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WORK PLAN FOR THE OPERABLE UNIT 4 REMEDIAL DESIGN REVISION 0 FINAL MAY 1995

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WORK PLAN FOR THE OPERABLE UNIT 4 REMEDIAL DESIGN

REVISION 0

18-WP-0009

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

MAY 1995

U.S. DEPARTMENT OF ENERGY
FERNALD FIELD OFFICE

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TABLE OF CONTENTS

Table of Contents i
List of Figures iv
List of Tables iv
Conversion Factors v
List of Common Acronyms and Abbreviations vii

1.0 Introduction 1-1
1.1 Purpose and Scope 1-1
1.2 Summary of Work Plan Approach 1-1
1.3 Work Plan Organization 1-2
2.0 Background 2-1
2.1 Site Location, Description, and History 2-1
2.2 Current Site Status 2-4
2.3 Nature and Extent of Contamination 2-5
2.3.1 Surface Soils 2-5
2.3.2 Subsurface Soils 2-6
2.3.3 Surface Water and Sediment 2-6
2.3.4 Groundwater 2-7
2.3.5 Perched Water 2-7
2.3.6 Great Miami Aquifer 2-8
3.0 Remedial Design Objectives, Scope and Strategy 3-1
3.1 Objectives 3-1
3.2 Scope 3-1
3.3 Remedial Design Approach 3-5
4.0 Task Plan for Remedial Design 4-1
4.1 Task 1, Title I Design - Project Planning Documentation 4-1
4.1.1 Review of Existing Data 4-2
4.1.2 Preparation of Remedial Design Work Plan 4-2

4.1.3 Preparation of Title I Design Project Planning Documentation 4-2
4.1.4 Title I/II Design - Data Needs/Support Studies 4-3
4.1.4.1 Pilot Plant Phases I and II Treatability Study Program . . 4-3
4.1.4.2 Required Technical Studies 4-5
4.1.5 Task 1 Deliverables and Milestones 4-5
4.2 Task 2, Title I/II Design - Remedial Facilities Infrastructure 4-6
4.2.1 Preparation of Title I/II Design 4-6
4.2.2 Remedial Facilities Infrastructure 4-7
4.2.2.1 Underground Utilities/Site Preparation Design 4-8
4.2.2.2 Silo Superstructures Design 4-9
4.2.2.3 Radon Treatment System (Silos 1 and 2) Design 4-9
4.2.3 Task 2 Deliverables and Milestones 4-10
4.3 Task 3, Title I/II Design - Vitrification Plant 4-10
4.3.1 Personnel Support/Plant Buildings and Services/Process Plant 4-11
4.3.2 Vitrification Plant 4-11
4.3.3 Task 3 Deliverables and Milestones 4-13
4.4 Title I/II Design - Final Site Remediation 4-14
4.4.1 Task 4, D&D/Waste Management Design 4-15
4.4.2 Task 4 Deliverables and Milestones 4-16
4.5 Task 5, Title I/II Design - Final Site Remediation 4-16
4.5.1 Final Site Remediation Design 4-17
4.5.2 Task 5 Deliverable and Milestone 4-17
4.6 Design Support Activities 4-17
4.6.1 Regulatory Requirements in Remedial Design 4-18
4.6.1.1 Permitting Requirements and Site-wide Monitoring 4-20
4.6.1.2 Requirements Affecting Emissions to Air 4-21
4.6.1.3 Requirements Affecting Emissions to Surface Water . . . 4-24
4.6.1.4 Groundwater Monitoring 4-28
4.6.1.5 Miscellaneous Requirements 4-30
4.6.2 Waste Packaging/Transportation 4-33

4.6.3 Waste Disposition 4-33
4.7 Community Relations 4-34
4.8 Project Completion/Closeout 4-36
5.0 Management Approach 5-1
5.1 Project Staffing 5-1
5.2 Project Schedules 5-4
5.3 Deliverables/Remedial Design 5-11
5.3.1 Preliminary (30%) Design 5-11
5.3.2 Intermediate (60%) Design 5-14
5.3.3 Pre-final/Final (90%/100%) Design 5-14
5.3.4 Comment Response Documents 5-15
References R-1
Appendix A A-1-1

LIST OF FIGURES

2-1 Fernald and Vicinity 2-2
2-2 Waste Storage Area 2-3
2-3 Generalized Groundwater Flow in Buried Channel Aquifer 2-9
5-1 Administrative Relationship 5-2
5-2 Operable Unit 4 Remediation 5-3
5-3 Remedial Design Work Plan Schedule 5-5
5-4 Remedial Design Summary Schedule 5-6
5-5 Phase I Remedial Action Work Plan Schedule 5-9
5-6 Phase II Remedial Action Work Plan Schedule 5-10

LIST OF TABLES

3-1 Remediation Levels in Soils - Radionuclides 3-2
3-2 Remediation Levels in Soils - Chemicals 3-3
5-1 Milestone Schedule 5-12

CONVERSION FACTORS

In this document, units of measure are generally presented with the metric equivalent first, followed by the measured English unit in parentheses. In cases where the measurement was originally made in metric units, the values were not converted back to English units; the data are generally in English or metric units only. The following table lists the appropriate conversion factors for English to metric units and for metric to English units.

English to Metric Conversion Factors

Multiply	By	To Obtain
acres	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (°F)	[(°F)-32]* 0.5555	degrees Centigrade (°C)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (l)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)

CONVERSION FACTORS
(Continued)

Metric to English Conversion Factors		
Multiply	By	To Obtain
centimeters (cm)	0.3937	inches (in)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Centigrade (°C)	1.8(°C) +32	degrees Fahrenheit (°F)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
liters (l)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

LIST OF COMMON ACRONYMS AND ABBREVIATIONS

A/E	Architect/Engineer
AEA	Atomic Energy Act
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
AWWT	advanced waste water treatment
BAT	Best Available Technology
°C	Degrees Celsius or Centigrade
CAA	Clean Air Act of 1990
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
Ci	Curies
cm	centimeter
COC	constituent of concern
COE	United States Army Corps of Engineers
CRP	Community Relations Plan
CRU4	CERCLA/RCRA Unit 4
CWA	Clean Water Act
DCP	Design Criteria Package
D&D	decontamination and demolition
DOE	United States Department of Energy
DOE-FN	United States Department of Energy - Fernald Field Office
DOE-OH	United States Department of Energy - Ohio Field Office
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Company
FFCA	Federal Facility Compliance Agreement
ft	feet (foot)

LIST OF COMMON ACRONYMS AND ABBREVIATIONS
(Continued)

ft^3	cubic feet
FRD	Functional Requirement Document
FS	Feasibility Study
GA	general arrangement
gal	gallon
ha	hectare
HEPA	high efficiency particulate air
kg	kilogram
km	kilometer
km^2	square kilometers
lb	pound
ℓ	liter
m	meter
m^2	square meters
m^3	cubic meters
mi	mile
mi^2	square miles
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
mg/ℓ	milligrams per liter
mrem	millirem
mrem/yr	millirem per year
μg/ℓ	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standard for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	Nuclear Regulatory Commission

LIST OF COMMON ACRONYMS AND ABBREVIATIONS
(Continued)

NTS	Nevada Test Site
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
P&ID	piping and instrumentation drawing
Pb	lead
pCi/g	picoCuries per gram
pCi/ℓ	picoCuries per liter
pCi/m^2-s	picoCuries per square meter-second
PFD	process flow diagram
Po	polonium
PP	Proposed Plan
ppb	parts per billion
psi	pounds per square inch
Ra	radium
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RD/RA	Remedial Design/Remedial Action
RFP	request for proposal
RI	remedial investigation
RI/FS	Remedial Investigation/Feasibility Study
Rn	radon
ROD	Record of Decision
RSE	Removal Site Evaluation
RTS	Radon Treatment System
SARA	Superfund Amendments and Reauthorization Act
SCQ	Site-Wide CERCLA Quality Assurance Project Plan
SDWA	Safe Drinking Water Act
TBC	to be considered

LIST OF COMMON ACRONYMS AND ABBREVIATIONS
(Continued)

Th	thorium
U	uranium
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978
WWT	Wastewater Treatment
yd	yard
yd^3	cubic yards

SECTION 1.0

INTRODUCTION

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1.0 INTRODUCTION

1.1 Purpose and Scope

The purpose of this Remedial Design (RD) Work Plan is to identify and define the activities required to develop final construction plans, specifications, and bid documents for the implementation of the selected remedy described in the Record of Decision (ROD) for Remedial Actions (RA) at Operable Unit 4, at the United States Department of Energy (DOE), Fernald Environmental Management Project (FEMP), Fernald, Ohio. The Operable Unit 4 remedial actions, as outlined in the *Final Record of Decision for Remedial Action at Operable Unit 4, December 1994 (DOE 1994a)*, primarily consist of the removal, stabilization by vitrification of the contents of Silos 1, 2 and 3, and off-site disposal at the Nevada Test Site (NTS); the demolition, removal, and final disposition of the contaminated concrete, debris and soils within Operable Unit 4, consistent with the Record of Decisions for Operable Units 3 and 5, respectively. The overall goal of the Operable Unit 4 remedial actions is to safely remediate all the Operable Unit 4 components in a timely, efficient and cost-effective manner, which assures compliance with all applicable or relevant and appropriate requirements (ARARs), and which would be protective of human health and the environment.

This work plan is the primary document to be used in the implementation of the Operable Unit 4 RD activities and has been prepared in accordance with the requirements of the Amended Consent Agreement, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), (hereinafter jointly referred to as "CERCLA"), and the Resource Conservation and Recovery Act (RCRA). The Operable Unit 4 remedial design and subsequent remedial actions are being implemented by the DOE, as the lead agency responsible for CERCLA activities at the FEMP.

1.2 Summary of Work Plan Approach

The Operable Unit 4 RD Work Plan provides the overall framework for performing the design for remedial activities authorized under the approved Operable Unit 4 ROD. Presented in this work plan is the overall Operable Unit 4 RD strategy, including a discussion of the two-phased approach for the development and implementation of remedial design activities and tasks. The general approach of this work plan is as follows:

- Summarize pertinent site and Operable Unit 4 background information, including Phase II Pilot Plant operations;
- Summarize the purpose and scope of the Operable Unit 4 remedial action as proposed in the Operable Unit 4 Feasibility Study/Proposed Plan - Final Environmental Impact Statement (DOE 1994b) and documented in the Operable Unit 4 ROD;
- Describe programmatic and action-specific strategies and requirements for the design of all remedial actions necessary to implement the Operable Unit 4 selected remedy; and
- Develop a framework document from which design review packages, individual reports, implementation plans, and other documents will be prepared, submitted and approved.

The Amended Consent Agreement (EPA 1991) requires that this Remedial Design Work Plan provide a schedule for implementation of remedial design activities, including the identification of specific remedial design package submittal milestones subject to enforceable deadlines by the United States Environmental Protection Agency (EPA), as well as a schedule for the development and submittal of the RA Work Plan. The remediation of Operable Unit 4 is a multi-faceted project that is anticipated to require approximately six years and 91.7 million dollars to implement, based on the assumptions presented in the Operable Unit 4 ROD.

1.3 Work Plan Organization

This work plan is comprised of the main document (five sections), a reference section, and one appendix. An outline and brief description of these seven sections is provided below.

Section 1 - Introduction

Provides the purpose and scope of the Operable Unit 4 remedial design, the work plan approach, and work plan organization.

Section 2 - Background

Provides a summary of pertinent background information essential to understanding the basis of the Operable Unit 4 remedial action.

Section 3 - Remedial Design Strategy

Presents a summary of the remedial design objectives, scope and management strategy for implementing the remedial design and actions outlined in the Operable Unit 4 Record of Decision.

Section 4 - Task Plan for Remedial Design

Describes each of the tasks that must be performed to implement the Operable Unit 4 remedial action, including planning, scheduling, remedial design and design support activities.

Section 5 - Management Approach

Provides a detailed description of the overall management structure for performing the remedial design and remedial action, a schedule for finalization of the work plan, and submittal of long-term schedules, plans and reports. This section also lists deliverables and design packages for review, comment, and/or approval by the regulatory agencies.

References

Provides references to documents identified in the preceding sections.

Appendix A

Provides a summary of the applicable or relevant and appropriate requirements (ARARs) and to-be-considered (TBCs) pertinent to the Operable Unit 4 remedial design.

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SECTION 2.0

BACKGROUND

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2.0 BACKGROUND

This section summarizes the background information concerning the FEMP and Operable Unit 4 relevant to this work plan. Included in this section is a brief summary of the site location, description, and history (Section 2.1), current site status (Section 2.2), and an overview of the nature and extent of contamination (Section 2.3).

2.1 Site Location, Description, and History

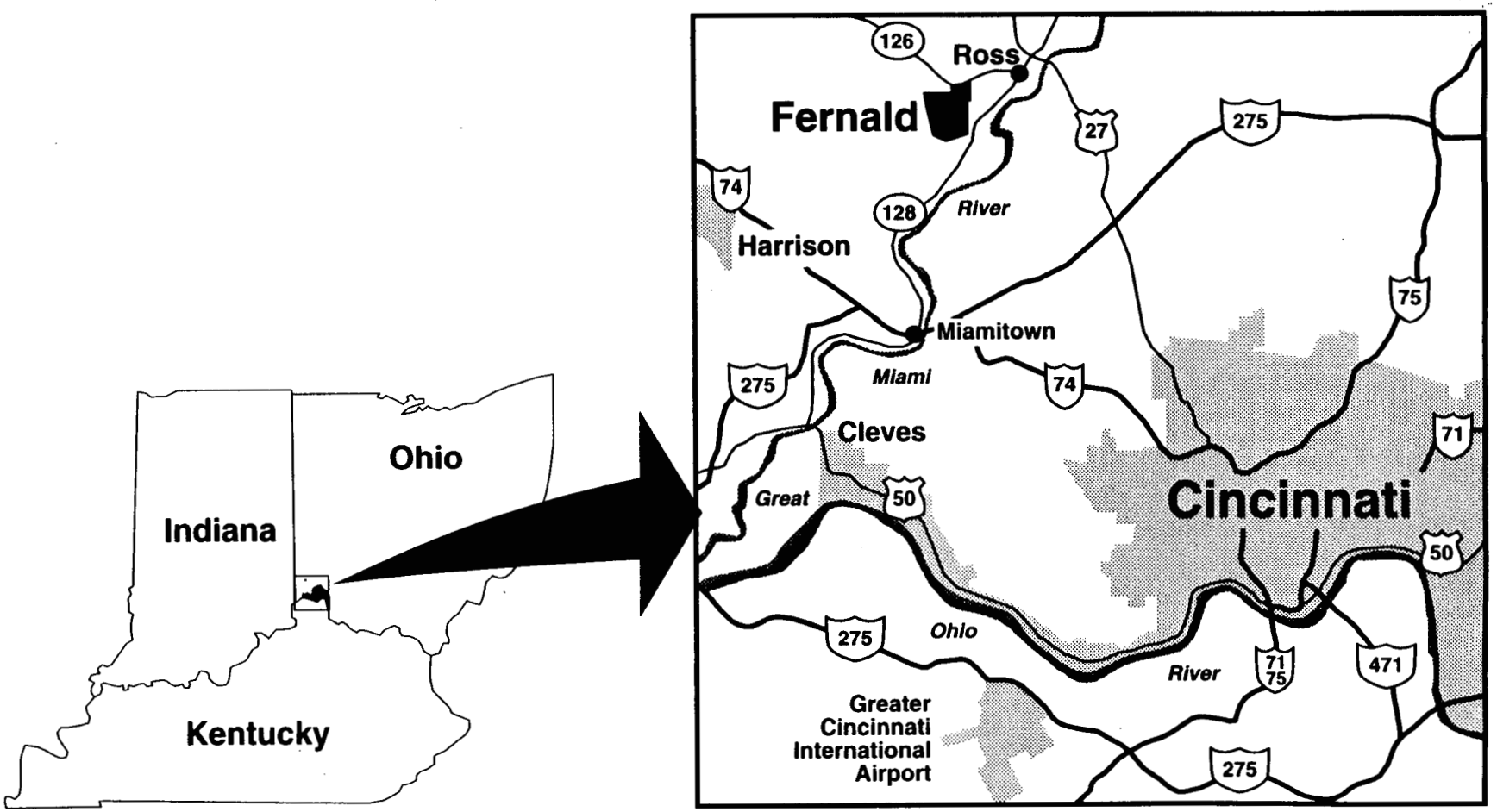
The FEMP site is a 425 hectare (1050 acre) facility located just north of Fernald, Ohio, a small farming community, and lies on the boundary between Hamilton and Butler Counties. Of the total site area, 345 hectares (850 acres) are in Crosby Township of Hamilton County, and 80 hectares (200 acres) are in Ross and Morgan Townships of Butler County. Other nearby communities include Shandon, New Baltimore, Ross, and Harrison (see Figure 2-1). Production operations at the facility were limited to a fenced 55-hectare (136-acre) tract of land, now known as the former Production Area, located near the center of the site. The FEMP's primary mission was to process uranium into metallic "feed" materials for other DOE facilities for use in the nation's defense program.

Prior to 1984, solid and slurried materials from uranium processing were stored or disposed in the on-site Waste Storage Area, which is located west of the former Production Area. Operable Unit 4, on which this phase of the FEMP remediation is focused, is situated in the southwestern portion of the Waste Storage Area, occupying an area of approximately 2 hectares (5 acres) (see Figure 2-2). Operable Unit 4 consists of two earthen-bermed, concrete silos containing K-65 residues; a decant sump tank; one silo containing cold metal oxides; one unused silo; and various quantities of contaminated soils and debris.

Briefly stated, the Operable Unit 4 site history dates back to the early 1950s, when the silos were constructed and received residues for storage. These residues were generated from the process of extracting uranium from high grade uranium ores and concentrates in support of the United States defense programs. These residues are classified as by-product materials, consistent with Section 11(e)2 of the Atomic Energy Act (AEA). Facilities and equipment associated with this placement, storage, and continued maintenance of these materials include: a decant sump tank, radon treatment system (RTS), various concrete pads, and miscellaneous piping and appurtenances. In 1991, a bentonite clay layer was

FIGURE 2-1

FERNALD AND VICINITY



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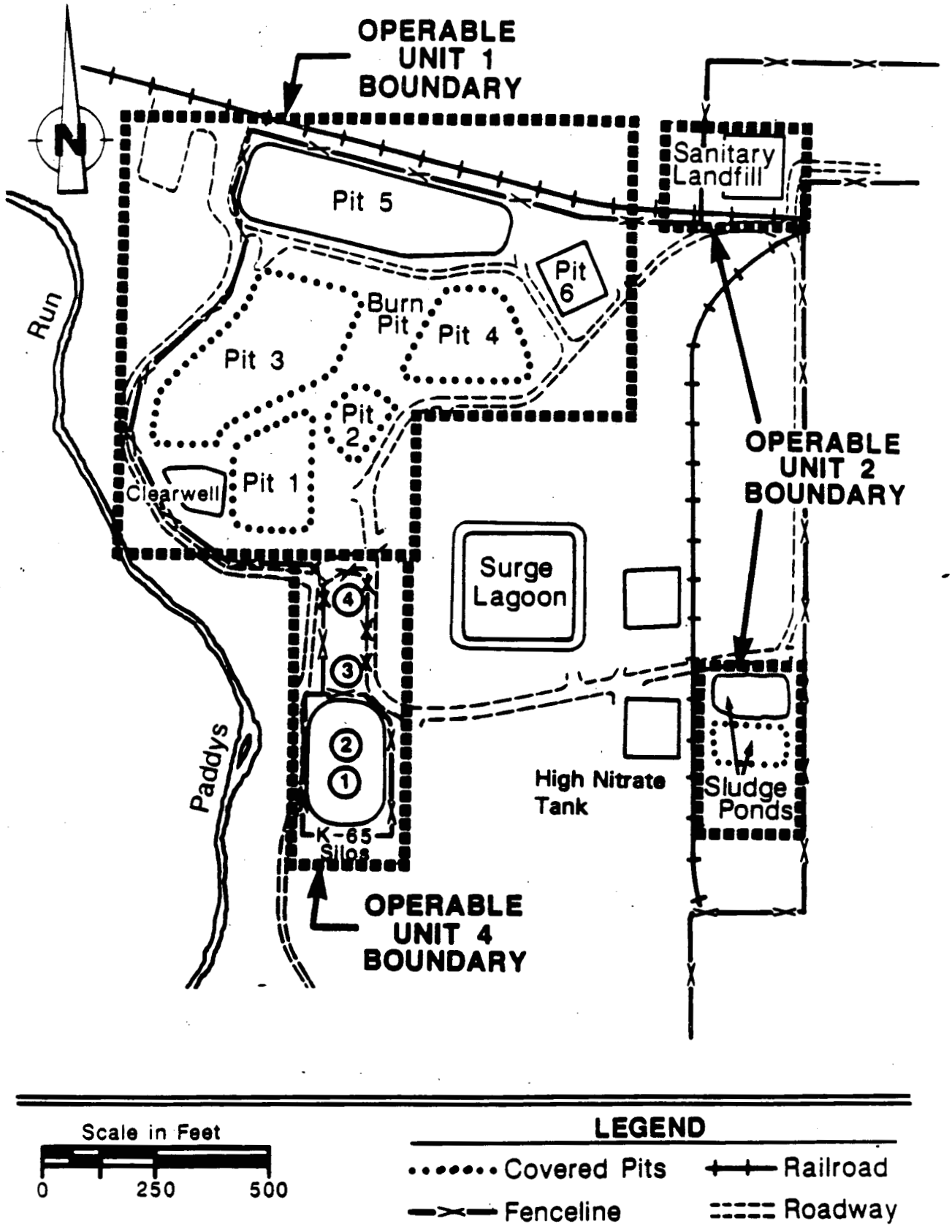

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FIGURE 2-2. WASTE STORAGE AREA

added over the residues in Silos 1 and 2 to reduce chronic radon emanation from both silos. In addition, an Expedited Removal Action was completed in January 1992, when an out-of-service dust collector and hopper assembly were removed from the dome of Silo 3. Minor facility modifications (i.e., equipment upgrades) have also been made in recent years to enhance radon monitoring capabilities, storm water runoff controls, and decant sump tank maintenance activities.

