). In cases where background exceeds 300 cpm, monitoring will be performed using alpha scintillation detectors. For alpha contamination monitoring, the detector should be held as close as possible to the surface being frisked (not in contact) and surveyed at a rate of 1 to 2 inches per second. All personnel will perform a whole body frisk upon exit from a contamination area.

In the event that contamination can not be removed to below the action level (100 cpm beta/gamma or detectable alpha above background), contact Health Physics personnel. Health Physics should be notified of any contamination incidents.

Vehicles and other equipment use on-site must be monitored for contamination (and decontaminated if necessary) before moving them to non-contaminated areas. Health Physics Personnel will determine when the equipment is safe to move to clean areas.

10.2 Decontamination

Decontamination reduces contaminant concentrations to acceptable levels, but does not generally remove it totally. Try to avoid contamination where possible by making minimum contact with the contaminant.

Personnel: Remove disposable protective equipment, wash hands, face and any other exposed skin. Detergent and water should be used to gently scrub skin surfaces which have contacted potentially contaminated wastes. The effectiveness of decontamination must be confirmed by frisking or the use of hand and foot monitors.

Heavy Equipment: Heavy equipment generally requires decontamination at the WMCO Decontamination Pad. Frisking and/or wipe tests will be performed to confirm the effectiveness of decontamination.

11.0 Sampling Derived Wastes

Sampling derived wastes are wastes generated in the performance of on-site activities and will be handled in accordance with WMCO Procedure SOP 65-C-106. These wastes include, but are not limited to:

- o Disposable PPE such as Tyvek Coveralls, Gloves, and Booties
- o Excess sample materials
- o Used Glovebags and decontamination materials

All potentially contaminated waste materials resulting from site activities will be collected and placed in drums or other containers specified by WMCO. Protective clothing will be placed in plastic bags and disposed of as compactable, potentially contaminated waste through WMCO. Wastes will be segregated as much as practicable to aid in disposal.

Sampling derived wastes are the property of the client and are to be left on-site.

12.0 Confined Space Entry

No Confined Space Entry is permitted. Explosion-proof lighting shall be utilized inside the K-65 silos and/or explosive gas testing will be performed.

13.0 Personal Protective Equipment

This discussion of personal protective Equipment is generic in nature. Specific site requirements are presented in Section 5.0.

13.1 Level-B

Hardhat (optional)
Face Shield (optional)
Self-Contained Breathing Apparatus (Airline or bottled air) Disposable Coveralls: Saranex, Tyvek or equivalent
Inner Gloves: Latex or PVC
Outer Gloves: (Chemical resistant): Nitrile, Butyl, etc.
Chemical Resistant Boots
Latex Booties (optional)
Level-B PPE is to be worn in any of the following environments:

- o Atmospheres containing chemicals having poor warning properties
- o Unknown atmospheres
- o Air concentrations exceeding 3X exposure standard
- o Contaminants do not pose significant threat of exposure through skin absorption

13.2 Level-C

Hardhat (optional)
Face Shield (optional)
Air Purifying Respirator Cartridges (Organic Vapors, Acid Gas, Pesticides, Radionuclides, Particulates)
5-Minute Escape Apparatus (optional)
Disposable Coveralls: Saranex, Tyvek or equivalent
Inner Gloves: Latex or PVC
Outer Chemical Resistant: Nitrile, Butyl, etc.
Chemical Resistant Boots
Outer Disposable Booties: Latex
Level-C is intended to be used where:

- o Contaminants have good warning properties
- o Cartridges are approved for use with the contaminant
- o Oxygen concentrations are between 19.5 and 25%
- o Toxic contaminant concentrations are not IDLH
- o Concentrations are known and continuously monitored
- o Contaminant concentrations do not exceed 3X exposure

Cartridges will be changed:

- o Daily
- o If color indicator shows that the cartridge is spent
- o If breakthrough is detected

13.3 Level-D

Hardhat (optional)
Eye Protection: Safety Glasses or Goggles
Coveralls
Work Boots
Work Gloves

Level D PPE is basically a work uniform and provides no protection against chemicals. Level D is intended for sites where there is no risk from contaminants which can enter the breathing zone. Since most nonvolatile chemicals can adhere to particulates and be suspended in the air, Level D is generally not permitted on contaminated sites. Level D can be used to work in areas where there is not risk of contamination. Level D is not street clothes.

