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SILO PROJECT INDEPENDENT REVIEW TEAM DOCUMENTATION - FACT SHEET FOR THE PROPOSED PLAN FOR REMEDIAL ACTIONS AT OPERABLE UNIT 4

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DOE-FEMP PUBLIC
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FACT SHEET

United States
Department of Energy
Fernald Environmental Management Project

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Fact Sheet for the *Proposed Plan for Remedial Actions at Operable Unit 4*

Silos 1-4 February 1994

This Fact Sheet briefly summarizes the Proposed Plan for Remedial Actions at Operable Unit 4. Additional information and details are available in the Feasibility Study Report for Operable Unit 4, as well as the Proposed Plan for Remedial Actions at Operable Unit 4, which are available at the Public Environmental Information Center.

This Fact Sheet Describes:

- The background of Operable Unit 4;
- The cleanup alternatives being considered;
- The U.S. Department of Energy's (DOE's) preferred alternative for remedial action;
- Potential environmental impacts;
- How the public can participate in the selection/modification of the preferred alternative; and
- Where the public can obtain more information.

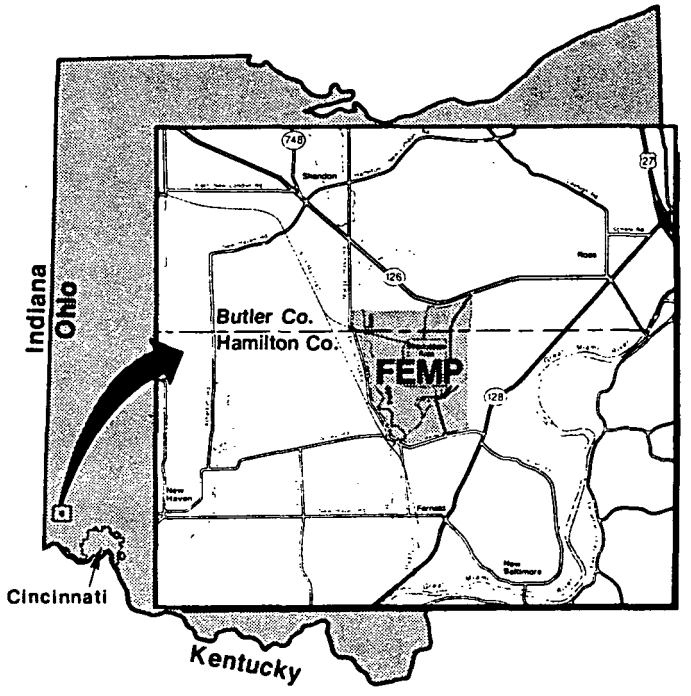
You are invited to a public hearing

The DOE, together with the U.S. and Ohio Environmental Protection Agencies (EPAs), encourage public involvement in the decision-making process for the remedial actions of Operable Unit 4 at the FEMP site. Representatives from DOE and U.S. and Ohio EPAs will be present at a formal public hearing to discuss the Operable Unit 4 remedial alternatives, including the preferred alternative, answer questions, and accept public comments. The hearing is scheduled for 7 p.m., March 21, 1994, at the Plantation, 9660 Dry Fork Road, Harrison, Ohio.

Public Comment Period

A formal public comment period will be conducted March 7 through April 20, 1994.

FIGURE 1 - FEMP SITE MAP



INTRODUCTION

This Fact Sheet provides a brief discussion of the U.S. Department of Energy's (DOE's) proposal for the management of contaminated material in the area designated as Operable Unit 4 of the Fernald Environmental Management Project (FEMP). It is DOE Policy to integrate the values of the National Environmental Policy Act (NEPA) into the procedural requirements of Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA). This Fact Sheet also describes how the public can participate in the selection of, or modification to, the final remedial alternative and describes how to obtain additional information.

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SITE DESCRIPTION AND HISTORY

The FEMP site, formerly known as the Feed Materials Production Center, produced high-purity uranium metal products for DOE and its predecessor agencies from 1952 through 1989. (Site construction began in May 1951, and pilot process testing began in October 1951.) Thorium products were also manufactured on a smaller scale and are stored on site with various uranium materials and process residues. The 425-hectare (1050-acre) site is located in a rural agricultural area within Hamilton and Butler counties, approximately 27 kilometers (17 miles) northwest of Cincinnati, Ohio.

All production activities at the FEMP site stopped in July 1989 to enable the site to focus on environmental cleanup and restoration. Congress officially closed the FEMP site in June 1991, formally ending the 37-year production mission. To reflect the site's new mission, DOE changed the name of the facility to the Fernald Environmental Management Project. In December 1992, the Fernald Environmental Restoration Management Corporation (FERMCO) assumed responsibility for the cleanup under the first Environmental Restoration Management Contract with DOE.