2.2 Current Site Status

In July 1986, the DOE and EPA signed a Federal Facilities Compliance Agreement (FFCA), addressing impacts to the environment associated with federally operated sites (including the FEMP). The DOE agreed to conduct the FFCA investigation as a Remedial Investigation/Feasibility Study (RI/FS) in accordance with guidelines of CERCLA. In November 1989, the FEMP site was included on the National Priorities List (NPL) of the EPA. The FFCA was later amended by the June 1990 Consent Agreement between DOE and EPA which was further modified by amendment in September 1991.

In accordance with the Amended Consent Agreement (September 1991), the DOE submitted to EPA a Draft Remedial Investigation (RI) Report for Operable Unit 4 in April 1993, which was later submitted as a Draft Final and Final Report in August 1993, and November 1993, respectively. Final approval of the Final RI Report for Operable Unit 4 was received in August 1994. Likewise, a Draft Feasibility Study (FS) Report and Proposed Plan (PP) for Remedial Actions at Operable Unit 4 were submitted to the EPA in September 1993. Subsequent Draft Final and Final documents were submitted to the agency in December 1993, and February 1994, respectively. Final EPA approval of the Final FS Report and PP for Operable Unit 4 was received on August 1994.

The Final ROD for Remedial Actions at Operable Unit 4 was submitted to the EPA in November 1994. The EPA approved and signed the Final ROD for Remedial Actions at Operable Unit 4 on December 7, 1994.

Currently, a pilot plant treatability study program is being conducted. The primary goals of this program are to provide essential data needed for detailed remedial design in areas of waste retrieval, full-scale vitrification process scale-up, optimal mix-design parameters, off-gas treatment, and vitrified product

handling. Additional details regarding the integral relationship of the Pilot Plant Phases I and II Treatability Study Program and the remedial design will be provided in Sections 3.0 and 4.0 of this work plan.

2.3 Nature and Extent of Contamination

This section summarizes the nature and extent of contamination in environmental media within the Operable Unit 4 boundary. Also included in this section is an overview of the levels of direct radiation associated with the current conditions within Operable Unit 4. Additional detail on these conditions is provided in Section 4.0 of the Final RI Report for Operable Unit 4, November 1993 (1993b).

2.3.1 Surface Soils

Sampling performed as part of the Operable Unit 4 RI/FS and other FEMP site programs in the vicinity of Operable Unit 4 indicates above background concentrations of uranium, and to a lesser degree other radionuclides, in the surface soils within and adjacent to Operable Unit 4. Activity concentrations observed during the RI for the surface soils in the vicinity of Operable Unit 4 were as much as 20.8 picoCuries per gram (pCi/g) for uranium (U)-238, or 16 times natural background (1.22 pCi/g), and 4.8 pCi/g for thorium (Th)-230, or approximately two times natural background (1.97 pCi/g). These above background concentrations appear to be generally limited to the upper six inches of soil. The Final RI Report for Operable Unit 4 indicates no direct relationship between the surface soil contamination in Operable Unit 4 and the silo contents. Further, more than 70 percent of the surface soil samples indicate that the uranium contamination in surface soils is depleted uranium (i.e., the uranium contains <0.71 percent of U-235). This result is inconsistent with the silo residues that consist of natural uranium. Thus, the existence of these activity concentrations in the surface soils are attributed to air deposition from the former Production Area, past plant production operations, and/or waste handling practices in the waste pit area.

Soil samples were also collected during the RI for Operable Unit 4 from the soils contained in the earthen embankment (berm) surrounding Silos 1 and 2. The analytical data from the berm fill show only slightly elevated radionuclide activity concentrations. Uranium was the predominant contaminant with activity concentrations less than 4 pCi/g, or approximately three times background (1.22 pCi/g). In addition to

U-238, activity concentrations of polonium (Po)-210 and lead (Pb)-210 ranging up to 10 and 6 times background (1.33 pCi/g and 1.33 pCi/g), respectively, were identified in the berm fill. These radionuclides are produced from the natural radioactive decay of radon (Rn)-222. Their presence in the berm fill is a direct result of radon escaping the silos by passing through cracks in the silo wall. Once outside the silo and in the soil, the radon decays to Pb-210 and then Po-210.

One sample collected as part of the berm investigations was retrieved from an interval that closely reflected the original ground surface prior to berm installation. Analytical results from this sample showed distinctly higher concentrations of radionuclides than other samples taken within the berm soils. Uranium and radium (Ra) concentrations in the sample were 19 and 580 times background (1.22 pCi/g and 1.45 pCi/g), respectively. This sample indicates the possible occurrence of spillage or seepage from the silo onto the original surface soils adjacent to the silo at the sampling location.

2.3.2 Subsurface Soils

As part of the RI for Operable Unit 4, samples were collected from the subsurface soils located under and adjacent to the K-65 silos. Analytical results reveal elevated concentrations of radionuclides from the uranium decay series in the soils at the interface between the berm and the original ground level. Elevated concentrations (up to 53 pCi/g for U-238, about 40 times background) were also noted in slant boreholes, which passed in close proximity to the silo underdrains.

The occurrence of these above background concentrations in soils near the silo underdrains are attributed to vertical migration of leakage from the silo underdrains or decanting system. Elevated readings at the interface between the silo berms and the native soils are attributed to historical air deposition or past spillage from the silos during filling operations in the 1950s, prior to installation of the berms.

2.3.3 Surface Water and Sediment

Extensive sampling was conducted on the sediment and surface water present in Paddys Run and on key drainage swales leading to Paddys Run, as part of the RI Report for Operable Unit 4 and other site programs. Results of the surface water sampling indicate the occurrence of above background concentrations of U-238, up to 1500 times background, in the drainage swales in the vicinity of Silos 1

through 4. The highest readings were recorded in a drainage ditch, which flows from east to west, located approximately 76 meters (250 feet) south of Silo 1. The most probable source of the contamination in Paddys Run and the drainage swales is the resuspension of contaminated particles from surface soils in Operable Units 4 and 1 boundaries into stormwater.

2.3.4 Groundwater

With the exception of perched groundwater which may be encountered during remedial action, groundwater within the Great Miami Aquifer underlying the silo area is not within the scope of Operable Unit 4. Groundwater in the Great Miami Aquifer underlying the entire FEMP site is being addressed as part of Operable Unit 5. Groundwater occurs not only in the Great Miami Aquifer underlying the FEMP site, but also in discrete zones of fine-grained sands located in the soils above the lower aquifer. The water contained in these sand pockets in the clay-rich glacial soils are termed perched water zones. Samples were collected from slant borings placed adjacent to and under Silos 1 and 2; 1000-series wells screened in the glacial overburden; 2000-series wells screened at the water table in the Great Miami Aquifer; and 3000-series wells screened at approximately the central part of the Great Miami Aquifer, just above the clay interbed.

Background concentrations of naturally occurring inorganics and radionuclides in groundwater in the vicinity of FEMP site were being established under the site-wide RI/FS during the completion of the RI Report for Operable Unit 4. The background concentration of total uranium in groundwater was assumed to be less than 3 micrograms per liter ($\mu g/\ell$) or 3 parts per billion (ppb).

2.3.5 Perched Water

Uranium was the major radionuclide contaminant found in the perched water. Elevated concentrations of total uranium were detected in the slant boreholes under and around Silos 1 and 2. Slant Boring 1617, immediately southwest of Silo 1, contained the highest concentration of total uranium (9240 $\mu g/\ell$). Uranium concentrations were also elevated in samples collected from the 1000-series wells. The highest observed total uranium concentrations obtained from 1000-series wells were in samples collected from Well No. 1032, located 46 meters (150 feet) due west of Silo 2. The range of the concentrations was

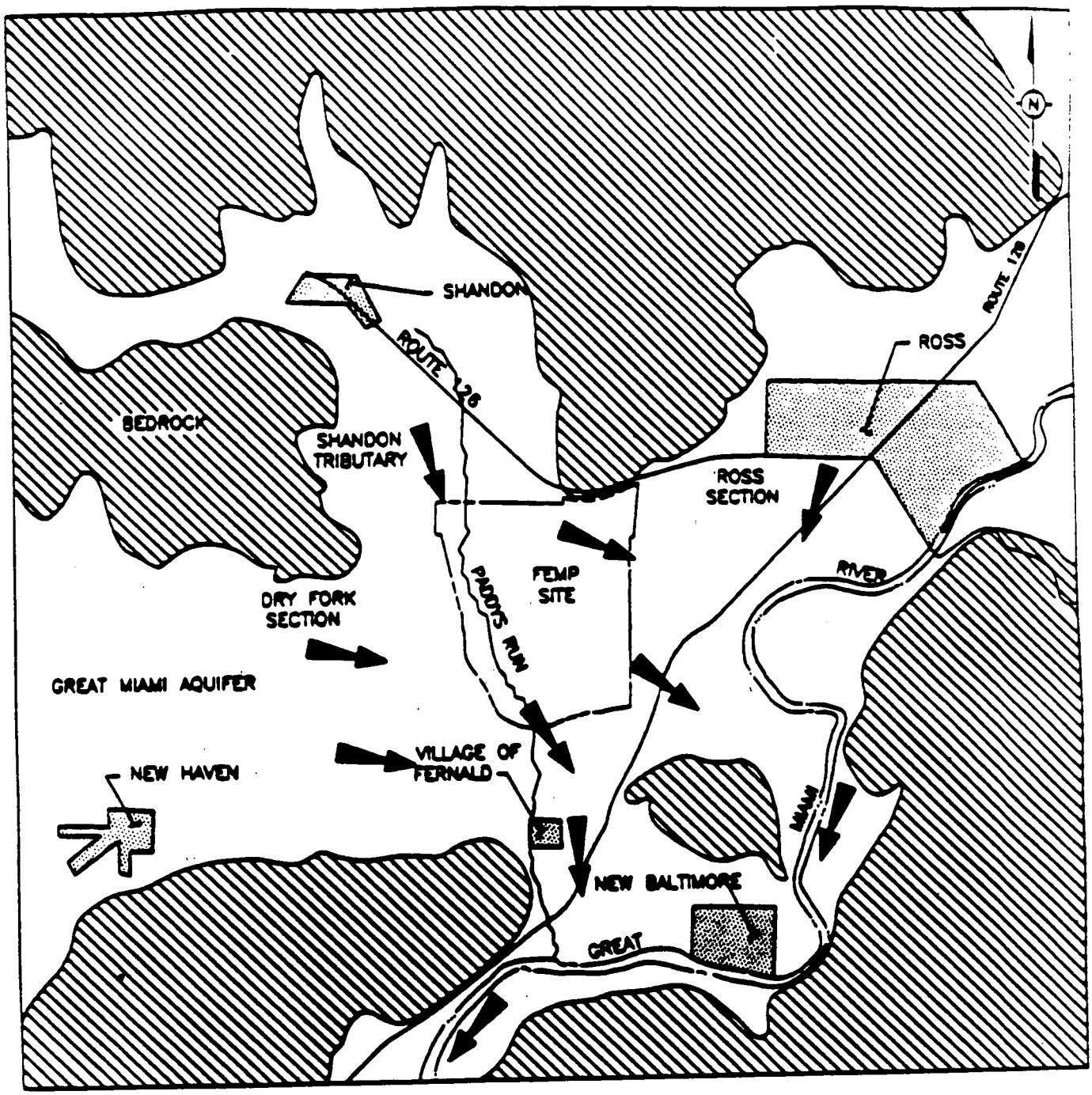
196 to 276 $\mu g/\ell$. Considering both the slant borings and 1000-series wells, U-238 was found in the range of 1.1 to 1313 pCi/ℓ.

The major inorganic constituents found in the perched water samples, taken from 1000-series wells and the slant borings, included elevated concentrations for major cations (iron, magnesium, manganese, and sodium) and major anions (chloride, nitrate, and sulfate). In particular, the concentrations of sodium, sulfate, and nitrate were significantly above background in slant boring samples. Boring 1615, northwest of Silo 2, had the highest sodium concentration [1,040 milligrams per liter (mg/ℓ)], boring 1618, southeast of Silo 1, had the highest sulfate concentration (2,200 mg/ℓ), and boring 1617 had the highest nitrate concentration (554 mg/ℓ). Low concentrations of organic constituents were detected in some samples. Overall, well measurements and analytical results confirmed that the perched groundwater in the vicinity of Operable Unit 4 flows from east to west.

2.3.6 Great Miami Aquifer

The concentration of total uranium in the upper portion of the Great Miami Aquifer, based on analysis of samples from the 2000-series wells, ranged from less than 1 $\mu g/\ell$ to 40.3 $\mu g/\ell$. These data do not necessarily suggest that the silos are the source of the observed contamination because both upgradient and downgradient wells contain above background concentrations of total uranium. Well No. 2032, located 46 meters (150 feet) west of Silos 1 and 2, exhibited a concentration of total uranium at 39.0 $\mu g/\ell$. Well No. 2033, located 46 meters (150 feet) east of Silos 1 and 2, exhibited a concentration of total uranium at 40.3 $\mu g/\ell$. Because groundwater flow in this region of the Great Miami Aquifer is from west to east (see Figure 2-3), these two wells are located upgradient and downgradient of Operable Unit 4, respectively.

The isotopic ratio of U-234 and U-238 would suggest the uranium in these samples is from a natural source. Such a ratio may be expected from Operable Unit 4, but is not a "fingerprint" for this source. The presence of uranium upgradient in the aquifer from an Operable Unit 4 source could be explained by leachate travel in the perched groundwater zone of the glacial overburden with emergence to Paddys Run. Here the diluted leachate could enter the aquifer via stream bed infiltration or flow at the perched zone/stream channel interface. No evidence is available to support or preclude this potential route.



SCALE
0 2500 5000 FEET

NOTE:
DIRECTION OF GROUNDWATER FLOW BASED ON APRIL 1986 WATER LEVEL CONTOURS AND GROUNDWATER MODELING OUTPUT (3DPART07.OUT)

LEGEND:
GENERALIZED GROUNDWATER FLOW DIRECTION.
BEDROCK OUTSIDE GREAT MIAMI AQUIFER

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FIGURE 2-3. GENERALIZED GROUNDWATER FLOW IN BURIED CHANNEL AQUIFER

The concentration of total uranium measured at deeper levels in the Great Miami Aquifer (3000-series wells) ranged from less than 1 to 4 $\mu g/\ell$, with the exception of 1 sample out of 16, which contained 15 $\mu g/\ell$. Like the 2000-series wells, no conclusion could be drawn to link or not to link this contamination to the silos.

SECTION 3.0

REMEDIAL DESIGN OBJECTIVES, SCOPE AND STRATEGY

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3.0 REMEDIAL DESIGN OBJECTIVES, SCOPE AND STRATEGY

3.1 Objectives

The purpose of the RD is to develop final construction plans, specifications, and bid documents, in accordance with CERCLA time-frame requirements for the selected remedy in the ROD for Remedial Actions of Operable Unit 4, approved and signed by the EPA on December 7, 1994. The overall objectives of the Operable Unit 4 remedial actions are to safely remove a known source of contamination to reduce the potential for release of hazardous substances, including radionuclides, to the environment in such quantities that could present an unacceptable risk to human health and the environment. The remedial design efforts have been structured to ensure that substantial, physical and continuous remedial activities can be initiated and sustained by March 3, 1996.

3.2 Scope

Under the selected remedy, the K-65 residues and cold metal oxides will be removed from Silos 1, 2, and 3 and treated in a newly constructed on-property vitrification plant. The sludges from the decant sump tank will also be removed and treated in the vitrification facility. Following treatment, the vitrified residues will be containerized and transported off site for disposal at the Nevada Test Site (NTS).

Following removal of the residues, the concrete silo structures will be dismantled. Additionally, the decant sump tank system, the existing radon treatment system and other miscellaneous structures within the Operable Unit 4 area will be demolished and dispositioned consistent with the ROD for Operable Unit 3. Following completion of treatment, the vitrification plant will be disassembled and decontaminated to the extent practicable. Opportunities for recycling or reuse of materials will also be explored to minimize waste generation.

Contaminated soils within the boundary of Operable Unit 4 will be excavated to the extent necessary to attain the remediation levels defined by the Operable Unit 4 (see Tables 3-1 and 3-2) and Operable Unit 5 RODs. Excavated areas would be backfilled to original grade and revegetated. Any perched water encountered during remediation will be collected and sent to the FEMP Advanced Waste Water Treatment (AWWT) facility for treatment prior to discharge to the Great Miami River.

TABLE 3-1

REMEDIATION LEVELS IN SOILS - RADIONUCLIDES

Constituent of Concern	Expanded Trespasser 10^{-6} ILCR PRG pCi/g	Background (95th percentile) pCi/g	ARAR Target pCi/g	Max. Detected Soil Concentration, pCi/g		Proposed Remediation Level[a] pCi/g	ILCR above background to an Expanded Trespasser from Proposed Remediation Level[b]
				Surface	Subsurface		
Pb-210 +2 progeny	77	1.33	NA	4.5	101	78	1.0×10^{-6}
Ra-226 +5 progeny	0.37	1.45	5 (top 6" soil) 15 (max. below 6")	88	206	2	1.0×10^{-6}
Ra-228 +1 progeny	0.77	1.19	NA	0.48	1.24	2	1.0×10^{-6}
Sr-90 +1 progeny	1420	ND	NA	1.8	0.8	NR	$< 1 \times 10^{-6}$
Tc-99	38700	ND	NA	3.6	3.6	NR	$< 1 \times 10^{-6}$
Th-228	0.4	1.43	NA	2.9	1.3	2	1.0×10^{-6}
U-238 +2 progeny	59	1.22	NA	37	53	60	1.0×10^{-6}

Notes:
a) Sum of backround and PRG.
b) Includes the direct radiation, soil ingestion, and inhalation pathways.
NA Not Available
NR No Remediation Required

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TABLE 3-2

REMEDIATION LEVELS IN SOILS - CHEMICALS

Constituent of Concern	Expanded Trespasser HI = 0.2 PRG mg/kg	Expanded Trespasser 10^{-6} ILCR PRG mg/kg	Background (95th percentile) mg/kg	ARAR Target mg/kg	Max. Detected Soil Concentration, mg/kg		Proposed Remediation Levels mg/kg	HI to an Expanded Trespasser from Proposed Remediation Levels	Risk to an Expanded Trespasser from Proposed Remediation Level[a]
					Surface	Sub surface			
Antimony	31	N/A	7.7	NA	32	32	NR	0.2	N/A
Arsenic	510	23	8.45	NA	10	12	NR	N/A	$<1\times10^{-6}$
Barium	>10000	N/A	91.3	NA	112	142	NR	<.1	N/A
Cadmium	26	N/A	0.82	NA	6	7	NR	<.1	N/A
Chromium(III)	NA	N/A	15.5	NA	23	25	NR	<.1	N/A
Molybdenum	930	N/A	2.6	NA	25	30	NR	<.1	N/A
Nickel	8300	N/A	20.9	NA	39	39	NR	<.1	N/A
Silver	130	N/A	2.6	NA	10	18	NR	<.1	N/A
Thallium	31	N/A	0.58	NA	0.5	0.5	NR	<.1	N/A
Vanadium	1700	N/A	30.4	NA	28	33	NR	<.1	N/A
Zinc	>10000	N/A	62.2	NA	65	67	NR	<.1	N/A

Table 3-2
(Continued)

Constituent of Concern	Expanded Trespasser HI = 0.2 PRG mg/kg	Expanded Trespasser 10^{-6} ILCR PRG mg/kg	Background (95th percentile) mg/kg	ARAR Target mg/kg	Max. Detected Soil Concentration, mg/kg		Proposed Remediation Levels mg/kg	HI to an Expanded Trespasser from Proposed Remediation Levels	Risk to an Expanded Trespasser from Proposed Remediation Level[a]
					Surface	Sub surface			
Benzo(a)anthracene	NA	61	ND	NA	4.7	ND	NR	N/A	$<1x10^{-6}$
Benzo(a)pyrene	NA	8.8	ND	NA	5.2	ND	NR	N/A	$<1x10^{-6}$
Benzo(b)fluoranthene	NA	72	ND	NA	9.7	ND	NR	N/A	$<1x10^{-6}$
Chrysene	NA	2000	ND	NA	3.5	ND	NR	N/A	$<1x10^{-6}$
Dibenzo(a,h)anthracene	NA	7.9	ND	NA	0.9	ND	NR	N/A	$<1x10^{-6}$
Indeno(1,2,3-cd)pyrene	NA	32	ND	NA	4.2	ND	NR	N/A	$<1x10^{-6}$

[a]Includes the direct radiation, soil ingestion, and inhalation pathways.
NA = Not Available.
N/A = Not Applicable.
ND = Not Detected.
NR = No Remediation Required.