14.0 Calibration of Monitoring Equipment

It is the designated Site Safety Officer's duty to ensure site monitoring equipment is properly calibrated and functioning normally. An on-site instrument log will be maintained by Health Physics Personnel and contain the following information:

- Certificate of Calibration or NBS Traceable Standard (semi-annual)
- Record of daily efficiency/function check using a check source for radiation meters

15.0 Heat Stress

Heating of the body occurs from three sources:

1. Radiant heating from heat sources or sunlight
2. Convective heating from contact with a warmer object or liquid
3. Metabolic heating caused by activity

Cooling occurs through three mechanisms:

1. Respiration: The air we exhale is warm. As the body overheats, the respirations become more rapid.

2. Radiation: Heat is released at the surface of the skin. As the body overheats, the surficial blood vessels dilate and allows more heat to be lost

3. Evaporation: Perspiration is released to the skin surface and evaporates. The skin is cooled by evaporative cooling

Personal Protective Equipment reduces the body's ability to shed excess heat through radiation and evaporation. Personal Protective Equipment can also act like a greenhouse and collect radiant heat.

This means that heat stress can be a serious problem to hazardous waste site workers. The following discussion is intended to familiarize personnel with the symptoms of heat stress.

Heat stress is a progressive condition. Its mildest form is a slight elevation of body temperature. Normal body temperature is generally near 98.6° F. Working in high temperatures may elevate the temperature to 100°-101°F. By the time that the body temperature reaches 101°F, the worker generally has a headache. This is not a serious condition and can be treated through increased rest periods and cool fluid intake. The worker should not be allowed to work until the body temperature has been reduced to below 99°F.

If work continues when the first symptoms occur, the person may develop Heat Cramps. Heat Cramps are brought about by long exposure to heat. The outside temperature does not have to be much higher than the "normal" environment. The person perspires heavily, often drinking large quantities of water. As the sweating continues, salts are lost by the body bringing about painful muscle cramps.

Treatment: Any heat related emergency will be immediately reported to the WMCO medical department for subsequent treatment. The worker should be given rest, cool fluids, and removed from work for at least the remainder of the day. The person is likely to have an increased susceptibility to heat for the next few days.

<u>Heat Exhaustion</u>

Heat Exhaustion symptoms include a near normal body temperature and profuse sweating. The temperature may reach 103°F.

<u>Treatment of Heat Exhaustion</u>

Remove the person from field work. Have the person rest in a cool area such as an air conditioned car or shaded area. Provide cool liquids to drink. Avoid beverages which contain caffeine or alcohol. Do not allow the victim to go back to work for at least one or two days.

<u>Heat Stroke</u>

Heat Stroke is a life threatening condition. The person's body temperature regulating mechanism fail and his body cannot rid itself of excess heat. heat stroke symptoms include high body temperatures and HOT DRY SKIN. Most cases of heat stroke are reported on hot humid days.

HEAT STROKE VICTIMS MUST BE TRANSPORTED TO A HOSPITAL FOR IMMEDIATE TREATMENT. The individual must not be allowed to drive himself, since cases are on record where the victims condition worsens, he lapses into unconsciousness and dies. Heat stroke victims are not to return to field work without the physician's consent.

[redacted]

Prevention of Heat Stress

Become acclimatized to heat for several days whenever possible. Work in the cooler portions of the day. Early morning hours and evening hours are cooler.

Take frequent breaks and consume at least one pint of cool fluid every hour. Replenish electrolytes through the consumption of diluted drinks. The body loses more water than electrolytes. Concentrated salt, electrolyte, or juices can make you more suspectable to heat stress.

Monitoring:

Heat Stress Monitoring should be performed whenever temperatures exceed 80°F and respiratory protection is required.