Contaminated soil and debris will either be processed and/or disposed in accordance with the selected Operable Unit 5 and Operable Unit 3 remedies, or placed in an interim storage facility, at a suitable location at the site, to await the finalization of the disposal decisions for soils and debris under Operable Unit 5 and Operable Unit 3. The interim storage will be managed pursuant to the approved work plan for Removal Action 17 (Improved Storage of Soil and Debris).

3.3 Remedial Design Approach

Remedial Management Strategy

There are several regulatory requirements that directly influence the approach developed by the DOE in structuring the remedial management strategy for Operable Unit 4. The CERCLA, Section 120(e)(2) states that, ..."substantial continuous physical on-site remedial action shall be commenced at each facility not later than 15 months after completion of the [remedial] investigation and [feasibility] study." EPA considers final approval of the ROD as signifying the completion of the remedial investigation and feasibility study phase of the project. For Operable Unit 4, the 15-month criteria milestone has been determined to be March 3, 1996.

In order for remedial activities to be considered (by the EPA) to satisfy the intent of "substantial" and "physical" requirements of Section 120(e)(2), remedial activities must represent a significant step in the process, and be a part of a logical and reasonable plan. Since the requirements apply to each Record of Decision at the FEMP, determining whether specific activities satisfy the test is an operable unit-specific issue. With respect to Operable Unit 4, the EPA has agreed that the beginning of construction of the Operable Unit 4 treatment facilities (including site preparation and utilities installation to support the treatment facilities) would constitute a substantial and physical activity, since construction of these facilities is necessary before treatment of the silo residues can begin (EPA 1994).

Section 120(e)(2) of CERCLA also requires the continuous implementation of remedial activities, which is defined by the EPA to mean that within 15 months of the ROD approval date there must be a tangible commitment to implement the remedy. Usually, the mechanism by which the EPA recognizes the demonstration of such a commitment is the entry into a legally binding contract for remedial services.

Consequently, one way the DOE will demonstrate compliance with the Section 120(e)(2) "continuous" requirement will be to award, within 15 months of the ROD approval date, contract(s) for activities included in the approved Operable Unit 4 RD Work Plan.

The EPA has also recognized that DOE's contracting activities must comply with federal procurement requirements and the Anti-Deficiency Act. It is the opinion of the EPA that at a minimum, Section 120(e)(2) of CERCLA requires that contracts for remedial activities, which are scheduled for the fiscal year in which such activities are required to begin, will be in place within 15 months of the ROD approval date. The EPA requires that if DOE cannot, within 15 months of the ROD approval date, award contracts for Operable Unit 4 remedial activities which are scheduled for subsequent fiscal years, DOE must include in its RD Work Plan schedule those activities necessary to award all contracts including making requests to Congress for funding (EPA 1994). Once the RD Work Plan is approved, the deliverables and milestones identified in the work plan schedule will be enforceable by the EPA pursuant to Section XVII of the Consent Agreement, as amended under CERCLA Sections 120 and 106(a), Docket Number V-W-90-C-057 (1991).

Further, Section XI.A of the Amended Consent Agreement requires that the DOE, within sixty (60) days of the approved ROD for Operable Unit 4, submit to the EPA for approval the work plan by which the design for remedial action will be accomplished. In addition to these requirements, the EPA has published guidance documents that delineate the requirements for properly conducting remedial design and remedial action activities under EPA oversight. These guidance documents (EPA 1986, EPA 1990a), which were developed to assist the EPA (as the lead agency) in its management and oversight of CERCLA remediation activities in the public domain, have been incorporated to the extent practicable.

Consistent with these aforementioned requirements, the DOE has adopted a remedial management strategy specific for Operable Unit 4 which not only satisfies these requirements, but expedites to the extent practicable the Operable Unit 4 remedial design and remedial action process. The proposed approach, outlined by this work plan, allows the Operable Unit 4 remedial design and remedial actions to be divided into logical, and manageable work elements (e.g., phases, design packages, etc.) to accelerate their implementation. In addition, the proposed succession of remedial activities is part of a sound, reasonable

plan that is comprised of substantial and physical activities which satisfy the intent of Section 120(e)(2) of CERCLA.

Phased Design Approach Summary

The remedial management strategy for Operable Unit 4 utilizes a phased approach to accomplish the remedial design and remedial action activities. This method allows the various regulatory, technical, and financial constraints to be addressed by the project. The phased design approach consists of a series of logically planned remedial design packages and submittals. One of the integral parts of this approach is the manner in which the Pilot Plant Phases I and II Treatability Study Program is integrated directly into the remedial design schedule effort for the Vitrification Plant. The Operable Unit 4 remedial design process will be performed in two distinct phases of work as follows:

- Silo Residue Retrieval/Treatment Facility Remedial Design
- Final Site Remedial Design

The successful implementation of this logical sequence of remediation design phases and their subsequent design packages, will facilitate compliance with the intent of CERCLA Section 120(e)(2) requirements for initiating substantial continuous physical remedial activities. In addition, it minimizes the schedule risks associated with the project's technical design, which is dependent on the ongoing Pilot Plant Phases I and II Treatability Study Program, and takes into account inherent contracting constraints imposed by the annual federal budgetary process. Similarly, since the Operable Unit 4 final site remedial design will be greatly influenced by the approved RODs for Operable Units 3 and 5, this phased approach affords the Operable Unit 4 remedial design the benefit of utilizing the most current decision-making information developed by those operable units.

Pilot Plant Phases I and II Treatability Study Program Interface

One of the key project elements which will have a direct influence in determining the overall success of the Operable Unit 4 remediation efforts is the timely integration of design information generated from the Pilot Plant Phases I and II Treatability Study Program into the Operable Unit 4 remedial design. This integration is graphically depicted on the schedule presented in Figure 5-4. The main advantage provided

by the scheduling of the Pilot Plant Phases I and II Treatability Study Program is that it permits adequate time for the collection of quantitative performance data on the innovative application of the vitrification treatment technology to the Operable Unit 4 residues. While already completed RI/FS treatability bench-scale testing has yielded promising results, this technology lacks sufficient full-scale application experience involving this wastestream (or similar wastestreams) to be routinely considered for full-scale remediation without extensive pilot scale treatability testing.

The demonstration of the vitrification process is essential in order to establish design data necessary for scale-up of processes and equipment to full-scale capacity. Upon completion of the Pilot Plant Phases I and II Treatability Study Program, the results will be incorporated into the ongoing Preliminary (30%) design (Title I) effort and allow initiation of the detailed design effort (Title II). Therefore, the Pilot Plant Treatability Study Program schedule reflects a "finish-to-start" relationship with the vitrification plant remedial design. This approach facilitates the evaluation of the necessary detailed design, cost and performance data necessary to optimize critical parameters of the Vitrification Plant.

The schedule contained in this Final Remedial Design Work Plan for the Vitrification Plant for Operable Unit 4 calls for four months of Title I work after issue of the final report on Pilot Plant operations (see Figure 5-4). The schedule also indicates that Title I design of the vitrification plant may proceed well in advance of the final report issuance, based on best available information and assumptions from Pilot Plant Phase I operations.

There are several technical issues now apparent which DOE anticipates may require significant revision and/or new work for the full-scale vitrification plant based directly on Pilot Plant results. These issues include the following:

- Melter processing rate and performance
- Product forming equipment reliability and maintainability
- Performance of off-gas treatment equipment
- Worker radiation exposure during operation and maintenance of the pilot plant

These issues are discussed in detail below.

Melter

There is little or no experience either in the DOE-complex or in commercial industry with radioactive waste vitrification at the anticipated full-scale production rate, with this or any other feed composition. Also, vitrification performance and capacity are difficult to predict even with similar feed and equipment. The Pilot Plant operations will determine the maximum extent to which the melter can be scaled-up with available technology. The Pilot Plant performance will determine the maximum capacity of a single melter and may dictate whether the required number of melters must increase in order to achieve the desired throughput. Pilot scale results may also indicate the need for a different glass formulations than currently anticipated (more or different additives for acceptable glass properties). Indicated design developments in the glassmaking process will have to be incorporated into the process flow diagrams, the material balance, and piping and instrumentation drawings (P&IDs) before further final remediation design can proceed.

Product Forming Equipment

One of the goals of the Pilot Plant Treatability Study Program is the assessment of the reliability and maintainability of the product forming equipment under continuous operations. The Pilot Plant incorporates a gem maker for determining its practicality for full-scale application (a monolith product form will also be tested). Existing gem makers are known to be high maintenance items. Some require daily maintenance to support one- or two-shift commercial glassmaking operations. Also, existing gem makers are designed to handle glass at temperatures around 1100°C (2000°F) rather than the 1250°C to 1350°C (2250°F to 2450°F) planned from the Pilot Plant melter. The Pilot Plant operating results are very likely to dictate redesign of full-scale systems for improved reliability and maintainability. In addition, redesign might be necessary due to both throughput requirements and radiation worker exposure limits.

Off-Gas Treatment

The actual removal efficiency of acid gases (e.g. SO_x, NO_x) and radon may vary from the design; the Pilot Plant will provide invaluable data in this area. Any changes in sizing, or selection of off-gas treatment equipment (e.g. scrubbers, desiccants, etc.), will require some time to implement through the

process and mechanical designs. The effective containment of radon by the process system and treatment by the carbon bed system will also be paramount.

Radiation Exposure

Actual radiation exposure measurements of personnel during Phase II pilot plant operations and maintenance could greatly affect design of the vitrification plant. If the gem maker indeed requires a great deal of maintenance, such measures as a radiologically controlled maintenance corridor or semi-remote maintenance may have to be considered. These issues would require additional evaluation and rework of the designs for the gem maker, and/or melter, and perhaps even the vitrification plant building. The schedule presented in this Final Remedial Design Work Plan would allow at least some of the time required for such a redesign.

Therefore, initiating remedial design on the vitrification plant without the benefit of completing the Pilot Plant Treatability Study Program is not expedient. The development and demonstration of the technology by the Pilot Plant Phases I and II Treatability Study Program reduces the technical, schedule and economic risks of the Operable Unit 4 remediation program.

The scope of each of the remedial design phases and various activities required to accomplish the tasks is described in greater detail in Sections 4.0 and 5.0.

SECTION 4.0

TASK PLAN FOR REMEDIAL DESIGN

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4.0 TASK PLAN FOR REMEDIAL DESIGN

The selected remedy in the ROD for Operable Unit 4 will serve as the basis for performing the remedial design and will subsequently be implemented during remedial action. The following tasks constitute the work elements to be performed by DOE during the remedial design for the remediation of Operable Unit 4. The modified task numbering system used in this work plan is similar to recommended task designations for RD as specified by the EPA Office of Solid Waste and Emergency Response. The following tasks are included in the Operable Unit 4 remedial design:

SILO RESIDUE RETRIEVAL/TREATMENT FACILITY REMEDIAL DESIGN

- Task 1: Title I Design - Project Planning Documentation
- Task 2: Title I/II Design - Remedial Facilities Infrastructure
- Task 3: Title I/II Design - Vitrification Plant

FINAL SITE REMEDIAL DESIGN

- Task 4: Title I/II Design - Decontamination & Demolition (D&D)/Waste Management
- Task 5: Title I/II Design - Final Site Remediation

4.1 Task 1, Title I Design - Project Planning Documentation

Task 1 of the remedial design will focus on the development of drawings, specifications and project planning documentation necessary to perform the safe removal and treatment of the silo residues. Task 1 is currently being conducted and includes the following activities:

- Review of Existing Data
- Preparation of Remedial Design Work Plan
- Preparation of Title I Documentation
- Title I/II Design Data Needs/Support Studies

4.1.1 Review of Existing Data

Various types of data are available from the remedial investigation; several treatability studies and the feasibility study activities that were performed for the EPA as agreed to in the Amended Consent Agreement. Three key documents for use in this RD are: the Final Remedial Investigation Report for Operable Unit 4, November 1993; the Final Feasibility Study Report for Operable Unit 4, February 1994; and the Final Record of Decision for Remedial Actions at Operable Unit 4, December 1994. The information contained within these documents will be reviewed and evaluated to ensure that all relevant predesign data, including all applicable or relevant and appropriate requirements (ARARs), will be incorporated into the design effort.

In addition, all available data and "lessons-learned" generated from the construction, start-up, and operations of the Phases I and II Pilot Plant Treatability Study program will be incorporated into the remedial design effort.

4.1.2 Preparation of Remedial Design Work Plan

This activity consists of the preparation of this RD Work Plan. Draft and Final versions were submitted in accordance with the project schedule (see Section 5.2). Consistent with previous Consent Agreement document submittals, it is assumed that both EPA and OEPA comments on the Final RD Work Plan will be formally submitted to DOE.

4.1.3 Preparation of Title I Design Project Planning Documentation

The main objective of this subtask will be to establish a design basis, and freeze the project scope and baseline features for project management purposes. The project planning documentation developed under this subtask will serve as the technical baseline for all Title I/II remedial design efforts.

Functional Requirements Document (FRD)

The FRD will identify and define functional requirements for the remedial design in terms of the functions that the various systems must be capable of performing, and the constraints and limitations that the design must satisfy. The functional requirements do not address detailed design requirements but rather establish the baseline for the development of Title I and Title II Design. This baseline information

allows tracking of the final detailed system requirements back to their origin (functionally) for the future assessment of design with respect to the original goals, objectives, and requirements.

Design Criteria Package

The Design Criteria Package (DCP) includes engineering design criteria and the project design basis. The DCP will present the engineering design criteria in accordance with DOE Order 4700.1. The objective of the engineering design criteria is to identify and specify all the applicable general and discipline-specific design requirements that must be satisfied in performing the engineering design, and preparing construction drawings and specifications for the final remediation. The DCP will list all pertinent DOE Orders, ARARs and "to be considered" (TBC) requirements, Engineering Design Codes (national, state, and local) and Standards, as well as describe how the project design will satisfy compliance with the ARARs, TBCs, and pertinent DOE Orders identified for this project.

The DCP will also address the project design basis. This discussion will provide a complete narration of the remediation facility functional systems along with any known design constraints and limitations. In addition, a list of the assumptions to be used in the preparation of the design will be presented. As the remedial design effort progresses through its preliminary stages toward final design, the assumptions will be periodically evaluated for confirmation and updated as necessary.

4.1.4 Title I/II - Design Data Needs/Support Studies

As identified in the list of assumptions and information needs discussions presented in the DCP, several activities must be completed (e.g., Pilot Plant Treatability Studies, Engineering Studies, etc.) to provide key information for design and operational requirements. The following section describes these activities.

4.1.4.1 Pilot Plant Phases I and II Treatability Study Program

The Operable Unit 4 Remedial Design/Remedial Action (RD/RA) Treatability Study Program consists of the removal and processing of K-65, bentonite clay, and Silo 3 material. The Treatability Study Program is being conducted in two phases as delineated in the "Operable Unit 4 Pilot Plant Phases I and II Treatability Study Work Plans." The following is a summary of the work that is being accomplished in support of the Operable Unit 4 RD.

The Pilot Plant Phase I Treatability Study Program will verify the adequacy of the equipment, process, and methodology of waste retrieval and the vitrification plant. The following is a list of the activities included in the scope of Pilot Plant Phase I operations:

- Superstructure and Equipment Room Construction
- Pilot scale vitrification plant construction
- Continuous operation of the vitrification plant with surrogate, non-radioactive materials

The Title I design documentation (ie. DCP) for the Vitrification Plant will be updated and finalized by incorporating any design and operational changes resulting from the data and the lessons-learned from the Pilot Plant Phases I and II Treatability Study Program.

Phase II of pilot scale testing will require minimal modifications to the vitrification plant constructed for Phase I. All "lessons learned" in Phase I concerning process control, equipment operation, material handling, and mix design will be incorporated into the Phase II operations. Phase II testing will utilize actual K-65 and Silo 3 material. K-65 material will be removed with a manually-operated slurry pumping device suspended from a mobile crane over Silo 2. This device will be deployed through an existing manway using a bag-in bag-out method to maintain the silo in a sealed condition. In addition to actual K-65 and Silo 3 vitrification, Phase II will demonstrate pneumatic removal of Silo 3 material, radon control for Silos 1 or 2 headspace atmosphere, and off-gas treatment for the vitrification plant. The following major activities are included in the work scope of Phase II Pilot Plant operations:

- K-65 Silo Radon Treatment System (RTS) upgrade (valves and ducting)
- Vitrification plant modification (if required)
- K-65 hydraulic material retrieval
- Silo 3 pneumatic material retrieval
- Vitrification of K-65 and Silo 3 material
- Gem making
- Vitrification furnace off-gas treatment
- Final product handling
- Safe Operation Philosophy
- Data Collection Methodology

Information obtained from the Pilot Plant Phases I and II Treatability Study Program will be used to generate quantitative performance data, and to further refine the remedial design of the final vitrification plant and the cost estimate for full-scale remediation in the following areas:

1) Determine limitations of the vitrification technology during continuous operation.
2) Process design parameters for all process unit operations.
3) Determine scale-up factors (parameters) needed for full-scale production plant design.

Full-scale remedial design will focus on hydraulic waste removal and vitrification treatment for K-65 material, and pneumatic waste removal and vitrification treatment for Silo 3 material. The design of the final treatment facility will take advantage of all "lessons-learned" from the Pilot Plant Treatability Study program.

4.1.4.2 Required Technical Studies

Several areas of the project have been identified that require additional engineering studies and evaluation before their associated detailed remedial design are initiated. The areas identified will include, but not be limited to the following:

- Waste packaging/transportation optimization
- Silo 4 superstructure reutilization
- Interim product storage/retrieval configuration
- Pilot Plant integration analysis
- Melter/product-forming configuration

These studies have been planned and sequenced to occur in parallel to the Title I remedial design development. Each study's completion has been prioritized so that the information will be available when needed for the detailed remedial Title I and II design efforts, for site utilities and the vitrification plant.

4.1.5 Task 1 Deliverables and Milestones

The efforts expended under Task 1 will result in the development of two document packages and the subsequent submittal of three document deliverables in accordance with the project schedule as follows:

Task 1 Deliverable	Date
Functional Requirements Document - Pre-final (90%) Review Package	August 15, 1995
Design Criteria Package - Preliminary (30%) Review Package	August 15, 1995
Design Criteria Package - Pre-final (90%) Review Package	December 4, 1996

4.2 Task 2, Title I/II Design - Remedial Facilities Infrastructure

4.2.1 Preparation of Title I/II Design

Title I/II of the remedial design will focus on the development of drawings, specifications and engineering support documentation necessary to perform the safe removal, treatment and disposal of the silo residues.

Title I Design

In general, Title I engineering and design will be performed to produce Process Flow Diagrams (PFDs), Piping and Instrumentation Diagrams (P&IDs), General Arrangement Drawings (GAs), Site Plan, Selected Equipment Performance Specifications, Equipment Lists, Control Philosophy, Electrical Single Line Diagrams, and Preliminary Engineering Calculations. PFDs will show process flows and material balances. P&IDs will show, in addition to process flow, all the equipment with their tag numbers, control logic, and instrumentation. Based on the PFDs and P&IDs, the GAs will be prepared and sufficiently detailed to show the relative arrangements of all the major equipment, structures, building, major pipe racks, etc., in plan and section.

Procurement Documents

Based on the specific requirements of each remedial design package, a procurement strategy will be developed which will effectively utilize "fixed-price subcontracting" and/or "request for proposal" procurement packages. As the remedial design effort unfolds, bid documents will be developed commensurate with the remedial design progression. A discussion of the level of detail presented in each design package submittal is presented in Section 5.3.

Identify Long-Lead Procurement Items

This activity involves the identification of procurement items that are expected to take significant time to obtain and that may impact the project's construction schedule for completion. Items to be considered for this category primarily include, but are not limited to, the availability and schedule constraints associated with the vitrification furnace, gem-forming machine, electrical substation, and air monitoring equipment.

Construction Schedule

A construction schedule will be developed and refined with the completion of each remedial design construction package. The schedule will provide a rough estimate of time required to complete the specific remedial action and will include an identification of the major construction tasks and subtasks. The target accuracy of the schedule will be logically refined as the design progresses (see Section 5.3 for more details regarding specific submittal information).

Construction Cost Estimate

A cost estimate will be developed and refined for submittal with the pre-final design deliverable. Each cost estimate will provide an estimate of cost required to construct the specific remedial action and will include an identification of the major construction tasks and subtasks. The target accuracy of the cost estimate will be refined as the design progresses (see Section 5.3 for more details regarding specific submittal information).

Title II Design

In general, Title II remedial design effort will consist of detailed engineering calculations, design drawings, and specifications required for construction of the remedial facilities. The final specifications for this project will be prepared using the Construction Specifications Institute format.

4.2.2 Remedial Facilities Infrastructure

In order to achieve the 15-month criteria for initiating substantial physical remedial activities, and to sustain continuous efforts, the Title I and II remedial design efforts for the following remedial activities have been combined into three distinct design packages.

- Title I/II - Underground Utilities/Site Preparation
- Title I/II - Silo Superstructure
- Title I/II - Radon Treatment System

The main purpose of this approach is to logically divide the main detailed design effort into discrete elements of the remedial treatment facilities, such as the underground utilities/site preparation, silo superstructures, and the Silos 1 and 2 headspace radon treatment system, whose Title I/II design can be combined and accelerated independent of the main remedial process facilities in order to sustain continuous substantial and physical remedial actions in the field (following the site preparation activities), while the more complex process facilities complete their design. These components when combined, will form the infrastructure which will support the primary remedial facilities for Operable Unit 4.

4.2.2.1 Underground Utilities/Site Preparation Design

This design package has been specifically scoped and accelerated to satisfy the Section 120(e)(2) requirements to initiate substantial continuous physical remediation within 15 months of the EPA-approved ROD (March 3, 1996). The elements of this design package will focus on the fundamental remedial actions which will support the implementation of the selected remedy.

Operable Unit 4 is located in the southwest portion of the Waste Pit Area on the western side of the FEMP site. The existing utilities in this area are quite limited and insufficient to support the remedial facilities necessary to implement the Operable Unit 4 selected remedy.

The eastern area adjacent to the Operable Unit 4 boundary, where the remedial process facilities will be constructed, is relatively underdeveloped and will require site preparation. Site preparation activities will include, but not be limited to preliminary site grading, the installation of run-on/runoff controls, electrical power, fire protection, sanitary and storm sewer lines, process and potable water, etc., to a convenient termination point to facilitate future connections.

Since the conceptual footprints of the new remedial facilities overlap the K-65 trench area, a portion of the K-65 trench (concrete pipe trench) originally used to house utilities and original material-transfer

piping used to fill the silos may be removed or filled-in as part of the site preparation activities. Currently, the trench contains an active airline and potable water supply to the Waste Pit Area. The demolition of the K-65 trench will be closely coordinated with Operable Units 3 and 5. All active piping interfering with the Vitrification Plant will be relocated.

4.2.2.2 Silo Superstructures Design

Silo residues will be removed hydraulically from Silos 1 and 2 and pneumatically from Silo 3. This work will be accomplished from an enclosed work platform, suspended over each silo dome. The work platform will be structurally mounted to a steel superstructure which will span each silo. As discussed in Section 4.1.4, a study will be performed to investigate the possibility of relocating the Silo 4 superstructure (constructed as part of the Pilot Plant Phases I and II Treatability Study Program) for re-use over Silos 1, 2, or 3. If this is not practical, a new superstructure will be designed for the hydraulic and pneumatic removal operations. The design and construction will be based upon the Silo 4 superstructure design concept to support waste retrieval operations without adversely affecting the structural integrity of the Silos.

4.2.2.3 Radon Treatment System (Silos 1 and 2) Design

In 1991, a removal action was completed during which, a bentonite cap was placed over the contents of Silos 1 and 2 in effort to attenuate the radon emanation rate from the silos. Immediately following the removal action, the radon concentration in each silos' headspace dropped dramatically; however, over time radon concentrations have gradually increased to approximately 1,000,000 pCi/L and 3,500,000 pCi/L in Silos 1 and 2 respectively. Once the bentonite caps in each silo are breached during waste retrieval operations, the attenuation barrier will be compromised and it is anticipated that the silos' radon headspace concentrations may increase. A radon treatment system capable of treating both silo's headspace to reduce radon concentrations to acceptable levels will be designed and constructed.

The design of the radon treatment system (RTS) for the Silos 1 and 2 headspace will be based on the operational data and specific performance measurements to be obtained from the completion of the ongoing Pilot Plant Phases I and II Treatability Study Program. To date, the design of a RTS capable of treating on a continuous basis large volumes of air containing relatively high concentrations of radon

has never been performed. The final design of the RTS will be based on the performance and design of previous successful off-gas treatment systems from both the existing silo RTS and the radon treatment system to be used in the Pilot Plant.

4.2.3 Task 2 Deliverables and Milestones

The efforts expended under Task 2 will result in the development and submittal of three design packages in accordance with the project schedule as follows:

Task 2 Deliverable	Date
• Title I/II - Underground Utilities/Site Preparation - Pre-final (90%) Review Package	September 1, 1995
• Title I/II - Silo Superstructures - Pre-final (90%) Review Package	May 2, 1996
• Title I/II - Radon Treatment System - Pre-final (90%) Review Package	January 2, 1997

Due to their relatively straightforward design, the aforementioned Pre-final (90%) deliverables have been selected by DOE to be submitted to the agencies without first undergoing formal Preliminary (30%) design review package submittals in order to expedite the remedial design schedule. However, in an effort to facilitate the ongoing communication of the technical issues and concerns between the parties, the DOE will informally submit Preliminary (30%) design review packages for informational purposes only to both agencies, in parallel with its own review.

4.3 Task 3, Title I/II Design - Vitrification Plant

The Title I/II design of the vitrification plant includes the following design areas:

- Personnel support/plant buildings and services/process plant
- Melter/product-forming and handling/off-gas

The following subsections discuss each of the planned remedial design areas.

4.3.1 Personnel Support/Plant Buildings and Services/Process Plant

The Title I and II remedial design efforts will focus on the engineering of the remedial process facility, personnel support, and service buildings. These buildings and facilities will form the underlying foundation to house and support the implementation of the selected remedy. The following is a conceptual discussion of these facilities.

Personnel Support

A facility will be designated to support personnel either operating the remedial process plant and/or working directly in the Operable Unit 4 final site remediation activities. This facility will functionally provide change-in/change-out facilities, showers, a break area, and restroom facilities for all personnel.

Plant Facilities

This element of the remedial design package is to develop the Title I and II design for the various building(s)/structure(s) necessary to house the equipment and facilities for the implementation of the selected remedy. The functional nature of these facilities have been conceptually identified, but not limited to the following:

- Waste Retrieval System
- Vitrification Process
- Product Forming Equipment
- Product Handling/Interim Staging Facility
- Off-gas Treatment System

4.3.2 Vitrification Plant

The development of the Title II remedial design for Vitrification Plant, which includes the melter, product forming machine and the off-gas treatment systems, are heavily dependent on the operational data (i.e. optimal design mixture envelope, optimum operating temperature range, residence time, etc.) and performance measurement data (i.e.NO_x/SO_x scrubber efficiency, carbon bed efficiency, etc.) to be

obtained from the completion of the ongoing Pilot Plant Phases I and II Treatability Study Program. As such, this design package has been logically scheduled to begin after the Pilot Plant Phases I and II Treatability Study Program has been completed. This strategy will allow the design team to take full advantage of the technical and operational information obtained from the Pilot Plant Phases I and II Treatability Study Program. This will ensure that design improvements are incorporated directly into the final remedial design and that process design can be optimized to the extent practicable.

The following is a brief conceptual discussion of all the main components included in this design area:

Waste Retrieval

Silo 1, 2, and 3 contents is to be accessed from the top of each silo by an independently supported superstructure to facilitate waste removal and material transfer while adding no additional load to the silo domes. The superstructures is to span the center of each silo to allow deployment of waste retrieval equipment from above the center manway of the silo.

The silo domes are to be modified as necessary to allow for retrieval equipment access while ensuring stability of the dome structure. The waste retrieval systems construction and operation shall not compromise the structural integrity of the silos.

Bulk material retrieval from Silos 1 and 2 shall be performed with a hydraulic mining device. The hydraulic mining device is to be totally supported by and deployed from the superstructure. The K-65 and Silo 3 material are to be transported from the silos via pipeline to the Vitrification Plant Feed Preparation System.

Melter

The vitrification furnace will be an electric (joule-heated) melter capable of melting a wide range of waste materials, at moderately high temperatures. The slurry feed will be delivered from the slurry tank to the melter and enters the melting chamber where it will then be deposited onto the "cold cap" that resides above the molten glass surface. The melter will utilize joule heating, which means that the electric current passes directly through the resistive molten glass, to produce a consistent, durable, stabilized glass

with minimal effluent. The melter will generally operate in the range of 1,250 to 1,350°C (2,250 - 2,450°F) as determined by Pilot Plant Treatability Study results.

Product-Forming Equipment

While melter feeding is in progress, molten glass inventory will be accumulated in the melting cavity and discharged into the gem-maker or directly into a casting container. The shape and size of the glass product will facilitate containerization and anticipated final packaging.

Off-Gas System

The off-gas system for the remedial process facility will utilize the Pilot Plant off-gas system design as a basis. Potential enhancements to meet the continuous operation requirements will be evaluated. The off-gas system design is expected to consist of a quench tower, scrubber, desiccant tower, radon adsorption carbon beds, HEPA filter, blower, and stack.

The remedial facility's exhaust stack will be equipped with an isokinetic sampler which will monitor the off-gas system to verify that particulate and gaseous radionuclide emissions are within regulatory limits during vitrification of K-65 and Silo 3 residues. Radon and other air contaminants discharge limits during remedial operations will be based on the regulatory limits listed in the ARARs/TBCs identified in the Operable Unit 4 ROD.

Interim Staging

The containerized vitrified product will require verification sampling to certify that it has met the waste disposal criteria of the NTS prior to off-site shipment. This, along with shipment preparation activities, will occur at a product staging area at the Vitrification Plant. In addition, a much larger interim storage area will be identified as a contingency to provide a buffer for continued operations in the event of any prolonged programmatic off-site shipping delays.

4.3.3 Task 3 Deliverables and Milestones

The efforts expended under Task 3 will result in the development and submittal of two design packages in accordance with the project schedule as follows:

Task 3 Deliverable	Date
Title I - Vitrification Plant - Preliminary (30%) Review Package	December 4, 1996
Title II - Vitrification Plant - Pre-final (90%) Review Package	September 1, 1997

4.4 Title I/II Design - Final Site Remediation

The Operable Unit 4 remedial design will address demolition and decommissioning of the four silos and related structures, as well as Operable Unit 4 waste management activities. More specifically, the scope of this design effort will focus on the following components of final site remediation:

- Demolition of Silos 1, 2, 3, and 4 and decontamination, to the extent practicable, of the concrete rubble, piping, and other generated construction debris.
- Removal of the Decant Sump Tank and its underdrain system.
- Excavation of contaminated soils within the boundary of Operable Unit 4, to achieve remediation levels. Placement of backfill following excavation to original grade.
- Removal and treatment of any contaminated perched water encountered during remedial activities.
- Demolition of the vitrification process system and associated facilities after use. Decontamination or recycling of debris prior to disposition.
- On-property interim storage of excavated contaminated soils and remaining contaminated debris in a manner consistent with the approved Work Plan for Removal Action 17 (improved storage of soil and debris).
- Continued access controls, maintenance and monitoring of the stored wastes inventories.
- Potential additional treatment and final disposition of stored Operable Unit 4 soil and debris using Operable Unit 3 and 5 waste treatment systems.

The Title I/II remedial design effort will consist of detailed engineering calculations, design drawings, and specifications required for implementation of the final site remediation activities. The final specifications for this project will be prepared using the Construction Specifications Institute format.

4.4.1 Task 4, D&D/Waste Management Design

The Title I/II design of the D&D and Waste Management will include the following design areas:

- Silo structures D&D
- Decant sump tank system D&D
- Remedial process facility D&D
- Waste Management

The following subsections discuss the scope of the D&D/Waste Management design effort.

Silo Structures D&D

The concrete Silos 1, 2 and 3 will be decontaminated to the extent practicable and systematically dismantled shortly after their contents have been removed and treated. Silo 4, which was never used for storage, will be the first silo demolished; as it will serve as a "test bed" for the demonstration of planned D&D technology and methodology to be used for the other silos. It is anticipated that a performance specification will be developed for these D&D activities.

Decant Sump Tank System D&D

Currently, there is an active Decant Sump Tank located below-grade between Silos 1 and 2, which continues to collect liquid through its underdrain system extending beneath both silos. Once Silos 1 and 2 have been systematically dismantled and the soil remediation underneath both those facilities is underway, the Decant Sump Tank and underdrain system will be excavated and systematically removed. It is anticipated that these remedial activities will be implemented via a performance specification.

Remedial Process Facility D&D

Once the remedial process facilities, which were constructed for the removal treatment and disposal of the Silos 1, 2 and 3 residues are no longer needed, they will systematically undergo D&D. A D&D sequencing plan will be developed as part of this design effort.

Waste Management

The construction envisioned for remedial design activities is not anticipated to produce any hazardous wastes. However, all wastes will be subject to characterization. If the waste characterization indicates any waste material contains hazardous waste constituents, the material would be subject to the substantive RCRA requirements for the management, storage, and final disposition as RCRA hazardous waste.

Final site remediation, including demolition and decontamination of the silos and final debris disposition will begin as soon as practicable following remedial vitrification operations. Although implementation of D&D for the Operable Unit 4 silos will be done independent of the Operable Unit 3 and Operable Unit 5 schedules, design activities involving soil remediation, as well as D&D of the silo structures, will be developed consistent with the Operable Unit 5 and Operable Unit 3 RODs, respectively. Those ARARs and TBCs identified in the Operable Unit 4 ROD, and updated in this document, that pertain to residual soil remediation and demolition and decontamination of the silo structures will be considered by Operable Unit 5 and Operable Unit 3 during planning of their remedial design and remedial action activities. Furthermore, there is expected to be coordination with Operable Unit 2 regarding on-site disposal of rubble and debris, with Operable Unit 3 for the latest decontamination technologies, and with Operable Unit 5 regarding final cleanup of the soil.

4.4.2 Task 4 Deliverable and Milestone

The efforts expended under Task 4 will result in the development and submittal of one design package in accordance with the project schedule as follows:

Task 4 Deliverable	Date
Title II - D&D/Waste Management - Pre-final (90%) Review Package	December 7, 2000

4.5 Task 5, Title I/II Design - Final Site Remediation

The Title I/II final site remediation design effort will be performed under one design package deliverable as follows:

- Title I/II - Final Site Remediation - Pre-final (90%) Review Package

4.5.1 Final Site Remediation Design

The Title I/II design of the final site remediation will include the following:

- Contaminated soil remediation
- Contaminated perched water remediation (if required)
- Final Site Preparation

The following subsections discuss each element of the planned remedial design areas.

Contaminated Soil Remediation

Contaminated soils within the boundary of Operable Unit 4 will be excavated to the extent necessary to attain the remediation levels defined by the Operable Unit 4 ROD (see Tables 3-1 and 3-2).

Contaminated Perched Water Remediation

Any perched water encountered during final remediation activities will be collected and sent to FEMP Advanced Waste Water Treatment facility for treatment prior to discharge to the Great Miami River.

Final Site Preparation

On completion of soil remediation within the Operable Unit 4, the excavated areas will be filled with suitable backfill and returned to a grade consistent with the future land-use strategy determined by the approved Operable Unit 5 ROD.

4.5.2 Task 5 Deliverable and Milestone

The efforts expended under Task 5 will result in the development and submittal of one design package in accordance with the project schedule as follows:

Task 5 Deliverable	Date
Title I/II - Final Site Remediation - Pre-final (90%) Review Package	December 7, 2001

4.6 Design Support Activities

The activities performed under this subtask will consist of various design support activities necessary to complete the remedial design, and support the preparation of final specifications and plans.

The efforts performed in this area will consist of the following design support activities:

- Incorporation of regulatory requirements
- Waste packaging/transportation
- Waste disposition

4.6.1 Regulatory Requirements in Remedial Design

The CERCLA remedial actions must achieve standards or levels of control that are consistent with environmental laws or regulations, which are termed applicable or relevant and appropriate requirements (ARARs). A detailed discussion of the ARARs and "to be considered" (TBC) criteria identified for Operable Unit 4 is provided in the Record of Decision; a complete list of the approved ARARs and TBCs is provided in Appendix A of this document. All activities undertaken as a result of the ROD must comply with the ARARs and TBCs that pertain to the activity. The selected remedy will be designed to comply with the identified ARARs and TBCs, unless those requirements have been properly waived in accordance with CERCLA (40 CFR § 300.430(f)(1)(ii)(C)), and will be performed in accordance with all pertinent DOE Orders. [Note: No waiver of any ARAR or TBC is expected during final remediation of Operable Unit 4.]

The three types of ARARs include chemical-specific, location-specific, and action-specific ARARs. Chemical-specific ARARs were limited to the constituents of concern (COCs) identified in Appendix D of the RI Report for Operable Unit 4. Chemical-specific ARARs for Operable Unit 4 have been identified for organic chemicals, inorganic chemicals, and radionuclides in drinking water. Location-specific ARARs generally restrict certain activities, or restrict or require where certain activities may be conducted, solely because of geographical, hydrologic, or land use concerns. Action-specific ARARs are usually restrictions on the conduct of certain activities or the operation of certain technologies at the site.

In addition, remedial actions must incorporate "to be considered" (TBC) criteria where needed to be protective of human health and the environment. TBCs include non-promulgated advisories, criteria, or guidance, and are used to augment the proposed action in situations where standards or ARARs do not exist, or existing requirements are not satisfactory to ensure protectiveness. For the proposed remedial

activities, portions of DOE Order 5400.5 were selected as TBCs to ensure adequate protection of the public during and following remediation. TBC requirements which are included in a CERCLA ROD are enforceable cleanup standards under CERCLA.

The National Contingency Plan (NCP) of CERCLA requires attainment of those ARARs that are substantive in nature, rather than administrative (CERCLA Compliance with other Laws manual, Draft Guidance, USEPA OSWER Directive 9234.1-01, August 8, 1988). Applicable requirements are cleanup standards or other environmental protection requirements that specifically apply to the substances or activities for which compliance with the requirements is mandated. Applicable requirements must be met at both on-site and off-site locations conducting the regulated activity, or managing the regulated waste material. The term "on-site" as used in this document is consistent with the CERCLA definition, and refers to the FEMP property and any adjacent areas of associated contamination which may extend beyond the facility boundary.

The basic considerations as to whether a requirement is relevant and appropriate are "whether the requirement addresses problems or situations that are sufficiently similar to the circumstances of the release or remedial action contemplated [i.e., relevant] and [emphasis added] whether the requirement is well-suited [i.e., appropriate] to the site, and therefore both relevant and appropriate" [40 CFR §300.400(g)(2)]. To be relevant and appropriate, the requirement must meet both the relevant and appropriate criteria. Relevant and appropriate requirements are not required to be met at off-site locations.

A generalized discussion of the major ARARs and TBCs that will impact the remedial design phase of remediation is included in the following sections. As the RD progresses to the final design package stage for each individual action to be performed, compliance methodologies for the specific ARARs will be defined for the specific action. As a specific Design Package is prepared, those ARARs and TBCs that pertain to the action will be identified and incorporated into the design and procedure for operation for that activity.

The ARARs and TBCs for remediation of Operable Unit 4, identified in the EPA approved Operable Unit 4 ROD and included in Appendix A of this document, are considered final with regard to the Operable Unit 4 Remedial Action. Compliance with regulatory requirements that are newly promulgated or modified after execution of the ROD will not be enforceable and will be considered only when determined to be applicable, or relevant and appropriate, and necessary to ensure that the remedial action is protective of human health and the environment.

A detailed discussion of compliance methodologies for the substantive design requirements found in the ARARs and TBCs will be presented in the Title I and II design package submittals, as appropriate.

4.6.1.1 Permitting Requirements and Site-wide Monitoring

CERCLA Section 121(e)(1) states that no federal, state, or local permit shall be required for any removal or remedial action conducted entirely on site, where such remedial action is selected and carried out in compliance with Section 121. Therefore, the RD/RA activities involved with Operable Unit 4 remediation are not required to obtain any federal, state, or local permits. However, the project must be conducted in accordance with the terms and conditions of those permits that otherwise would have been required, in accordance with the CERCLA and Section XIII.B of the Amended Consent Agreement. Identification of those permits that would otherwise be required, as well as a discussion of the design approach for compliance with the major ARARs and TBCs for air, surface water, and groundwater media, is included in this document. A detailed explanation of how the remedial action will meet the standards, requirements, criteria, or limitations of the permits and other ARARs will be included in the Operable Unit 4 Title I and II design review package submittals.

In addition to air, surface water, and groundwater monitoring requirements associated with a permit or other ARAR for remediation of Operable Unit 4, existing site-wide programs that address contamination of air, surface water, and groundwater media at the FEMP site will continue to be conducted during final remediation of Operable Unit 4. These site-wide monitoring programs are designed to monitor ambient air conditions both on-site and at the property boundary, the concentration of contaminants in treated wastewater discharged to the Great Miami River, and contaminant levels within the groundwater under the site. Environmental air monitoring at the FEMP also includes continuous monitoring for radon at

various site locations. These three programs are intended to identify the potential for off-site releases as well as minimize the effects from site activities on environmental media.

Field monitoring for radionuclides will be conducted on an activity specific basis in accordance with approved site procedures and requirements under the DOE 10 CFR Part 835 and DOE Orders for worker protection, and to evaluate personnel exposure. This will be an ongoing activity as long as there is project activity in the field.

The following sections summarize the major ARARs and TBCs, and general permit requirements for all potential release pathways. Also included is a generalized discussion of the monitoring and other major criteria that affect the remedial design that are necessary to meet the substantive requirements of the ARARs and TBCs identified in the ROD.