Body Temp.: less than 99°:	Continue Work
Body Temp.: > 99°-100.3°F	Reduce rate of work or take more frequent breaks. Consume more cool fluids.
Body Temp.: > 100.4°F	Remove from work until temperature reduced to 99°F or less.
Pulse Rate: > 110 bpm	Remove from work until pulse rate falls below 110 beats per minute.

If the body temperature exceeds 100.4° or the pulse rate exceeds 110 bpm at rest the person must not continue to work. These conditions have been found to prevent most heat related illnesses. Occasionally, high heat conditions combine with poor eating, sleeping and drinking habits has resulted in heat stroke occurring in less than 20 minutes.

Table 15-1 lists signs and symptoms of heat stress.

Table 15-1
Signs and Symptoms of Heat Stress

- **Heat Rash** may result from continuous exposure to heat or humid air.

- **Heat Cramps** are caused by heavy sweating with inadequate electrolyte replacement.

  Signs and symptoms include:
  - muscle spasms
  - pain in the hands, feet and abdomen

- **Heat Exhaustion** occurs from increased stress on various body organs including inadequate block circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

  - pale, cool, moist skin
  - heavy sweating
  - dizziness
  - nausea
  - fainting

- **Heat Stroke** is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include:

  - red, hot, usually dry skin
  - lack of/or reduced perspiration
  - dizziness and confusion
  - strong, rapid pulse
  - coma

16.0 Area Emergencies/Contingency Plan

All area emergencies involving the sampling evolutions will be handled in accordance with WMCO procedure SOP-65-C-201.

17.0 Chemical/Radiological Releases and Spill Containment

The proposed operations pose a possibility for spilling or releasing hazardous materials. Potentially spillable materials include gasoline and diesel fuel. There is also a possibility that the core itself may release radioactive materials. If a minor spill of diesel fuel of gasoline (<1 gal) occurs, personnel will take steps to control or clean the release such as shoveling contaminated soil into a drum. If a large release in the form of a spill greater than one gallon, or vapor cloud is observed, involved personnel will immediately withdraw at least 300 feet upwind and notify WMCO emergency services.

Radio to "CONTROL" - Control will dispatch the necessary personnel to handle the situation.

If possible, the following information should be included in the notification:

- Cause of release if known
- Location of release
- Time of release
- Chemical identify
- Quantity involved
- If there is radioactive involvement
- If materials are leaving the area as a vapor/gas
- If there is fire involvement
- The number of known exposures or injuries (if any)

Additional information may be requested such as:

- What has been/is being done to minimize the hazard.
- Degree of hazard to responders based on your knowledge of the contaminants.

K-65 SILO SAMPLING TRAINING PLAN

1.0 Purpose

This plan outlines the personnel training required to perform the resampling of the K-65 Silos at the Feed Materials Production Center (FMPC), Fernald, Ohio. The resampling is a joint effort between International Technology Corporation (IT), IT Subcontractor Personnel, Advanced Sciences Incorporated (ASI) and Westinghouse Materials company of Ohio (WMCO). All personnel involved with on-site activities will be trained in accordance with this Training Plan prior to start of the K-65 Silo Sampling Operations. Site-Specific Training shall be conducted by site-staff and technical personnel.

2.0 OSHA Training Requirements

Personnel involved with site operations shall be trained and certified in accordance with 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response. This training will consist of:

- 40-Hour OSHA Training
- 8-Hour Annual Refresher Training
- 8-Hour Supervisory Training (Supervisors)
- 24-Hour Supervised Field Experience

3.0 Site-Specific Training

Personnel involved with site operations shall be trained on site-specific plans, procedures and practices prior to sampling the K-65 Silos. This training will include:

- Site-Specific Health and Safety Plan (to include Hazard Assessment, Personnel Protective Equipment, ALARA Practices, Safe use of Engineering Controls and Equipment, Names of Primary and Alternate Site Health and Safety Personnel).

- WMCO Radiation Safety Training

- K-65 Silo Resampling Detailed Work Procedures

- Respirator Training and Fit Test

- Daily Tailgate Safety Meetings

- Other WMCO Training (Criticality, Emergency Preparedness, Site Orientation, etc.)