4.6.1.2 Requirements Affecting Emissions to Air

Ambient air quality in areas accessible to the public is regulated by both state and federal standards under the Clean Air Act (CAA). There are three potential sources of air emissions during the remedial activities planned for Operable Unit 4: 1) radon and other gaseous or particulate releases resulting from K-65 and Silo 3 material removal and treatment; 2) dust from construction and earth-moving activities; and 3) heavy equipment exhaust. In addition to the federal NESHAP standards, state permit requirements, and DOE Orders that impact design and operation of air contaminant sources, the State of Ohio has several regulations that govern the control of fugitive dust and visible particulate emissions, and prohibit the operation of air pollution nuisances. Emissions of radon, and other air contaminants in the off-gases generated during operation of the melter to treat the waste materials, will be controlled through collection and treatment. Radon generated during material removal from the silos will also be contained or treated. Measures for reducing fugitive dust emissions, such as surface wetting or using dust suppressants, will be used in exposed soil areas as appropriate. Particulates will be controlled by approved site standard operating procedures and the use of best available technology, including off-gas control equipment during waste treatment. While not possible to control emissions from individual vehicles, emissions of vehicle exhaust will be minimized through proper planning and scheduling of activities.

State Permitting Requirements

The only State of Ohio air permits that would normally be required are as follows:

- OAC 3745-31-02(A) states, ..."no person shall cause, permit, or allow the installation of a new source of air pollutants or cause, permit, or allow the modification of an air contaminant source without first obtaining a Permit to Install.
- OAC 3745-35-02(A) states, ..."no person may cause, permit, or allow the operation or other use of any air contaminant source without first applying for and obtaining a Permit to Operate."

Under ordinary circumstances, state Permits to Install and Permits to Operate would be required for the proposed remedial action; however, under CERCLA, a permit is not required as long as the requirements normally included in such a permit are met.

The proposed remedial action must not prevent or interfere with the attainment or maintenance of pertinent ambient air quality standards; must not result in a violation of any pertinent laws; and must employ the best available technology (BAT) to control emissions. Furthermore, the proposed remedial action must be operated in compliance with pertinent air pollution control laws; must be constructed, located, or installed in compliance with the terms and conditions of a Permit to Install; and must not violate NESHAPs adopted by the Administrator of the EPA.

The proposed remedial action will not interfere with the attainment or maintenance of any pertinent air quality standards, and will not result in a violation of any pertinent laws. BAT will be used to control emissions from the process. Particulate emissions from the additive bins will be controlled by the installation of dust collection devices. The furnace off-gas passes through a quench tower, scrubber, desiccant, carbon beds and HEPA filtration; moreover, the batch and mixing tanks and thickener (other process equipment) are vented into the off-gas system downstream of the scrubber which will facilitate removal of radon from these unit operations by the carbon bed emissions control system.

NESHAP Requirements

The federal Clean Air Act (CAA) establishes specific requirements under the National Emissions Standards for Hazardous Air Pollutants (NESHAP) program which affect remedial design for Operable Unit 4. They are: 1) emissions of radon and its daughters [40 CFR Part 61 Subpart Q] and 2) emissions of radionuclides other than radon and its daughters (40 CFR Part 61 Subpart H).

40 CFR Part 61 Subpart Q establishes a radon flux rate standard for radium bearing material of 20 pCi/m^2-s. This requirement will govern radon control during storage of vitrified material on-site, as well as operations involving final disposition of radium bearing soil and debris in an on-property disposal facility. [Note: Due to off-site disposal of radium bearing waste from Operable Unit 4, little, if any, of this material is expected to be disposed onsite.]

40 CFR Part 61 Subpart H sets a maximum dose rate standard for radionuclides, other than radon and its daughters, of 10 mrem/yr to any member of the public, measured as an effective dose equivalent. Radionuclide emission measurements shall be made at release points which have the potential to discharge radionuclides into the air in quantities that could cause an effective dose equivalent of 0.1 mrem/yr or greater. Air dispersion modeling will be conducted for those activities that have a potential to release emissions in excess of this standard. The potential to release radionuclides will be determined on a basis of characterization data and unit-specific design features of the off-gas treatment system. Any activity that modeling indicates has the potential to release a dose of 0.1 millirem per year (mrem/yr), due to radionuclides other than radon and its decay products, to an individual off-site must have a monitoring system installed at locations appropriate to quantify the release from that activity. Therefore, the design of point sources and associated control equipment that will be operated during the implementation of this remedial action will be required to accommodate individual monitoring for radionuclides, as well as for chemical, and/or particulate emission levels.

DOE Order Requirements

Parts of DOE Order 5400.5 are included in the ROD as TBC criteria, and establish standards and limits for protection of the public from radionuclides, including radon. The Order requires that potential exposures to radon be minimized through the use of "as low as reasonably achievable" (ALARA)

principles in the design and operation of the remedial treatment facilities. These principles include the use of administrative and engineering controls, including controlled areas during remedial operations to restrict personnel access to hazardous areas.

Radon emissions from the silo structures will comply with the Federal Facility Agreement for Control and Abatement of Radon-222 Emissions (November 14, 1991), or an EPA-approved alternative agreement. Strategic monitoring stations will provide data to show compliance with the radon release limits in the Order, and for the FFA and NESHAP Subpart Q requirements. Additionally, the operation of a RTS will capture radon and remove it from the silo headspace during activities conducted at Silos 1 and 2.

Release of radon from the remedial treatment facility will be controlled to ALARA level through appropriate design of off-gas control equipment, as well as through use of administrative controls. These levels are expected to meet the Derived Concentration Guide (DCG) level established in the Order for radon releases that may reach the public or other off-site receptors.

Following remediation, releases of radionuclides, including radon, from the stored waste that has been treated in the remedial treatment facility will be minimized due to the non-porous (vitrified) waste form, along with appropriate monitoring and ALARA controls.

4.6.1.3 Requirements Affecting Emissions to Surface Water

Regulations under the Clean Water Act (CWA) establish requirements for discharges to surface waters, and govern dredge and fill activities. Surface water in the area of the FEMP may be impacted during final remediation of Operable Unit 4 by discharge of wastewater, stormwater runoff, and activities conducted in wetland areas.

NPDES Permitting

The proposed remedial action will result in the generation of wastewater which will be discharged to the FEMP Advanced Wastewater Treatment Facility (AWWT). Generated wastewater streams will include both process wastewaters and the accumulations of rain water from the diked concrete pads. Wastewaters

anticipated to be generated during Operable Unit 4 remedial activities include: wastewater from various unit operations associated with the vitrification process, and wastewater generated during gross D&D activities of the silo structures, the decant sump system and the vitrification process. Each of these wastewater streams will be characterized to determine the appropriate means of treatment in the site AWWT facility, with the treated effluent being discharged under the existing site National Pollution Discharge Elimination System (NPDES) permit. Activities will be managed to ensure compliance with all effluent limitations and permit conditions stipulated by the existing FEMP permit. In addition to monitoring specific wastewater streams, existing site-wide surface water sampling under the Clean Water Act (CWA) at various locations at the FEMP will continue through final remediation.

Pollutants that are likely to be encountered during remediation activities include oils, greases, heavy metals, and uranium and other radionuclides. Depending on the concentrations of pollutants present in the wastewater, "pretreatment" may be required to facilitate final treatment in the FEMP's AWWT facility, and to ensure the requirements of the NPDES permit are met. All wastewaters generated during remediation activities will be required to meet the limits established in the FEMP NPDES permit prior to discharge.

Ohio regulations require that no person shall cause, permit, or allow the installation of a new disposal system, or cause, permit, or allow the modification of a disposal system without first obtaining a Permit to Install. No person may discharge any pollutant or cause, permit, or allow a discharge of any pollutant without applying for and obtaining an Ohio NPDES permit. Under ordinary circumstances, a Permit to Install and an Ohio NPDES permit would be required for the proposed remedial action; however, under CERCLA, a permit is not required as long as the requirements normally included in such a permit are met.

The proposed remedial action must not prevent or interfere with the attainment or maintenance of any pertinent ambient water quality standards; must not result in a violation of any pertinent laws; and must employ the best available technology. All discharges authorized under the NPDES permit shall be consistent with the terms and conditions of the permit. Facility expansions, production increases, or process modifications which result in new, different or increased discharges of pollutants, must be

reported to the Ohio EPA. Furthermore, a Best Management Practices (BMP) program to prevent the release of toxic or hazardous pollutants to waters of the United States must be developed and implemented as part of the NPDES permit process.

The proposed remedial action will not interfere with the attainment or maintenance of any water quality standards, and will not result in a violation of any applicable laws. Wastewater streams generated by the vitrification process will not significantly alter the character of the plant effluent streams. The current FEMP NPDES permit references an approved BMP program.

Operable Unit 4 shall keep Operable Unit 5 apprised of the volume of wastewater generated and the types and expected concentration ranges of pollutants for all wastewater streams to be discharged to the FEMP's AWWT facility. Operable Unit 5 will be responsible for treating the wastewater, and establishing the discharge scheme through the FEMP's AWWT facility to ensure that appropriate treatment is provided to accomplish the goals of remediation and to ensure NPDES compliance. Optimization and consolidation of treatment systems will be effected to the extent practicable to improve system performance and reduce operational costs to the site.

Wastewater Management

Wastewater that has contacted the waste materials will be generated during the process of remediation. The Silo 1 and 2 contents and decant sump tank sludge will be removed as a slurry with a water content of approximately 80 percent. After the slurry enters the treatment process, it will be dewatered to increase the solids content to the level required for vitrification. The supernatant water will be recycled for reuse in the hydraulic removal operations at the silos. This water will also be recycled for use in off-gas scrubbing operations for treatment of off-gases during the vitrification process.

Wastewater that is not recycled for use in the hydraulic removal operations, and wastewater generated from treatment of off-gases in the scrubber, will be pretreated as required, and routed to the FEMP AWWT facility prior to being discharged to any receiving waters.

During D&D activities involving the silo structures, a high-pressure water jet may be used to remove loose sediment and debris. The debris, sediment, and contaminated water will be contained, and separated for management. The aqueous fraction will be pretreated, as required, and routed to the FEMP's AWWT facility for treatment. The concrete debris and sediment will be dispositioned with other contaminated concrete from Operable Unit 4 remediation activities.

Throughout the design phase of Operable Unit 4 remedial activities, including the design for management of wastewater, an emphasis will be placed on pollution prevention. Pollution prevention will minimize the amount of additional chemicals introduced during remediation, and the amount of contaminated wastewater generated. Compliance with discharge limitations and design of additional pretreatment requirements, if any, will be evaluated during the remedial design process.

Stormwater Management

During remedial design, runoff control measures will be specified to protect the storm sewer system, undisturbed land within Operable Unit 4, and surrounding drainage ditches from contamination, erosion, or solids build-up. As part of the design process, the Operable Unit 4 area will be reviewed for existing drainage patterns; the locations of all storm sewer system inlets and drainage paths to natural waterways will be considered during design to ensure appropriate protection. All runoff control practices will be in accordance with those identified in the existing FEMP Stormwater Pollution Prevention Plan.

On completion of activities involved with remediation of Operable Unit 4, any disturbed land will be stabilized in an expedient manner. This will include proper backfill of excavations and other borings or pits resulting from dismantling of the silo structures and the vitrification process unit and removal of contaminated soils; grading the area in accordance with existing drainage patterns; and where appropriate, seeding the disturbed area to prevent future erosion.

All vitrification material and debris generated from D&D activities will be properly containerized and protected from exposure to weather by tarps or other temporary enclosures prior to final disposition, thus reducing the potential for contamination to mix with stormwater runoff (rainfall or snow melt).

Protection of Wetlands

Under the CWA, permits are normally required for activities that discharge material into United States waters (including wetlands). Installation of utility lines to serve the proposed vitrification unit may impact wetland areas. This activity can be accomplished under a nation-wide permit granted by regulation for this class of activity without the need to obtain a separate permit. In addition, no person may discharge materials into wetland areas without obtaining a permit from the United States Army Corp of Engineers (COE). To obtain this permit, a State Water Quality Certification is required. The State of Ohio has been granted State Water Quality Certification for Nationwide Permits #12, for utility lines, and #14 for construction of access roads. The proposed remedial action will comply with the conditions set forth in these permits during remediation of Operable Unit 4 to minimize any impacts on wetland areas.

Restrictions on the location of a solid waste disposal facility with respect to potential impacts on wetlands are established in 40 CFR Part 258.12. Siting of a facility to dispose of residual soil and debris from Operable Unit 4 remediation activities will be in accordance with the Operable Unit 2 approved ROD and remedial design documents. Operable Unit 2 will consider potential impacts on wetlands when siting the disposal facility.

4.6.1.4 Groundwater Monitoring

Groundwater monitoring is not specifically required during remedial activities at Operable Unit 4 unless circumstances necessitate the need to determine the impact of an activity or accidental release to the environment on the groundwater quality.

An on-going sitewide groundwater monitoring program at the FEMP is conducted by Operable Unit 5. Since the Remedial Investigation report for Operable Unit 5 did not indicate that Operable Unit 4 is a source of existing sitewide groundwater contamination, routine sampling of existing wells in the vicinity of Operable Unit 4 is not being proposed.

Removal of material from Silos 1 and 2 by hydraulic mining and remediation of the area is not expected to contribute to groundwater contamination in the vicinity of Operable Unit 4. In addition, the decant sump tank underneath the silos is fully functional and continues to be monitored; any accumulated liquids

from the silo underdrain will continue to be managed on a continuous basis throughout Operable Unit 4 remediation activities.

The decant sump tank system consists of a silo underdrain which extends out beyond the perimeter of the silo walls. This underdrain collects liquids that may be leaking from the bottom of the silos, as well as seepage from the walls of the silos that would migrate down to the underdrain. The decant sump tank drains and contains liquids collecting in the underdrain of the silos. Liquids collected in the decant sump tank are periodically pumped and treated in the FEMP Advanced Waste Water Treatment System. By monitoring the rate and frequency at which the decant sump tank reaches capacity the leakage rate of the silos will be able to be determined.

In addition, appropriate design and operational controls, such as secondary containment for silo wastes containing liquids, will be incorporated into the vitrification plant and storage facility structures to prevent spills or discharges that may affect groundwater. In the event of a spill or release, or suspected release of a hazardous substance which could impact groundwater, Operable Unit 5 would be notified to assist in any corrective measures required to mitigate any potential impacts to groundwater resources. In addition to spill response, a Removal Site Evaluation (RSE) may be conducted to determine whether a Removal Action is warranted. A removal action could include sampling of existing groundwater monitoring wells in proximity to Operable Unit 4 to determine impacts on groundwater, or placement of additional wells. Any groundwater monitoring activities involving Operable Unit 4 will be coordinated by Operable Unit 5.

RCRA Groundwater Monitoring

Groundwater monitoring is required under RCRA for certain land disposal hazardous waste management units (HWMUs) at the FEMP. No HWMUs exist in Operable Unit 4, and none are planned to be created as a result of final remediation. However, the existing RCRA routine groundwater monitoring system for the FEMP site consists of 33 monitoring wells installed at the downgradient property boundary of the FEMP, which satisfies RCRA groundwater monitoring requirements for the entire site, and in addition provides continual site-wide CERCLA monitoring. Analytical data from these wells may be used to determine the effects of any remedial activity in Operable Unit 4 on the groundwater.

If, during the RD/RA activities, contaminants are identified in groundwater other than those on the current parameter list for the routine program, the parameter list will be revised to include those contaminants. Order 6 in the Director's Findings and Orders, September 10, 1993, negotiated with the Ohio EPA addresses handling changes to the routine RCRA groundwater monitoring program.

4.6.1.5 Miscellaneous Requirements

The residues in Silos 1, 2, and 3 are by-product material which is excluded from regulation under RCRA by 40 CFR Part 261.4(a)(4). The residues resulted from the production of uranium metal from source material such as pitchblende ores. Since the waste materials meet the exclusion, the RCRA regulations are not directly applicable as ARARs. However, the excluded materials stored in the silos contain elevated levels of natural metals such as lead which exhibit a characteristic of RCRA hazardous waste. Due to the hazard associated with the toxicity of the metals, the substantive requirements of RCRA are adopted as relevant and appropriate to ensure protectiveness during remedial design activities.

RCRA Tank Design

Design requirements for tanks are established in 40 CFR Part 264.192 (OAC 3745-55-92). Tank systems must be designed with a material compatible with the waste to be stored or treated in the tank and have sufficient structural strength and corrosion protection to ensure it will not collapse, rupture, or fail. Tank systems must be supported and protected against physical damage and excessive stress due to settlement, vibration, expansion, or contraction. In addition, design of tank systems must include spill prevention controls, such as check valves and dry disconnects, and overfill prevention controls, such as level sensing devices and automatic feed cutoff controls.

Prior to being placed in use, the tank system must be inspected and shown to be free from weld breaks, punctures, scrapes of protective coatings, cracks, corrosion, and other structural damage. In addition, tank systems must be inspected for structural stability, and tested for tightness to ensure tank and ancillary equipment will not fail under design loads.

RCRA tank systems must be provided with a secondary containment system that meets the requirements of 40 CFR Part 264.193 (OAC 3745-55-93). Secondary containment systems must be designed to be

capable of detecting and collecting releases to prevent migration of wastes or accumulated liquids to the environment. The secondary containment system must be constructed of a material that is compatible with the waste to be managed and must have sufficient strength and thickness to prevent failure due to anticipated pressure gradients, climatic conditions, and daily operations. The base of the secondary containment system must also be designed to prevent failure due to settlement, compression, or uplift.

Ancillary equipment associated with tanks systems must also be provided with secondary containment, unless it is visually inspected on a daily basis and consists of one or more of the following:

- aboveground piping (exclusive of flanges, joints, valves, and other connections),
- welded flanges, welded joints, and welded connections,
- sealless or magnetic coupling pumps and sealless valves, or
- pressurized aboveground piping with automatic shut-off devices.

Secondary containment must meet the following criteria:

- contain any spills or leaks,
- prevent migration of any spills through the liner,
- be free of any cracks, joints, or other breaches,
- have sufficient slope to convey leaked or spilled material down to a sump area where it can be visually detected by periodic (daily) inspection, and
- have a system in place that allows removal of any leaked material within 24 hours.

Treatment, Storage, or Disposal Facility Preparedness and Prevention

Treatment facilities must be designed to minimize the possibility of a fire, explosion or any unplanned sudden or non-sudden release of hazardous waste to air, soil, or surface water which could threaten human health or the environment (40 CFR Part 264 Subpart C). Facility design must include:

- an internal communications or alarm system capable of providing immediate emergency instruction to personnel,
- a device capable of summoning assistance from emergency response personnel, and
- portable fire extinguishers, fire control equipment, spill control equipment, decontamination equipment, and water at adequate volume and pressure to supply fire control equipment.

Emergency communication and alarm systems must be immediately available to all personnel during handling of hazardous waste. Finally, aisle space must be maintained to allow for unobstructed movement of personnel and emergency response equipment (i.e., fire protection, spill control) to any area of the facility.

Use and Management of Containers

The material produced by the vitrification process will not contain any free liquids. Therefore, the container storage area will only be required to be designed to drain and remove liquids resulting from precipitation, and to prevent containers from coming in contact with accumulated liquid (40 CFR Part 264 Subpart I).

Waste Characterization

The construction envisioned for remedial design activities is not anticipated to produce any hazardous wastes. However, all wastes will be subject to characterization. If the waste characterization indicates any waste material contains hazardous waste constituents, the material would be subject to the substantive RCRA requirements for the management, storage, and final disposition as RCRA hazardous waste.

Residual Soil Remediation and Demolition and Decontamination of Silo Structures

Final site remediation, including demolition and decontamination of the silos and final debris disposition will begin as soon as practicable following remedial vitrification operations. Although implementation of D&D for the Operable Unit 4 silos will be done independent of the Operable Unit 3 and Operable Unit 5 schedules, design activities involving soil remediation, as well as D&D of the silo structures, will be developed consistent with the Operable Unit 5 and Operable Unit 3 RODs, respectively. Those ARARs and TBCs identified in the Operable Unit 4 ROD, and updated in this document, that pertain to residual

soil remediation and demolition and decontamination of the silo structures will be considered by Operable Unit 5 and Operable Unit 3 during planning of their remedial design and remedial action activities. Furthermore, there is expected to be coordination with Operable Unit 2 regarding on-site disposal of rubble and debris, with Operable Unit 3 for the latest decontamination technologies, and with Operable Unit 5 regarding final cleanup of the soil.

4.6.2 Waste Packaging/Transportation

Because the vitrification process developed for the silo residues reduces the volume of silo residues, the radionuclides in the residues are concentrated. An understanding of this concentration and how it relates to United States Department of Transportation (DOT) requirements, the NTS waste acceptance criteria (NVO-325), and DOE ALARA principles are required to determine final packaging specifications. An analysis is currently being performed to evaluate and optimize the packaging configuration and shipping requirements for the vitrified wastes, to quantify their impact on costs of disposal for the vitrified residues, and to define the shielding requirements for the container configuration to eliminate special handling issues. This evaluation is intended to produce an acceptable packaging and shipping concept for the several waste form compositions and configurations, with the eventual comparison of options resulting in an optimization of the overall cost for waste disposition. The final product handling, packaging, transportation, and disposal costs have a significant impact on the total cost of this remedial action.

4.6.3 Waste Disposition

To the extent practicable, final remedial wastes generated will be decontaminated. Items that are decontaminated to the extent that they meet free release criteria will be released for unrestricted use, or will be recycled, reused, or disposed in a solid waste/sanitary landfill. Contaminated soils and debris will be dispositioned consistent with the RODs for Operable Units 5 and 3 to take advantage of any applicable treatment methods or decontamination technologies those Operable Units have developed for soils and debris. This integrated site-wide disposal approach allows Operable Unit 4 to take advantage of any applicable waste minimization initiatives or bulk disposal options developed by Operable Units 5 and 3. Waste disposition coordination with Operable Unit 3 and Operable Unit 5 will be discussed in Operable

Unit 4 Title I/II, Decontamination and Demolition/Waste Management design documentation and will be finalized and incorporated as part of the Title I/II, Final Site Remediation design.

Free release criteria for unrestricted release of material will be specified based on current site procedures, Nuclear Regulatory Commission (NRC) guidelines, and DOE Orders. The free release criteria will specify which materials are candidates for free release, the contamination levels at which they are considered safe for free release, and the methods for demonstrating compliance with the safe levels. Decontamination of materials for free release for unrestricted use minimizes contaminated waste generation, which reduces special disposal and handling and their associated costs.

4.7 Community Relations

As a Superfund site, Fernald must comply with certain requirements for informing and involving the public. The *Community Relations Plan* (CRP) for the U.S. Department of Energy Fernald Environmental Management Project, Revision 4, provides details about how management will involve the public in decisions related to the site during the RD and RA and Operations and Maintenance phases. Under the RD and RA phases, requirements are limited to revising the CRP, if determined necessary by the lead agency (DOE), and notifying the public at the beginning of the RD stage -- prior to implementation of the RA phase. The CRP is designed to comply with the public participation requirements in the NCP and its empowering legislation, CERCLA. It also reflects EPA guidance in *Community Relations in Superfund: A Handbook* (January 1992). The CRP sets forth activities under the Amended Consent Agreement between DOE and EPA. The CRP also complies with the requirements of all applicable laws and regulations, including NEPA and the FFCA.

The CRP was revised in September/October 1994. The Ohio EPA approved the revised CRP in December 1994 and the EPA approved the CRP in January 1995. Throughout the duration of Fernald remediation activities, the CRP may be revised to reflect changing community concerns, as well as changes in the law, regulations or regulatory agreements.

Required Public Involvement Activities During Remedial Design and Remedial Action

- Upon completion of the final engineering design, prepare a fact sheet describing the remedial design [NCP 300.435].
- Provide a public briefing upon completion of the final engineering design and prior to the beginning of the remedial action [NCP 300.435].

Throughout the Operable Unit 4 RD and RA phases, the public will be informed of the status of RD and RA activity schedules and progress, as well as any new findings or significant developments. Upon submittal of the draft and final RD work plans to EPA, key stakeholders, such as community leaders and, members of the Fernald Citizens Task Force and F.R.E.S.H. Inc., will be informally notified of the documents' availability at the Public Environmental Information Center (PEIC). The PEIC is located in the JAMTEK Building, 10845 Hamilton-Cleves Highway, Harrison, Ohio (513-738-0164). The PEIC is open: Monday and Thursday, 9 a.m. to 7 p.m.; Tuesday, Wednesday, Thursday, 9 a.m. to 4:30 p.m.; and Saturday, 9 a.m. to 1 p.m.

When practicable, Operable Unit 4 management will offer public involvement opportunities -- surpassing regulatory requirements -- throughout the RD, RA, and Operations & Maintenance phases of Fernald site cleanup. For example, as identified in the CRP, following completion of the final engineering design for the first construction package under RD, a fact sheet describing general engineering design for all components will be distributed to the general public. A public briefing will also be held to discuss the Operable Unit 4 actions to be undertaken. At a minimum, these opportunities will reflect regulatory requirements, as well as DOE's commitments for public involvement at Fernald.

Supplemental Public Involvement Activities

Following are examples of some supplemental public involvement activities which may be conducted during the Operable Unit 4 RD and RA:

Public Meetings	Media relations
Public Information and notification	Written materials and video stories
Fernald Visitors Bureau (tours and speakers)	Fernald Precollege Education Outreach programs
Presentations to interested community groups and elected officials	When appropriate, environmental education programs

4.8 Project Completion/Closeout

This task covers all efforts related to the administrative closeout of the Operable Unit 4 remedial design. The task begins after the completion of all technical activities under the work plan. The task covers all the work involved in compiling remedial design decision-making documents for inclusion into the administrative record.

The following are typical document requirements:

- Engineering calculations
- Studies/reports
- Final design drawings
- Final specifications
- Bid documents
- Project files
- Data validation packages

Within 60 days of completion of all remedial design activities, the DOE will submit to the EPA an index of all the remedial design information included into the administrative record.

SECTION 5.0

MANAGEMENT APPROACH

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5.0 MANAGEMENT APPROACH

This work plan supports the remediation of Operable Unit 4 at the Fernald Environmental Management Project. The governing document is the Amended Consent Agreement between the DOE and the EPA Region V, signed in September 1991. As such, ultimate project management responsibility lies with these two agencies as defined by this agreement. In addition, the OEPA has been granted regulatory authority over certain RCRA activities. Each agency has engaged contractors to perform identified scopes of work related to their prime areas of responsibility for site remediation. Figure 5-1 shows this responsibility matrix, and Figure 5-2 identifies the lead personnel.

Within each agency, various organizations and offices have been delegated specific program responsibilities. Direct management of the Operable Unit 4 Remediation program activities is delineated as described in Section 5.1.

5.1 Project Staffing

The DOE Operable Unit 4 Branch Chief will provide the overall programmatic direction for this project. The FERMCO CERCLA/RCRA Unit 4 Manager, will provide for the overall project management and technical guidance to the FERMCO team. Within the Operable Unit 4 organization, the Remediation Plant Project Manager is directly responsible for all remedial design activities. The Remediation Plant Project Manager reports directly to the CERCLA/RCRA Unit 4 Manager. All support divisions will contribute to the remedial design efforts. The FERMCO organization consists of project organizations, support divisions, and service departments. The support divisions will provide a multifaceted-discipline team of full-time/part-time personnel to the project on a matrix basis. This may range from a simple point of contact (such as the procurement, safety, and quality control representatives) to a full department (such as Environmental, Engineering, or Construction). Service organizations (such as Nuclear Safety) will provide resources and support on a request-for-service basis.

Public participation in the remedial design process will be coordinated through both the DOE and Operable Unit 4 Public Affairs Specialists.

FEMP OU4 Remediation

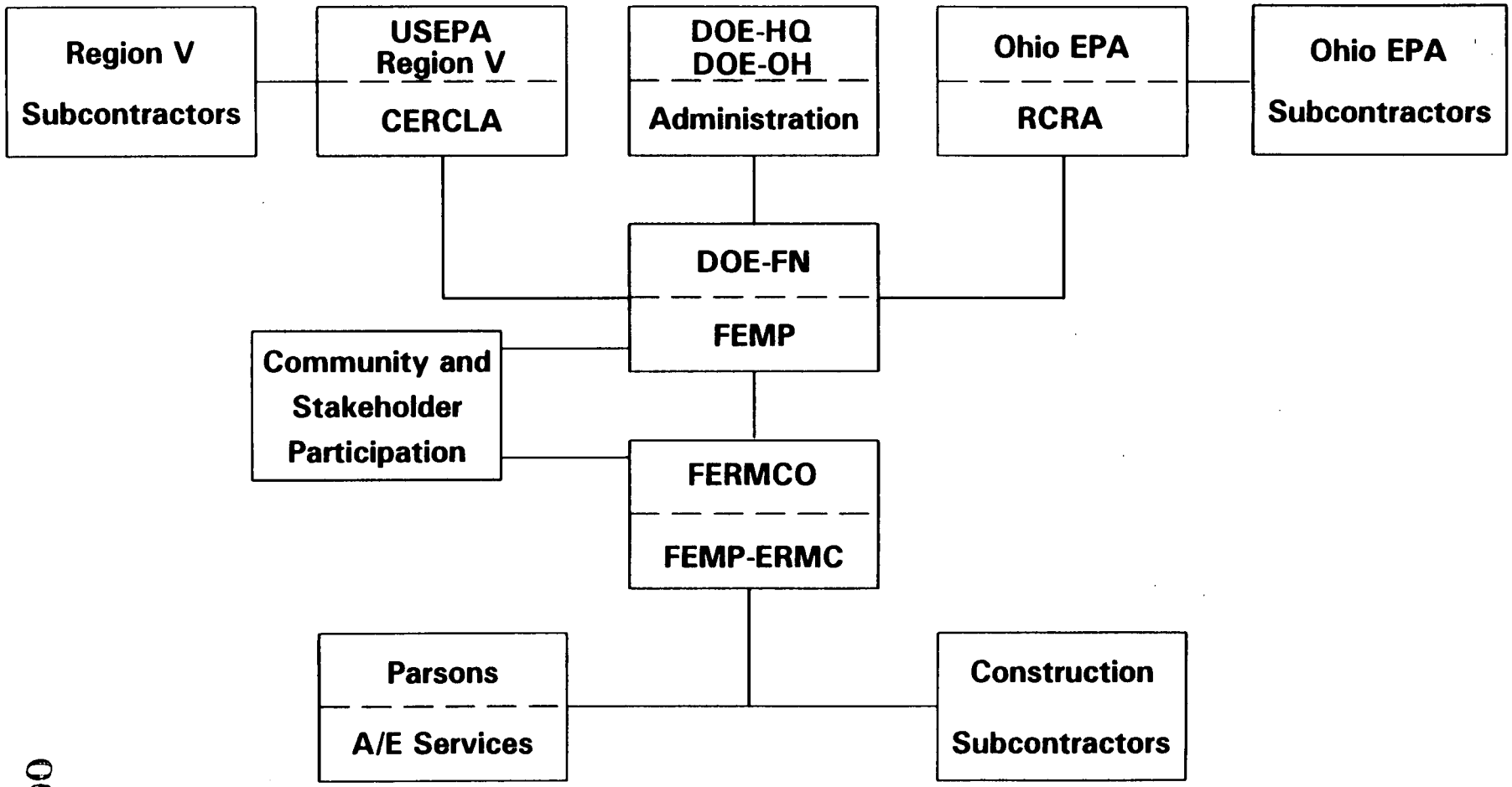

Figure 5-1 Administrative Relationship

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CERCLA/RCRA Remediation

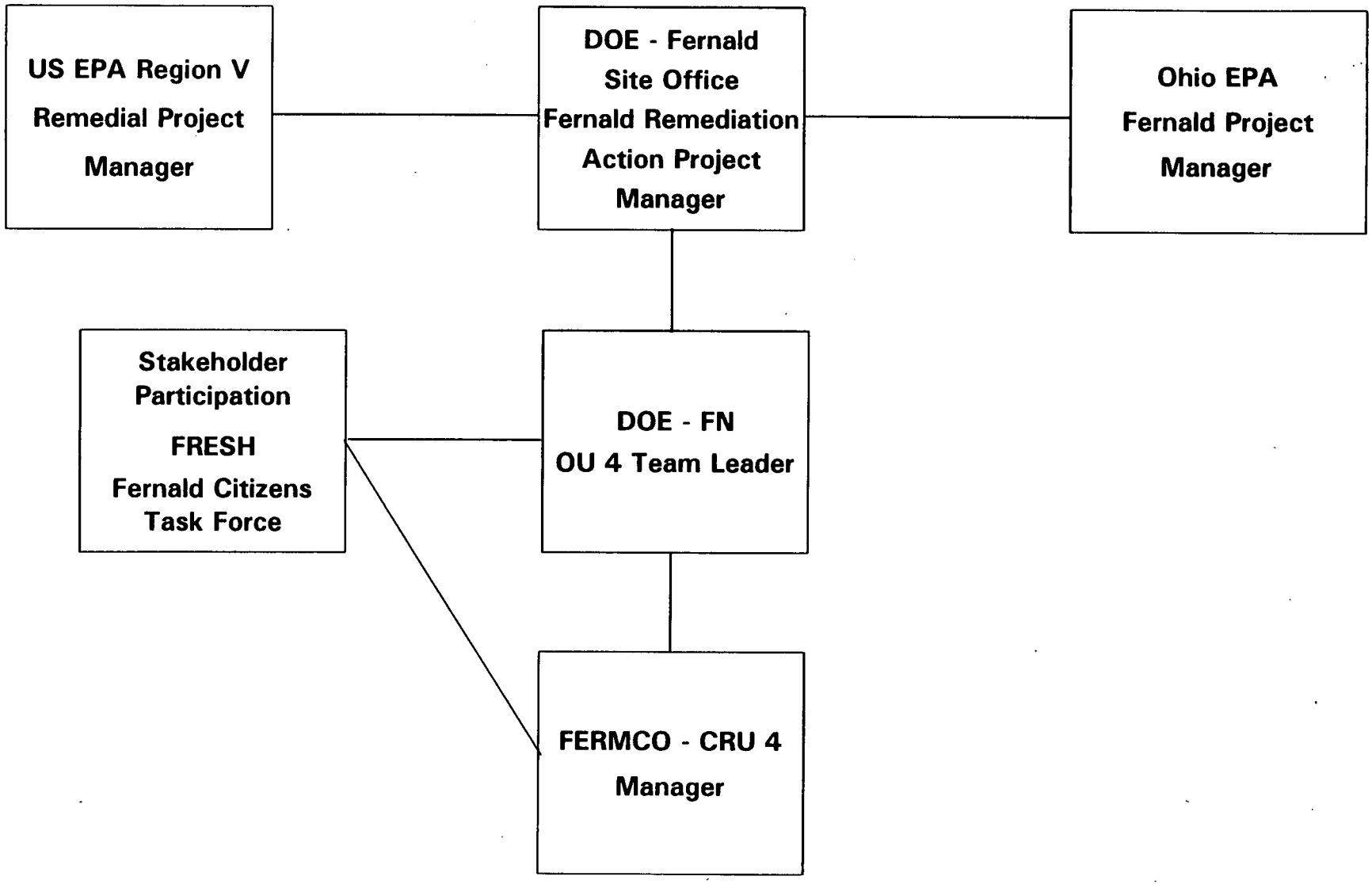

Figure 5-2 Operable Unit 4 Remediation

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5.2 Project Schedules

The schedules provided in this section (Figures 5-3 through 5-6) address the preparation and approval process of the Remedial Design Work Plan, including a schedule for the implementation of the tasks required to complete the Operable Unit 4 remedial design and the submittal of the Remedial Action Work Plan.

Remedial Design Work Plan

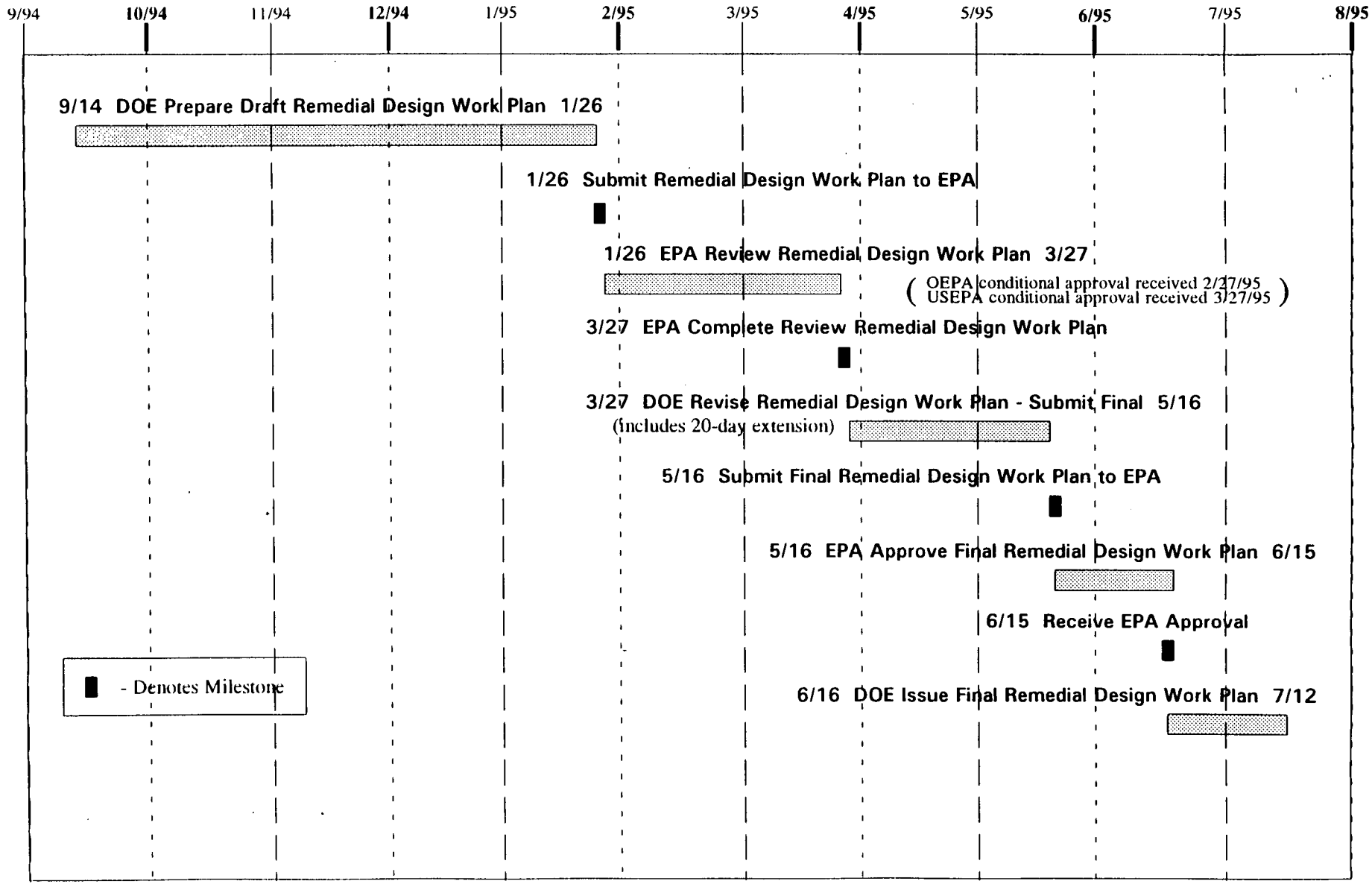
In accordance with the Amended Consent Agreement, Section XI.A, this remedial design work plan has been prepared and submitted within sixty (60) days of the receipt of EPA approval of the Operable Unit 4 ROD. This milestone was calculated to be February 6, 1995. However, the draft remedial design work plan was submitted to both the OEPA and EPA on January 26, 1995. The DOE received OEPA and EPA conditional approval of the remedial design work plan on February 27, 1995 and March 27, 1995, respectively.

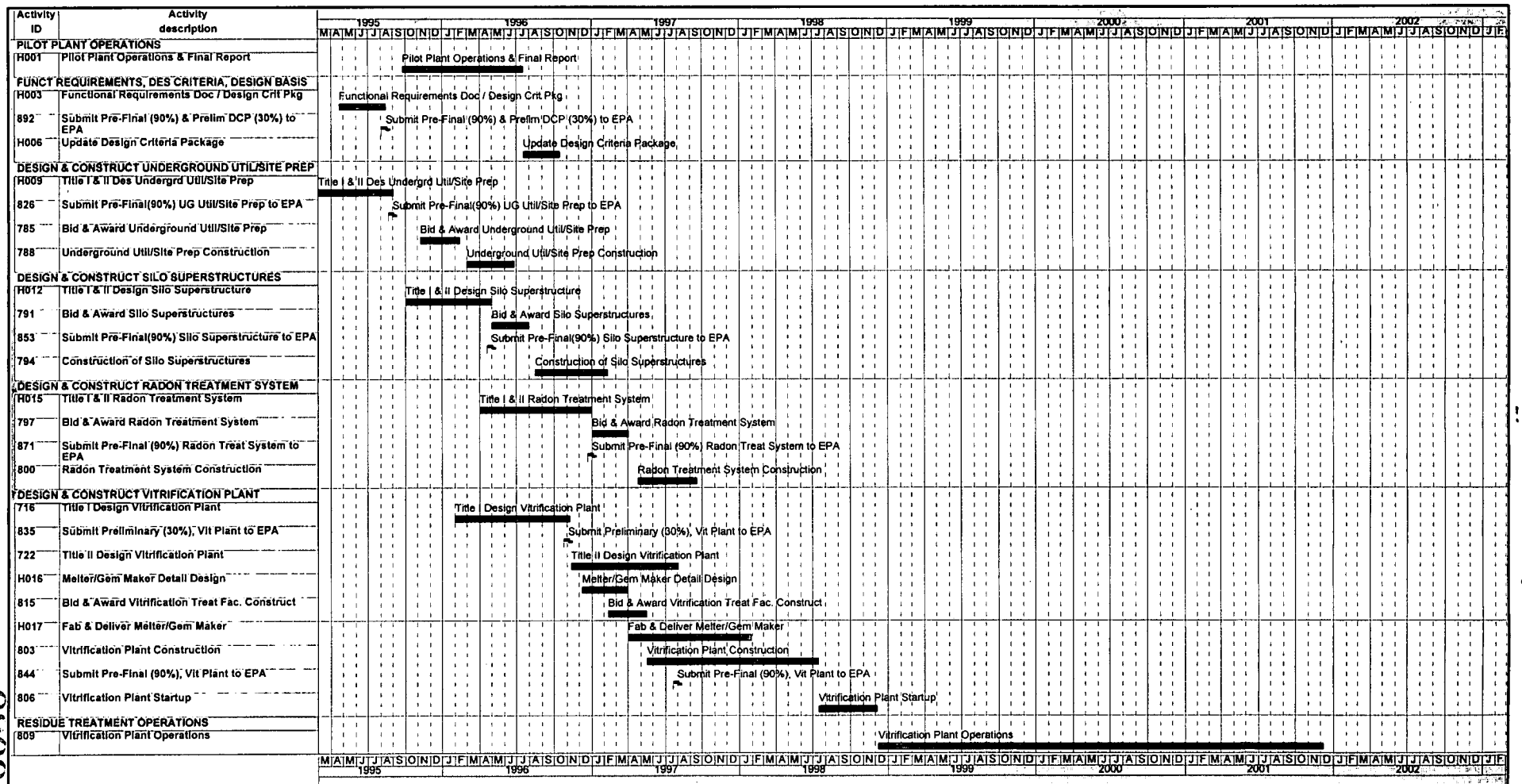
On April 17, 1995, in accordance with Section XVIII.B.5 of the Consent Agreement, as amended, the DOE-FN requested a twenty-day extension to the submittal date of the Final Work Plan for the Operable Unit 4 Remedial Design (DOE 1995). The extension request was necessary to support a refinement of the remedial design strategy which supports a more technically sound approach toward the successful remediation of Operable Unit 4. On the basis of the approved request, the Final Work Plan for the Operable Unit 4 Remedial Design submittal date is May 16, 1995.