4.0 Mock-Up Training

A mock-up training session will take place in accordance with DWP-004, "Mock Silo Sampling". This training will provide for a operational check of sampling equipment, test the Detailed Work Procedures for suitability to work being performed and familiarize personnel with personnel protective equipment and operating procedures. This will reduce the amount of time required for the actual sampling thus assisting in attaining ALARA goals.

5.0 Recordkeeping

Records and certificates of training shall be maintained in the project file and will be made available to the client upon request. All personnel participating in site activities shall have a completed Table 1, Record of Personnel Training, on file prior to the start of the K-65 Silo Resampling.

Table 1
Record of Personnel Training

Name ____________________ Company ____________________

SS # _____-_____-_______

1.0 OSHA Training

Requirements		Completion Date or N/A *
1.1	40-Hour Hazardous Materials Course	________
1.2	8-Hour Annual Refresher Training (If required)	________
1.3	8-Hour Supervisory Training (If required)	________
1.4	24-Hour Supervised Field Experience	________

2.0 Site-Specific Training

Requirements		Completion Date
2.1	WMCO Radiation Safety Training	________
2.2	Detailed Work Procedures	________
2.3	Respirator Training and Fit Test	________
2.4	WMCO Indoctrination (Criticality Safety, Emergency Preparedness, etc.)	________
2.5	Site-Specific Health & Safety Plan	________

3.0 Mock-Up Training

3.1	Mock-Up Training	
3.2	Revised Procedure Training (If required)	________

Reviewed By ______________________________
Safety Supervisor

[redacted]

* N/A - Not Applicable

[redacted]

APPENDIX C

MISCELLANEOUS PROCEDURES

[redacted]

APPENDIX C

1.0 CHAIN-OF-CUSTODY PROCEDURES

1.1 Field Sampling

The following will be used in the chain-of-custody process for sample tracking and field activities:

- Sample identification and labeling
- Sample chain-of-custody form
- Sample collection log; and
- Laboratory request for analysis form

1.1.1 Sample Identification and Labeling

All samples will be adequately marked for identification from the time of collection and packaging through shipping and storage. Marking will generally be made on the sample container (jar, bottle, etc.) but may be applied directly to the sample, or on a tag or label attached to the sample or container, depending on the type of sample and its intended use. Sample identification will include, as appropriate:

- Project name and number
- Sample ID number
- Sample location (silo number, manway location, zone location)
- Sample date and time
- The initials of the individual(s) performing the sampling
- Gross weight, sample weight and tare weight
- Preservatives used

An example of the sample label is illustrated in Figure 1-1. A sample numbering system will be established for the purpose of identifying the samples according to the location and type.

[redacted]

FIGURE 1-1

[redacted]

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K65 RESIDUES ANALYTICAL SAMPLE

COLLECTOR:	______	I.D. NO.:	______
DATE COLLECTED:	______	SILO NO.:	______
TIME COLLECTED:	______	MANWAY:	______
GROSS WEIGHT:	______	ZONE:	______
TARE WEIGHT:	______	SECTION:	______
SAMPLE WEIGHT:	______		

FMPC-T-3052 (9/28/88)

K65 RESIDUES LEXAN TUBE LABEL

COLLECTOR:	______	I.D. NO.:	______
DATE COLLECTED:	______	SILO NO.:	______
TIME COLLECTED:	______	MANWAY:	______
		ZONE:	______
		SECTION:	______

FMPC-T-3054 (9/28/88)

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1.1.2 Chain-of-Custody Record

Documentation of the sample chain-of-custody is provided by the use of a chain-of-custody record that includes the sampling location, the type and amount of samples collected, the date and time of sample collection, the name(s) of the person(s) responsible for sample collection, the date and time of all custody transfers, the signature of the person relinquishing and accepting sample custody, and other pertinent information.

Chain-of-Custody procedures document sample possession from the time of collection to disposal. A sample is considered in custody if it is:

- In one's physical possession
- In view, after being in physical possession
- Locked so that no one can tamper with it, after having been in physical custody; and/or
- In a secured area, restricted to authorized personnel

Chain-of-Custody record will be initiated in the field and will accompany each group of samples during shipment to the laboratory. Each time custody of the sample changes, the new custodian will sign the record and indicate the dates of transfer. An example of the chain-of-custody record is included in Section 1, Figure 3-4.