The Remedial Design Work Plan Schedule (Figure 5-3) has been updated to reflect the early submittal and receipt of conditional approval by both agencies, as well as, the twenty-day extension of the final work plan submittal date. The schedule (Figure 5-3) has been prepared based on the Remedial Design Work Plan being a "Primary Document" as defined by the Amended Consent Agreement and being reviewed, revised, and resubmitted in accordance with the time durations specified by the Amended Consent Agreement, Sections XII.B.1 and XII.C.1.

Figure 5-3

Remedial Design Work Plan Schedule





OPERABLE UNIT 4
REMEDIAL DESIGN SUMMARY SCHEDULE
FIGURE 5-4

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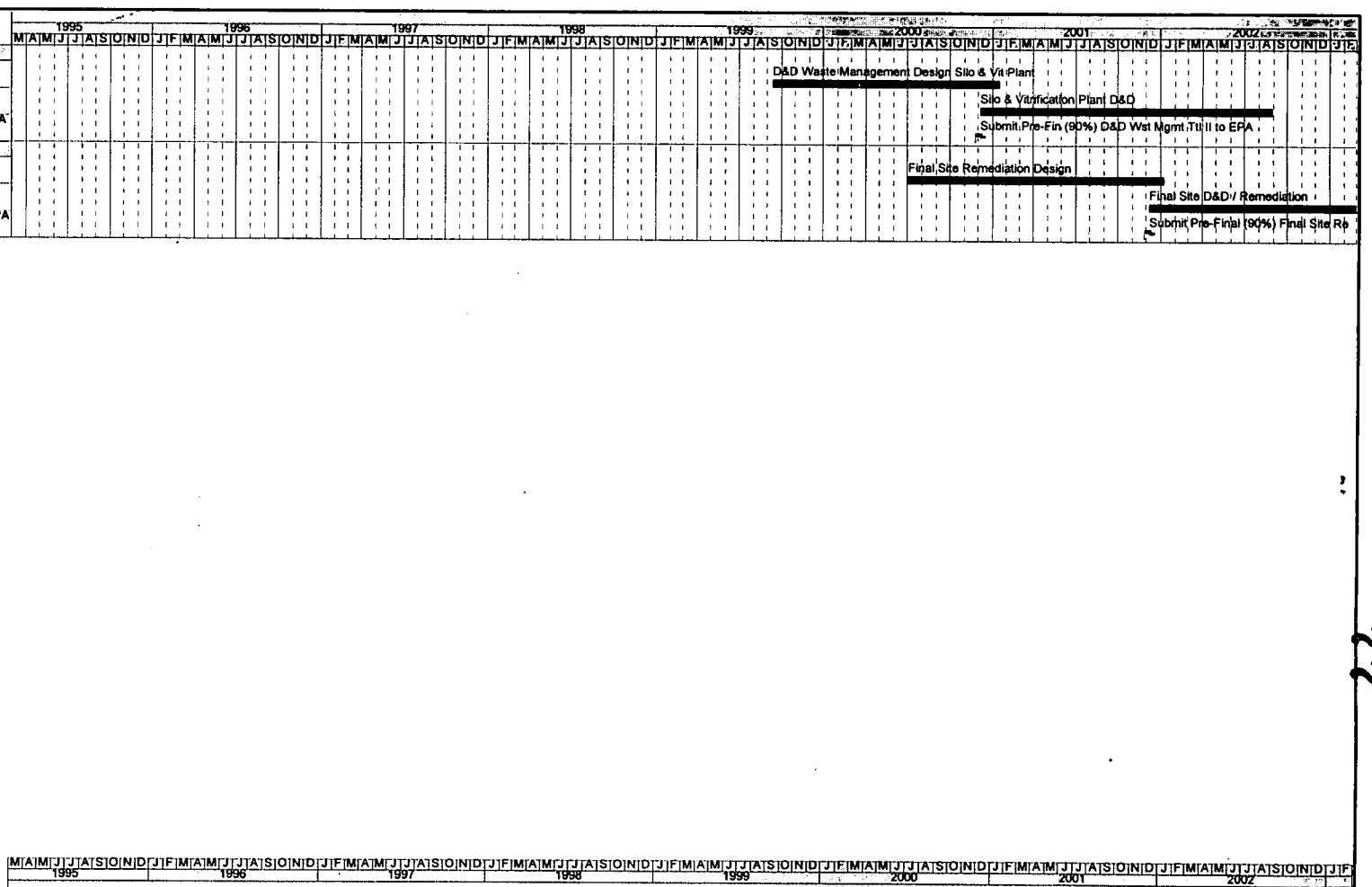
Activity ID	Activity description
SILO, VIT PLANT, & PILOT PLANT D&D / WASTE MGMT	
882	D&D Waste Management Design Silo & Vit Plant
878	Silo & Vitrification Plant D&D
888	Submit Pre-Fin (90%) D&D Wst Mgmt Tt II to EPA
FINAL SITE REMEDIATION	
885	Final Site Remediation Design
884	Final Site D&D / Remediation
891	Submit Pre-Final (90%) Final Site Rem Des to EPA



Project Start	01JAN90	Early Bar
Project Finish	03MAR03	Progress Bar
Data Date	01MAR95	Critical Activity
Plot Date	10MAY95	

(c) Primavera Systems, Inc.

RDRC

Sheet 2 of 2

OPERABLE UNIT 4
REMEDIAL DESIGN SUMMARY SCHEDULE
FIGURE 5-4

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Remedial Design

The sequencing of remedial design activities is based on the need, pursuant to CERCLA, Section 120(e)(2), to initiate substantial continuous physical on-site remedial action no later than 15 months after issuance of the EPA Approved ROD for Operable Unit 4, while taking into account anticipated practical design and review durations. In addition, the remedial design schedule presented have been prepared based on the assumption that the EPA and OEPA only review and approve the various submittals listed in Table 5-1 as noted.

The schedule outlined in Figure 5-4, presents the schedule for implementation of the tasks required to complete the remedial design. The remedial design schedule has been prepared on the basis that all formal Preliminary (30%) Design Review package submittals are considered "primary" documents as defined by Section XII of the Amended Consent Agreement. Therefore, the submittal dates established for all formal Preliminary (30%) Design Review packages have been established as key milestone dates and are subject to Section XVIII (extensions), or Section XVI.A.3 (enforceability) of the Amended Consent Agreement. Likewise, the remedial design schedule has been prepared on the basis that all Pre-final (90%) Design Review package submittals are considered "primary" documents as defined by Section XII of the Amended Consent Agreement. The submittal dates established for all Pre-final Design Review packages are considered as key milestones subject to enforceable deadlines under Section XVI.A.3 of the Amended Consent Agreement.

Remedial Action Work Plan

In accordance with the Amended Consent Agreement, Section XI.A, this remedial design work plan includes a schedule for the development and submittal of the remedial action work plan to the EPA. The purpose of the remedial action work plan is to identify the activities required to implement the selected remedy described in the Record of Decision for Remedial Actions at Operable Unit 4.

Consistent with the remedial design approach, the submittal of the Operable Unit 4 Remedial Action Work Plan has been restructured into two document submittals (See Figures 5-5 and 5-6). The Phase I Remedial Action Work Plan will focus its content on the implementation of the following remedial actions:

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Figure 5-5
Phase I Remedial Action Work Plan Schedule

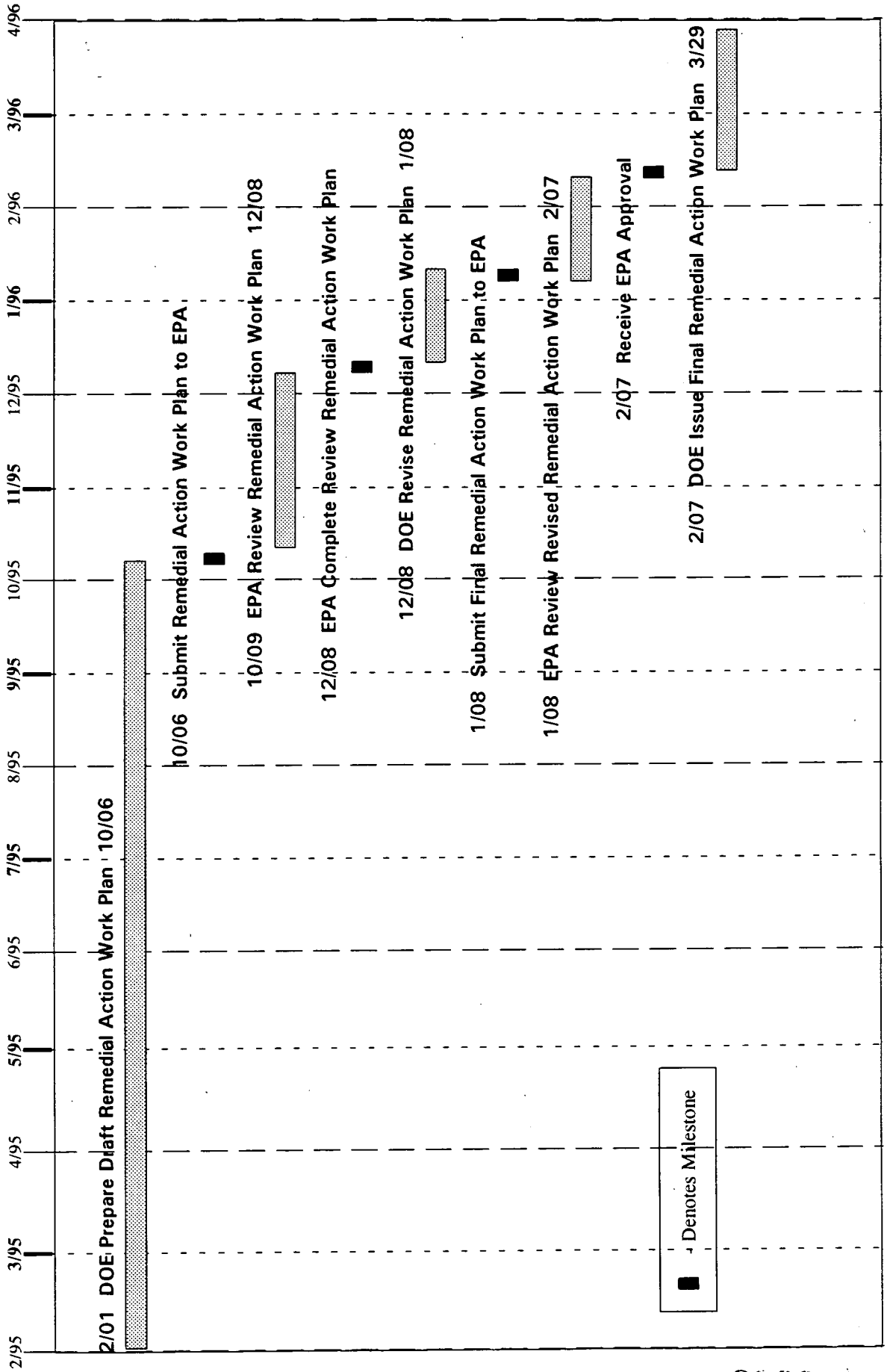

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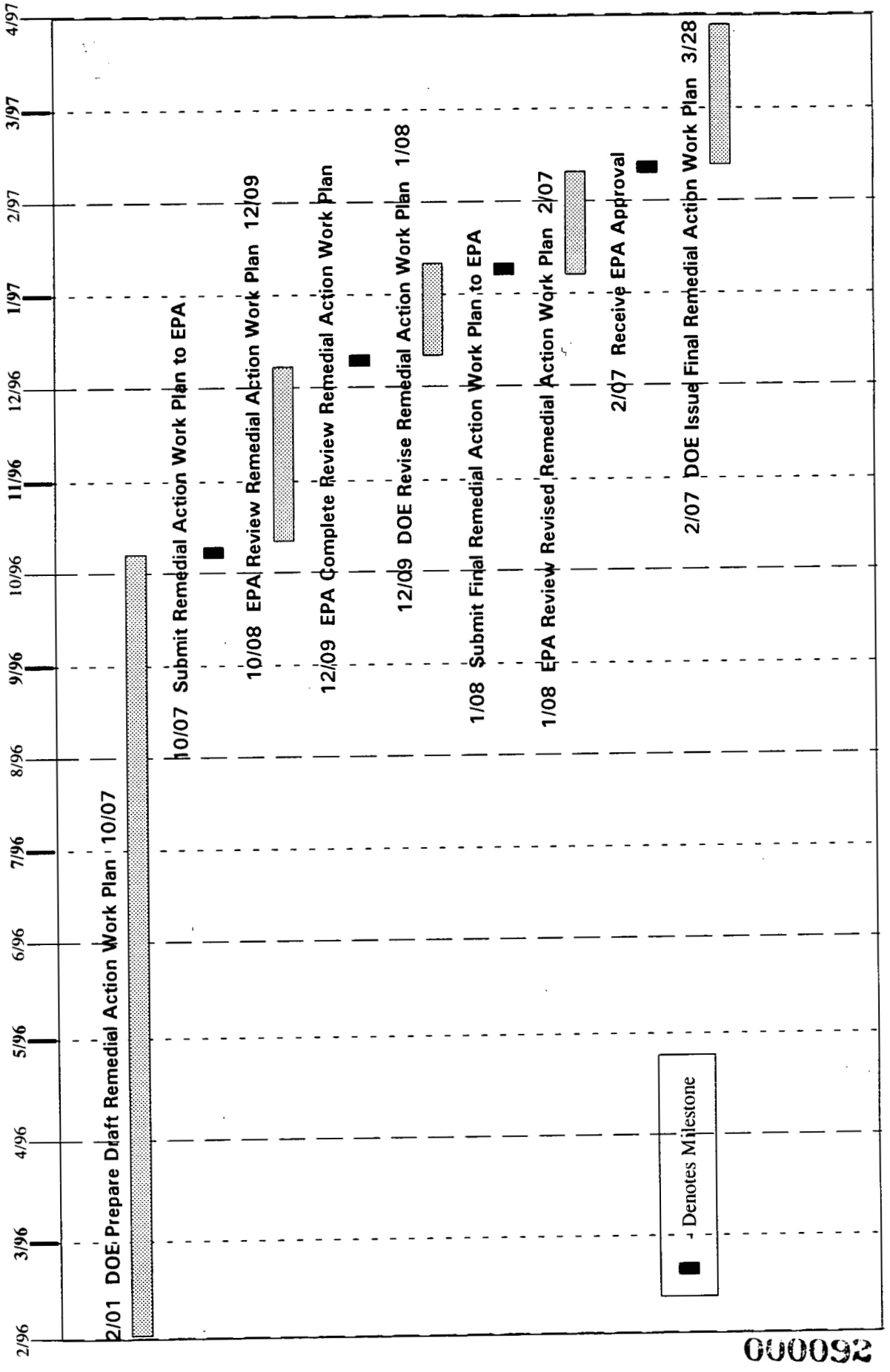
Figure 5-6

Phase II Remedial Action Work Plan Schedule



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- Underground Utilities/Site Preparation;
- Silo Superstructure Construction; and
- Silo Headspace Radon Treatment System

The Phase II Remedial Action Work Plan will address the remaining remedial actions:

- Vitrification Plant Construction and Operation; and
- Final Site Remediation

This two-phased approach to the development and submittal of the Operable Unit 4 Remedial Action Work Plan is necessary to support the implementation of the remedial design strategy adopted for this project.

5.3 Deliverables/Remedial Design

The EPA and OEPA will be provided with design review packages (see Table 5-1) in accordance with the remedial design schedule. Based on the aggressive schedule necessary to support the Operable Unit 4 remedial design, the management strategy to satisfy CERCLA Section 120(e)(2) requirements preclude a formal submittal and comment period to be conducted by DOE at the (intermediate level) 60 percent stage of a remedial design development.

In general, the level of detail presented in the Preliminary (30%), and Pre-final (90%)/Final (100%) design submittals will be similar with the EPA OSWER Directive 9355.0-4A, "Superfund Remedial Design and Remedial Action Guidance," dated June 1986. The following subsections discuss the level of detail to be presented in the various Title I/II design review packages.

5.3.1 Preliminary (30%) Design

In order to expedite the remedial design schedule, the Operable Unit 4 remedial design strategy has identified several combined Title I/II design packages for which only Pre-final (90%) design review packages will be formally prepared and submitted to the agencies. In order to facilitate communication of technical issues and concerns between the parties, the DOE will informally submit for informational purposes only, the related Preliminary (30%) design review package, in parallel to DOE's internal review of the documents.

The remedial design schedule has been prepared on the basis that the Preliminary (30%) Design Review package submittals identified in Table 5-1 are considered "primary" documents as defined by Section XII of the Amended Consent Agreement. The following describes the level of detail to be provided in each of the formal Preliminary Design Review submittals.

TABLE 5-1

MILESTONE SCHEDULE		
SUBMITTAL DESCRIPTION	**TYPE**	**DATE**
REMEDIAL DESIGN WORK PLAN		
Submit Draft Work Plan to EPA		26-Jan-95A
Receive EPA Comments on Draft Work Plan		27-Mar-95A
Submit Final Work Plan to EPA		16-May-95A
EPA Approve Final RD Work Plan		15-Jun-95
REMEDIAL DESIGN		
Functional Requirements Document	Pre-final, 90%	15-Aug-95
Design Criteria Package	Preliminary, 30%	15-Aug-95
Underground Utilities/Site Prep, Title I/II Design	Pre-final, 90%	01-Sep-95
Silo Superstructures, Title I/II Design	Pre-final, 90%	02-May-96
Radon Treatment System, Title I/II Design	Pre-final, 90%	02-Jan-97
Vitrification Plant, Title I Design	Preliminary, 30%	04-Dec-96
Design Criteria Package	Pre-final, 90%	04-Dec-96
Vitrification Plant, Title II Design	Pre-final, 90%	01-Sep-97
D&D/Waste Management, Title I/II Design	Pre-final, 90%	07-Dec-00
Final Site Remediation, Title I/II Design	Pre-final, 90%	07-Dec-01
REMEDIAL ACTION WORK PLAN		
Submit Phase I Remedial Action Work Plan		06-Oct-95
Submit Phase II Remedial Action Work Plan		07-Oct-96

A - Actual Completion Date

Preliminary Design Plans and Specifications

DOE will prepare preliminary design plans and specifications that will be sufficiently detailed to allow a technical review of the project to determine whether the Final Design will provide an operable and usable remedial facility.

DOE will prepare an outline of the construction specifications which will identify each specification section to be included in the final design package. Typical specifications will include, but are not limited to the following sections:

- General Conditions
- Temporary Facilities
- Civil
- Electrical/Instrumentation
- Mechanical
- Architectural
- Structural

Preliminary Bid Documents

At this stage of the project, the design is insufficiently advanced to afford significant development of the bid documents. The DOE will prepare an annotated outline of the contents of the bid documents that will include a description of how the bid documents and construction specifications will be integrated.

Identify Long-Lead Procurement Items

This activity will include the identification of procurement items that are expected to take significant time to obtain and that may impact the project's construction schedule for completion. Long-lead items to be considered for this project include the electrical substation, vitrification furnace, gem-forming equipment and miscellaneous process control equipment.

Preliminary Construction Schedule

The DOE will not provide a schedule for submittal with the Preliminary (30%) design deliverables. Schedules will only be only be submitted with the Pre-final (90%) design review packages.

Preliminary Construction Cost Estimate

The DOE will not develop a cost estimate for submittal with the preliminary design (30%) deliverables. Cost estimates will only be submitted with the Pre-final (90%) design review packages.