If the samples are shipped to the laboratory by commercial carrier, the original chain-of-custody from WMCO shall be sealed in a watertight container, placed in the shipping container, and the shipping container sealed prior to giving it to the carrier.

If the samples are directly transported to the laboratory, the original chain-of-custody form shall be kept in possession of the person delivering the samples.

For samples shipped by commercial carrier, the waybill shall serve as an extension of the chain-of-custody record between the final field custodian and receipt in the laboratory. (The carrier and waybill number will be written on the chain-of-custody form. If the original chain-of-custody form is sealed in the shipping container before the waybill number is received, then this number will be written on the copy of the chain-of-custody form.)

Upon receipt in the laboratory, the Quality Control Coordinator, or representative, shall open the shipping containers, compare the contents with the chain-of-custody record, and sign and date the record. The Quality Control Coordinator will also record the carrier and waybill number on the original chain-of-custody form, if it is not already present.

The original (white copy) of the original chain-of-custody record and the Request for Analysis Form will accompany the sample to the laboratory.

The yellow copies of the chain-of-custody record and the Request for Analysis Form will be retained in the project file. Once samples are received in the laboratory, chain-of-custody records will be signed by a designated representative of the laboratory and copies of the signed chain-of-custody records will be submitted to the K-65 Sampling Task Manager or other designated representative.

1.1.3 Sample Collection Log

A sample collection log is prepared for each sample to record information pertaining to the location and collection of a sample. The following information is required on the sample collection log, as appropriate:

- Project name and number
- Unique sample number
- Sample location
- Collector initials
- Date and time sample collected
- Sample location

An example of a sample collection log is provided in Figure 1-2.

1.1.4 Laboratory Request for Analysis Form

The laboratory Request for Analysis Form is prepared to indicate the testing program required for the collected samples. The following information is recorded on the laboratory request for analysis form:

- Project name and number
- Date samples shipped
- Required report date and turnaround times for analysis
- Contact with telephone number for receipt of the analytical report and billing invoices

Page

Sample Collection Log

Computer Entry	Date	
1st Key		
2nd Key		
ManVer		

Task

Field Check by ______________ Date __________

Unique Sample Number	Well / Boring ID No.	Collectors Initials	Collection Date			Collection Time		Sample Depth Interval	Preservative	Sequence	Blank	Spike	Duplicate	Duplicate of Sample Number	Split	General Comments
			MM	DD	YY	HH	MM									

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[redacted]

- Sample identification numbers
- Sample volume collected and appropriate preservatives

An example of the laboratory request for analysis form is provided in Section 1, Figure 3-5.

1.2 <u>Analytical Laboratory</u>

1.2.1 Laboratory Sample Receipt

Upon sample receipt, the QA coordinator or designee shall:

- If samples have been damaged during shipment, the remaining samples shall be carefully examined to determine whether they were affected. Any samples suspected of being affected shall also be considered damaged. It will be noted on the chain-of-custody record what specific samples were damaged and that the samples were removed from the sampling program. The K-65 Sample Task Manager or designee will be notified by telephone and in writing as soon as possible of an estimate of the cause of damage, that samples were damaged and that they must be resampled, or the testing program changed.

- Compare samples received against those listed on the chain-of-custody record

- Sign and date the chain-of-custody record and attach the waybill to the chain-of-custody record

- Place the samples in adequate laboratory storage

- Enter the samples in the laboratory sample log-in book which contains the following information:

    - Project identification number
    - Sample numbers
    - Type of samples
    - Date received in laboratory

- Notify the laboratory manager or group leaders of sample arrival

- Place the completed chain-of-custody records in the project file

If samples collected arrive without chain-of-custody or with incorrect chain-of-custody records, the following actions shall be undertaken by the QC coordinator:

- If the chain-of-custody record is incorrect, a memorandum to the project director and K-65 Task Sampling Manager is prepared stating the deviation. The memorandum must be signed and dated by the person originating the chain-of-custody and by the QC coordinator. The memorandum will serve as an amendment to the chain-of-custody. If the information on the chain-of-custody record cannot be corrected by the QC coordinator or the field personnel, the samples affected shall be removed from the sampling program. The K-65 Sampling Task Manager will be contacted.

- If the chain-of-custody record is not shipped with the samples, the field personnel shall be contacted and a memorandum prepared which lists the persons involved in collecting, shipping, and receiving the samples and the times, dates, and events. Each person involved must sign and date this memorandum. The completed memorandum will be maintained in lieu of the chain-of-custody record.

1.2.2 <u>Initiation of Testing Program</u>

As stated in Section 1.1.4, a request for analysis form shall be submitted with the samples to the laboratory. If the analytical program is not defined with the sample shipment, the QC coordinator shall immediately notify the manager responsible for the work for definition of the analysis program.

The laboratory manager and group leaders are responsible for prioritizing samples on the basis of holding time and of the required time needed to include the samples into the laboratory sample stream.

1.2.3 <u>Sample Disposal</u>

The chain-of-custody for the sample is completed as part of sample disposal. There are several possibilities for sampie disposition:

- The sample may be completely consumed during analysis
- Samples may be returned to WMCO for disposal
- The samples may be stored after analysis. Proper environmental control

and holding time must be observed if re-analysis is anticipated. If re-analysis is not anticipated, environmental conditions for storage will not be observed.

The laboratory manager shall determine disposition of samples if not specified on the Request for Analysis Form.

2.0 SAMPLE COLLECTION PROCEDURES

The following considerations form the basis for the sampling program:

- Frequency of sampling
- Location and number of locations to be sampled
- Methods of sampling to be employed
- Media to be sampled
- Number of samples to be collected
- Volume of samples to be collected
- Type and kind of analyses to be performed in the field
- Procedures and precautions to be followed during sampling; and
- Methods of preservation and shipment

Methods of sampling employed shall preserve the integrity of material parameters.

The following guidelines are applicable to the implementation of a field sampling program:

- Review the sample collection program to become familiar with the overall scope of the study and also sampling procedures and equipment, sample handling procedures, and shipping requirements

- Determine the characteristics of the material to be sampled, become familiar with the safety precautions and practices, and obtain the necessary safety equipment

- Obtain equipment and materials necessary to perform field sampling and analyses

- Review manufacturer's instructions on equipment calibration and sensitivity

- Calibrate all field equipment prior to field work according to manufacturer's instructions and calibration procedures

  NOTE: Certain equipment may require calibration in the field before each measurement

- Fill out the appropriate sample field collection reports (Sample Collection log, Figure 1-2) completely prior to leaving the field location.

- Label all sample containers with appropriate information. This includes sample number, location, sampling date and time, preservatives added and sampler's initials.

- Complete chain-of-custody records and laboratory request for analysis forms which will accompany all samples during shipment.

The following guidelines are applicable for sample packaging to avoid breakage or cross contamination:

- Sample container lids are never to be mixed. Sample lids will stay on the original container until time of sampling (only open sample container at the time of sampling). The original sample containers will arrive in the field in packages with custody tape affixed at the appropriate access points. When sample container packages are received in the field, the chain-of-custody form for shipping the empty containers to the filed will be appropriately marked to state if the custody seal was affixed when the package arrived.

- After a sample is placed in a plastic/glass container, the sample container will be secured with a custody seal and placed in a plastic bag to minimize the potential for contamination from vermiculite or other packing material.

- Upon arrival at the laboratory, the QC coordinator, or designee will examine the contents of the shipping container and document on the chain-of-custody record if any sample containers do not have the custody tape affixed.

- The secured sample containers will be placed in the container in such a way so they do not touch one another. Use additional container protection (e.g., new, unused paint cans), if necessary. (Keep container closed except when placing sample in container).

Samples will be properly packaged and labeled for shipment and dispatched to the appropriate laboratory for analysis. Separate chain-of-custody and request-for-analysis records will be prepared for each laboratory. The following requirements for shipping containers will be followed:

- United States Department of Transportation (DOT) regulations covering the transport of hazardous materials are contained in the Code of Federal Regulations (CFR) Title 49, Parts 170-179. Field personnel should acquaint themselves with the general provisions of these requirements.