5.3.2 Intermediate (60%) Design

Based on the aggressive design schedule necessary to support Operable Unit 4 remediation, a formal review and comment period by the agencies will not be conducted. If requested by the agencies, the Remedial Design team will conduct a presentation of the intermediate design with the EPA and OEPA and participate in teleconference meetings for a given design package.

5.3.3 Pre-final/Final (90%/100%) Design

The remedial design schedule has been prepared on the basis that all Pre-final (90%) Design Review package submittals are considered "primary" documents as defined by Section XII of the Amended Consent Agreement. The following describes the level of detail to be provided in each of the Pre-final Design Review submittals.

Pre-final/Final (90%/100%) Plans and Specifications

The efforts expended under this subtask will prepare final design plans and specifications that will evolve directly as a result of the intermediate level design plans and development of specifications. These documents will contain document packages that reflect a design effort of 90 percent and 100 percent completion of the final project deliverables. At 90 percent completion, the effort will be considered as pre-final and transmitted to the DOE for submittal to the EPA and OEPA for final review and comments. If necessary, the DOE will participate in a pre-final design review meeting to be held at the EPA Region V offices in Chicago to resolve any remaining issues. On responding to EPA and OEPA comments and making corrections, as appropriate, the documents will be considered final (100%). These final design plans and specifications will be submitted to the EPA and OEPA and then serve as the basis for the subsequent remedial action.

Pre-final/Final (90%/100%) Construction Schedule and Cost Estimate

A pre-final/final construction schedule and cost estimate summary will be prepared for submittal with the following pre-final/final submittals:

- Underground Utilities/Site Preparation, Title I/II
- Silo Superstructures, Title I/II
- Radon Treatment System, Title I/II
- Vitrification Plant, Title II
- D&D/Waste Management, Title I/II
- Final Site Remediation, Title I/II

The level of detail in the schedules and cost estimates will be sufficient for use by DOE to determine the reasonableness of competitive bids received in connection with sealed bids construction contracts, and serve as a control in evaluating cost and pricing data in negotiated contracts or proposals. The pre-final/final construction schedule and cost estimate will be provided at a summary level in each Pre-final submittal.

Pre-final/Final Bid Documents

The bid documents prepared under this task will cover all aspects of the completed design and will be of sufficient detail for release to qualified contractors.

5.3.4 Comment Response Documents

The DOE will address all comments on the formal Preliminary (30%) Design Review Packages, submitted by the EPA and OEPA through the submittal of a comment response document for EPA approval within 30 days of receipt of the agencies' comments. The DOE will not submit revised Preliminary (30%) design documents. All comments with appropriate responses and/or changed pages will be incorporated into the Pre-final (90%) design package.

The DOE will formally address all comments submitted by the EPA and OEPA on the Pre-final (90%) Design Review packages through the submittal of a joint comment response document to both agencies, within 30 days of receipt of both agencies' comments.. All comments will be addressed and incorporated appropriately into the Final (100%) design package. Each Final (100%) Design package will have a

milestone for submittal to the EPA and OEPA within 30 days of receipt of the agencies' original comments. In the unlikely event additional time is required to satisfy this requirement, the DOE will notify the EPA in writing and provide a schedule for submittal of the Final (100%) Design package.

All critical issues requiring immediate resolution and/or not resolved to the satisfaction of regulatory agencies by the comment response document will be addressed either via teleconferences or meetings between the parties. The short duration of many of the remedial design activities dictates that a modified approach to that utilized by the RI/FS program must be instituted for this phase of the remediation process.

REFERENCES

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REFERENCES

U.S. Department of Energy, 1988, EPA-Approved Site-Wide RI/FS Work Plan, Volume III.

U.S. Department of Energy, 1990, Radiation Protection of the Public and the Environment, DOE Order 5400.5, Office of Environment, Safety, and Health, Washington, D.C.

U.S. Department of Energy, 1991a, Procedures Manual EM-RM001, Fernald Environmental Management Project, Fernald, OH.

U.S. Department of Energy, 1993b, "Final Remedial Investigation Report for Operable Unit 4," Volumes 1-3.

U.S. Department of Energy, 1993c, "Operable Unit 4 Treatability Study Work Plan for the Vitrification of Residues from Silos 1, 2, and 3," prepared by the Fernald Environmental Remediation Management Corporation, Fernald, Ohio, May 1993.

U.S. Department of Energy, 1994a, "Final Feasibility Study Report for Operable Unit 4," Volumes 1-4.

U.S. Department of Energy, 1994b, "Operable Unit 4 Feasibility Study/Proposed Plan - Final Environmental Impact Statement," September 1994.

U.S. Department of Energy, 1994c, Operable Unit 4 Pilot Plant Phase I Treatability Study Work Plan, prepared by the Fernald Environmental Restoration Management Corporation, Fernald, Ohio, February 1994, Rev. 0.

U.S. Department of Energy, 1994d, Operable Unit 4 Pilot Plant Phase II Treatability Study Work Plan, prepared by the Fernald Environmental Restoration Management Corporation, Fernald, OH, March 1994, Rev. 0.

U.S. Department of Energy, 1994e, "Final Record of Decision for Remedial Action at Operable Unit 4," December 1994.

U.S. Department of Energy, 1995, Jack R. Craig to Messrs James A. Saric and Tom Schneider, "Operable Unit 4 Final Remedial Design Work Plan", DOE-0858-95, dated April 17, 1995.

U.S. Department of Energy, "CERCLA/RCRA Unit 4 (CRU4) Health and Safety Plan," Rev. 0, prepared by the Fernald Environmental Restoration Management Corporation, Fernald, OH.

U.S. Department of Energy, Improved Storage of Soil and Debris, Removal Action 17 Work Plan, prepared by the Fernald Environmental Restoration Management Corporation, Cincinnati, OH., Rev. 2, February 1993.

U.S Environmental Protection Agency, 1986, "Superfund Remedial Design and Remedial Action Guidance," (OSWER Directive 9355.0-4A), U.S. EPA, Washington, D.C., dated June 1986.

U.S. Environmental Protection Agency, 1990a, "Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties," (OSWER Directive 9355.5-01) U.S. EPA, Washington, D.C., April 1990.

U.S. Environmental Protection Agency, 1991, Consent Agreement as Amended under CERCLA Sections 120 and 106(a) in Matter of: U.S. Department of Energy Feed Materials Production Center, Fernald, Ohio, Administrative Docket No. V-W-90-C-052, Region V, Chicago, IL, September 18, 1991.

U.S. Environmental Protection Agency, 1994, James A. Saric to Jack R. Craig, "CERCLA 120(e)(2) Application to Operable Unit 4," April 13, 1994.

APPENDIX A

SUMMARY OF ARARs FOR THE OPERABLE UNIT 4 REMEDIAL ACTION

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TABLE OF CONTENTS

Page

List of Tables . . . . . A-i

List of Acronyms . . . . . A-ii

A.1.0 Introduction A-1-1

LIST OF TABLES

Page

A.1-1 Summary of ARARs for Operable Unit 4 Selected Remedial Action Alternatives - Chemical-Specific A-1-2

A.1-2 Summary of ARARs for Operable Unit 4 Selected Remedial Action Alternatives - Location-Specific A-1-4

A.1-3 Summary of ARARs for Operable Unit 4 Selected Remedial Action Alternatives - Action-Specific A-1-5

LIST OF ACRONYMS

A	Applicable
AEA	Atomic Energy Act
ARAR	Applicable or Relevant and Appropriate Requirement
CAA	Clean Air Act of 1990
CAMU	Corrective Action Management Unit
CFR	Code of Federal Regulation
CWA	Clean Water Act
DCG	Derived Concentration Guide
DOE	United States Department of Energy
EDE	Effective Dose Equivalent
HLRW	High Level Radioactive Waste
NEPA	National Environmental Policy Act
OAC	Ohio Administrative Code
ORC	Ohio Revised Code
pCi/ℓ	picoCuries per liter
pCi/m^2-s	picoCuries per square meter per second
R&A	Relevant and Appropriate
RCRA	Resource Conservation and Recovery Act
SDWA	Safe Drinking Water Act
SWMU	Solid Waste Management Unit
TBC	to be considered
TRU	transuranic
TSD	Treatment, Storage, or Disposal
TU	Temporary Unit
UMTRCA	Uranium Mill Tailings Radiation Control Act of 1978

A.1.0 INTRODUCTION

Appendix A presents a summary of ARARs/TBCs associated with the remedial action alternatives identified for Operable Unit 4. These tables group the ARARs/TBCs according to type (i.e., Chemical-specific, Location-specific, and Action-specific) and by the governing regulatory act (e.g., CAA, CWA, RCRA, etc.). The tables identify those ARARs/TBCs Operable Unit 4 will be considered during the Remedial Design activities, a brief description of the requirement, and the classification of the ARAR/TBC.

TABLE A.1-1
SUMMARY OF ARARs FOR OPERABLE UNIT 4
SELECTED REMEDIAL ACTION ALTERNATIVES

Chemical-Specific

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/ TBC
CAA	Radionuclide Emissions (Except Airborne Radon-222) 40 CFR§ 61, Subpart H	Operating units shall establish procedures to prevent a member of the public from receiving an EDE of 10 mrem per year.	A
CAA	Radon-222 Emissions 40 CFR§ 61, Subpart Q	Storage and disposal activities for radium-bearing by-product material shall establish measures to ensure emissions of radon are maintained below 20 pCi/m^2/s.	A
CWA	Ohio Water Quality Standards (Five Freedoms of Surface Waters) OAC 3745-1-04	Establishes requirements for maintaining integrity and useability of surface water.	R&A
CWA	Ohio Water Quality Standards OAC 3745-1-07	Establishes allowable limits on discharges or releases to Paddys Run and the Great Miami River.	A
RCRA Sub. D	Chemicals in Drinking Water (Solid Waste Disposal Facility) 40 CFR§ 257.3-4 [OAC 3745-27-10(D)]	Establishes requirements to protect underground drinking water sources from operation of the proposed disposal facility for Subunit C material.	R&A
RCRA Sub. C	Chemicals in Drinking Water (Hazardous Waste Disposal Facility) 40 CFR§ 264.94 (OAC 3745-54-94)	Establishes requirements to assure groundwater concentrations of hazardous constituents do not exceed regulatory levels due to operation of the proposed disposal facility for Subunit C material.	R&A
SDWA	Inorganic Chemicals in Drinking Water 40 CFR§ 141.11 40 CFR§ 141.15, 141.16, 141.51, 141.62 and 143.3 (OAC 3745-81-11, OAC 3745-81-15, and OAC 3745-81-16)	Establishes requirements to assure protection of drinking water sources from inorganic contaminants.	R&A
SDWA	Organic Chemicals in Drinking Water 40 CFR§ 141.61 (OAC 3745-81-12)	Establishes requirements to assure protection of drinking water sources from organic contaminants.	R&A
UMTRCA	Standards for Control of Residual Radioactive Material 40 CFR§ 192.02 (b)	Establishes standards for managing residual radioactive material from inactive uranium processing sites so the average release rate of radon-222 does not exceed 20 pCi/m^2/s or the average concentration in air outside facility boundary does not exceed 0.5 pCi/ℓ above background following remediation activities.	R&A

TABLE A.1-1
(Continued)

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/ TBC
DOE	Radiation Protection of the Public and the Environment (DCGs for Water) DOE Order 5400.5 Chapter III	Establishes allowable residual concentrations of radionuclides in water. Included as TBC to ensure adequate protection of human health and the environment from sources of radioactivity.	TBC
DOE	Radiation Protection of the Public and the Environment (DCGs for Air) DOE Order 5400.5 Chapter III	Establishes allowable residual concentrations of radionuclides in air. Included as TBC to ensure adequate protection of human health and the environment from sources of radioactivity.	TBC
DOE	Residual Radioactive Material (Interim Storage) DOE Order 5400.5 Chapter IV 6.b	Establishes allowable concentrations of radon-222 in air during interim storage of waste material. Included as TBC to ensure adequate protection of human health and the environment from sources of radioactivity.	TBC

TABLE A.1-2

SUMMARY OF ARARs FOR OPERABLE UNIT 4 SELECTED REMEDIAL ACTION ALTERNATIVES

Location-Specific

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/TBC
NEPA/ DOE	Compliance with Floodplains/Wetlands Environmental Review Requirements 10 CFR§ 1022 (Executive Order 11990)	Establishes requirements for DOE to evaluate potential adverse effects DOE actions might have on wetlands.	A
NEPA/ EPA	Endangered Species Protection 50 CFR§ 402 (OAC 1518, 1513.25) (OAC 1501-18-1-01)	Remedial actions must not jeopardize the continued existence of any endangered or threatened species, or potential habitat of threatened or endangered species.	R&A
RCRA Sub. D	Solid, Nonhazardous Waste Disposal Facility Design Considerations OAC 3745-27-07	Establishes requirements for the design, construction, and operation of the proposed disposal facility for Subunit C material.	R&A
RCRA Sub. D	Protection of Wetlands (Solid Waste Disposal Facility) 40 CFR§ 258.12	Establishes restrictions on the location of a solid waste disposal facility with respect to potential impacts on wetlands.	R&A

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TABLE A.1-3

SUMMARY OF ARARs FOR OPERABLE UNIT 4 SELECTED REMEDIAL ACTION ALTERNATIVES

Action-Specific

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/TBC
CAA	Prevention of Air Pollution Nuisance ORC 3704.01-.05 OAC 3745-15-07	Requires control of emissions of air pollutants during remediation that could endanger health, safety, or welfare of the public.	A
CAA	Control of Visible Particulate Emissions from Stationary Sources OAC 3745-17-07	Establishes requirements to prevent discharge of air emissions of a shade or density greater than 20 percent opacity during treatment operations.	A
CAA	Control of Fugitive Dust OAC 3745-17-08	Visible emissions of fugitive dust generated during grading, loading, or construction activities must be minimized.	R&A
CAA	Restriction on Particulate Emissions from Industrial Processes OAC 3745-17-11	Treatment operations shall maintain emissions below specified particulate material release limits.	A
CWA	Nationwide Permit Program 33 CFR§ 330	Establishes requirements for dredge and fill activities in jurisdictional wetlands.	A
CWA	Discharge of Storm Water Runoff 40 CFR§ 122.26	Establishes requirements for monitoring and controlling runoff from construction sites greater than five acres.	A
CWA	Discharge of Treatment System Effluent (Best Management Practices) 40 CFR§ 125.100 40 CFR§ 125.104	Program establishes measures to prevent releases from spills or runoff during the implementation of remedial actions.	R&A
NEPA/ DOE	NEPA Implementation 10 CFR§ 1021	Requires NEPA evaluation and documentation for DOE activities.	A
RCRA Sub. D	On-Site Solid Nonhazardous Waste Management Facilities (Design Standards) 40 CFR§ 241 Subpart B (OAC 3745-27-08)	Establishes design criteria for the proposed disposal facility for Subunit C material.	R&A
RCRA Sub. C	Hazardous Waste Determinations 40 CFR§ 262.11 (OAC 3745-52-11)	Establishes procedures for identifying material as hazardous waste so that it may be stored, treated, and disposed in accordance with RCRA requirements.	R&A (This requirement will be applicable to non-excluded solid wastes)

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TABLE A.1-3
(Continued)

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/TBC
RCRA Sub. C	Management of Empty Containers 40 CFR§ 261.7 (OAC 3745-51-7)	Requirements to ensure containers are properly emptied and to ensure residuals removed from the containers are properly managed in accordance with RCRA requirements.	R&A
RCRA Sub. C	Generators Who Transport Hazardous Waste for Off-Site Treatment, Storage, or Disposal 40 CFR§ 262.20 - 262.33 and 263.20-31 (OAC 3745-52-20 through 33 and OAC 3745-53-20 through 31)	Establishes standards for generators shipping hazardous waste for off-site treatment, storage, or disposal.	A
RCRA Sub. C	Treatment, Storage, or Disposal (TSD) Facility (General Standards) 40 CFR§ 264, Subpart B (OAC 3745-54-13 through 16)	Establishes general standards for the proper management of material determined to be hazardous waste.	R&A
RCRA Sub. C	TSD Facility (Preparedness and Prevention) 40 CFR§ 264, Subpart C (OAC 3745-54-31) 40 CFR§ 264.32 (OAC 3745-54-32) 40 CFR§ 264.33 (OAC 3745-54-33) 40 CFR§ 264.34 (OAC 3745-54-34) 40 CFR§ 264.35 (OAC 3745-54-35) 40 CFR§ 264.37 (OAC 3745-54-37)	Establishes standards for preparedness and prevention against fires, explosions, or unplanned releases of hazardous waste at TSD facilities.	R&A
RCRA Sub. C	TSD Facility (Contingency Plan and Emergency Procedures) 40 CFR§ 264, Subpart D 40 CFR§ 264.51 (OAC 3745-54-51) 40 CFR§ 264.52 (OAC 3745-54-52) 40 CFR§ 264.55 and 56 (OAC 3745-54-55 through 56)	Establishes standards for contingency plans and emergency procedures in responding to fires, explosions, or unplanned releases of hazardous waste at TSD facilities.	R&A
RCRA Sub. C	Releases from Solid Waste Management Units 40 CFR§ 264, Subpart F (OAC 3745-54-91 through 99 and OAC 3745-55-01 through 011)	Establishes groundwater monitoring requirements for assuring concentrations of hazardous constituents do not exceed regulatory levels.	R&A

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TABLE A.1-3
(Continued)

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/TBC
RCRA Sub. C	Closure 40 CFR§ 264, Subpart G 40 CFR§ 264.111,.114, and .116 (OAC 3745-55-11,-14, and -16)	Establishes closure requirements for TSD facilities.	R&A
RCRA Sub. C	Post-Closure 40 CFR§ 264.117 (OAC 3745-55-17) 40 CFR§ 264.119 (OAC 3745-55-19)	Establishes requirements for the protection of human health and the environment following closure of the facility.	R&A
RCRA Sub. C	Container Storage 40 CFR§ 264.171 - 178 Subpart I (OAC 3745-55-71 through -78)	Establishes standards for use and management of containers of hazardous waste.	R&A
RCRA Sub. C	Tank Systems 40 CFR§ 264, Subpart J (OAC 3745-55-91 through 96)	Establishes standards for the tank systems used in the vitrification treatment process.	R&A
RCRA Sub. C	Closure Requirements for Tanks 40 CFR§ 264.197 (OAC 3745-55-97)	Establishes closure and post-closure requirements for tank systems.	R&A
RCRA Sub. C	Landfill Capping 40 CFR§ 264.310 (OAC 3745-57-10)	Establishes design standards for closure of the proposed disposal facility for Subunit C material.	R&A
RCRA Sub. C	Miscellaneous Units 40 CFR§ 264, Subpart X (OAC 3745-57-91 through 92)	Establishes standards for treatment, storage, and disposal of hazardous waste in miscellaneous units.	R&A
RCRA Sub. C	Corrective Action for SWMUs (CAMU and TU) 40 CFR§ 264, Subpart S 40 CFR§ 264.552 -.553	Establishes requirements and criteria for corrective action management units for management of remediation waste during remediation activities.	R&A
RCRA Sub. C	Containment Buildings 40 CFR§ 264, Subpart DD	Establishes standards for containment buildings used for interim storage and management of material determined to be hazardous waste during remediation activities.	R&A
RCRA Sub. C	Digging Where Hazardous or Solid Waste Was Located ORC 3734.02 (H)	Establishes post-remedial action institutional controls for on-site disposal of Subunit C material.	A
SDWA	Ohio Water Well Standards OAC 3745-9-10	Establishes standards for abandonment of test borings, holes, and wells that might be used and/or closed as part of the remediation activities.	A

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TABLE A.1-3
(Continued)

Regulatory Program	Regulatory Title and Citation	Regulatory Description	ARAR/TBC
AEA	Env. Rad. Protection Stds. for Mgt. and Disposal of HLRW, Spent Nuclear Fuel, and TRU Wastes 40 CFR§ 191, Subpart A 40 CFR§ 191.03(b)	Establishes standards for management and storage for disposal of material from Subunit A to ensure the combined annual dose equivalent to any member of the public does not exceed specified limits. (This requirement pertains to only the on-site portion of this alternative).	R&A
UMTRCA	Standards for Control of Residual Radioactive Material 40 CFR§ 192, Subpart A 40 CFR§ 192.02(a)	Requires that controls for the residual radioactive material in the proposed on-site disposal facility be effective for 1000 years, where reasonably achievable, or at least 200 years.	R&A
UMTRCA	Standards for Cleanup of Lands Contaminated with Residual Radioactive Materials 40 CFR§ 192, Subpart B 40 CFR§ 192.12(a)	Establishes standards for remedial actions to ensure residual concentration of radium-226 in soils does not exceed regulatory levels.	R&A
UMTRCA	Implementation of Health and Environmental Protection Standards for Uranium Mill Tailings 40 CFR§ 192, Subpart C	Establishes guidance for remedial activities involving control and cleanup of residual radioactive material from OU4.	R&A
DOE Order	Radiation Dose Limit (All Pathways) DOE Order 5400.5, Chapter II, Section 1.a	Establishes limits for the allowable exposure of the public to radiation sources from all pathways as a result of routine DOE activities. Included as TBC to ensure adequate protection of human health and the environment from sources of radioactivity.	TBC