- Shipping containers are to be padlocked or custody-sealed for shipment, as appropriate. The packing custody seal should consist of filament tape wrapped around the container, with a custody seal affixed at appropriate access points. In this way, access to the container can be gained only by cutting the filament tape and breaking the seal.

- Shipping containers will be secured by field personnel with a proper custody seal, marked with indelible pen or ink, and addressed to the appropriate laboratory.

- Field personnel will make arrangements for transportation of samples. When custody is relinquished to a shipper, field personnel will telephone the receiving laboratory custodian to report the expected time of arrival of the sample shipment and the existing time constraints (holding times) for sample analysis.

2.1 Field Storage and Shipment of Samples

Samples will be stored in a cool place away from direct sunlight. Field personnel should make sure that sample container lids are tight and secure before storing them in a final package.

Sample collected during sampling operations will have to be transported to IT Laboratories in Tennessee for analysis. Transportation of sample must be accomplished not only in a manner designed to protect the integrity of the sample, but also to prevent any detrimental effects from the potentially hazardous nature of the samples. Regulations for packaging, marking, labeling, and shipping of hazardous materials, substances and wastes are promulgated by the U.S. Department of Transportation (DOT) and described in 49 CFR 171 through 177 (in particular, 172.402h, Packaging Containing Samples). In general, these regulations were not intended to cover the shipment of samples collected at hazardous waste sites. However, the U.S. EPA has deemed it prudent to package, mark, label, and ship samples observing these DOT procedures. The information contained in this section is for general guidance and, although factual, should not be misconstrued as identical to DOT regulations for transportation of hazardous materials. Samples collected shall be classified as hazardous substance (or waste) samples. Special precautions, procedures, and secondary containment areas within laboratories will be used.

2.2 Sample Bottle Preparation and Sample Preservation

Sample bottle containing premeasured amounts of the appropriate chemical preservatives are prepared in the laboratory and are shipped to the field. Sample bottles are either purchased precleaned in accordance with U.S. EPA specifications or are cleaned in the laboratory to U.S. EPA specifications. Volatile organic analysis (VOA) vials are purchased precleaned. Glass containers for other organic analyses are washed with a nonphosphate detergent, rinsed with tap water, rinsed with methanol, rinsed with deionized water, and then rinsed with dilute nitric acid. Plastic containers for other general chemistry and radiological procedures are washed with a nonphosphate detergent and rinsed with tap water and deionized water.

2431

TABLE 1-1
SAMPLING AND PRESERVATION REQUIREMENTS FOR RINSATE SAMPLES
FEED MATERIALS PRODUCTION CENTER
FERNALD, OHIO

PARAMETER	CONTAINER	SAMPLE VOLUME (b) REQUIRED	PRESERVATIVE	REFERENCE	MAXIMUM HOLDING TIMES (a)
Radionuclides	Plastic	1L (c)	None	1	Indefinite
Inorganics	Plastic, Glass	500 ml	< pH 2.0 HNO_3	2, 3, 4, 5	6 Months
Mercury	Glass	250 ml	< pH 2.0 HNO_3		28 Days
Cyanide	Glass	500 ml	< pH 2.0 NaOH		14 Days
Volatile Organics	Glass, Teflon-lined septum	2-40 ml (d)	Cool, 4 Degrees C	6	10 Days
Semivolatile Organics (e)	Glass, Teflon-lined cap	1 L	Cool, 4 Degrees C	6	10 days until extraction 40 days after extraction
Pesticides/PCBs	Glass, Teflon-lined cap	1 L	Cool, 4 Degrees C	6	5 days until extraction 40 days until extraction

000481

(a) Samples will be analyzed as soon as possible after collection. The times listed are maximum times that samples should be held before analysis.

(b) Three times the sample volume required for QC analysis.

(c) Check with laboratory for the volume of samples required for different radionuclide analyses.

(d) 40-ml VOA vial.

(e) Se· latile organics include acid and base-neutral extractable . pesticided/polychlorinated.