The FEMP site was placed on U.S. EPA's National Priorities List in 1989; therefore, all cleanup actions are being conducted in accordance with the requirements of CERCLA, as amended by the Superfund Amendments and Reauthorization Act (SARA). As the lead agency, DOE is responsible for conducting the cleanup activities under the terms of the Amended Consent Agreement signed with U.S. EPA in 1991.

In addition, it is DOE policy to comply with NEPA during the planning stages of remedial activities. Therefore, the values of NEPA have been integrated into the Feasibility Study and Proposed Plan for Operable Unit 4. The resulting document is an integrated Feasibility Study/Proposed Plan-Draft Environmental Impact Statement which examines the potential environmental impacts of the proposed action and alternatives pursuant to NEPA requirements.

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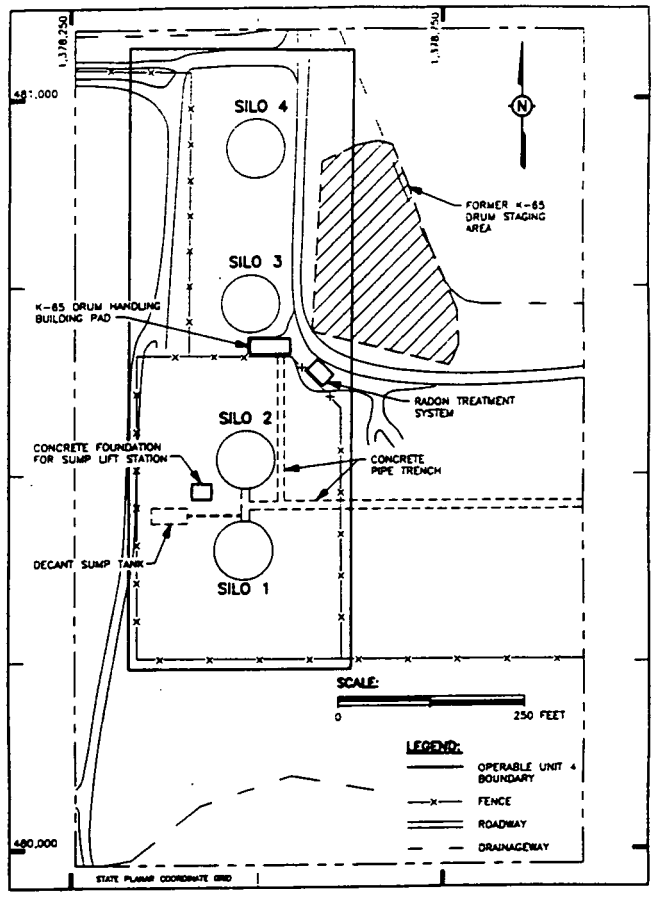
UNDERSTANDING OPERABLE UNIT 4

To better manage environmental investigation and cleanup, the FEMP site was divided into five operable units. The operable units are defined by their physical locations as well as the potential for similar technologies to be used in the cleanup process. Operable Unit 4 is one of five operable units at the FEMP site. Operable Unit 4 consists of the following facilities and associated environmental media (see Figure 2):

- Silos 1 and 2 and their contents (K-65 residues, by-product material);
- Silo 3 and its contents (cold metal oxides, by-product material);

FIGURE 2 - OPERABLE UNIT 4 AREA



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- Silo 4 (empty, except for rainwater infiltration);
- K-65 decant sump tank and its contents;
- A radon treatment system;
- A portion of a concrete pipe trench and other concrete structures;
- An earthen berm surrounding Silos 1 and 2;
- Soils beneath and immediately surrounding Silos 1, 2, 3, and 4;
- Perched groundwater encountered in the vicinity of the silos during the implementation of cleanup activities.

Originally constructed in 1951 and 1952, three of the four silos received residues until 1958. Silos 1 and 2 were originally constructed to provide temporary storage of the K-65 residues, generated from the processing of uranium ores until they could be returned to the African Metals Corporation. After remaining in storage at the FEMP for more than 30 years, ownership of the K-65 residues was transferred to the United States government in 1984. Note that the term "K-65" was used to describe the uranium ores processed at the FEMP site.

The K-65 residues have been the focus of considerable attention from DOE, U.S. EPA, Ohio EPA, and the community due to the nature of the materials and their present storage configuration. Significant concerns associated with Silos 1 and 2 include:

- High concentrations of radionuclides, including radium and thorium, which are present in the materials stored in the silos;
- An elevated, direct-penetrating radiation field in the silos;
- Chronic emissions of radon (a radioactive gas from the decay of radium) from Silos 1 and 2 into the atmosphere;
- The structural instability of the silo domes and the age of the remaining portions of the structures;
- The potential threat of the contaminated residues leaching into the underlying sole-source aquifer, that is the primary drinking water source for this area.

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Due to deterioration in 1963, site workers repaired the concrete coating around each silo and constructed an earthen berm around them to counterbalance the outward load from the silo contents. The berm also protected the silo walls from weathering and served as a radiation shield. This berm was expanded in 1983 to reduce soil erosion.

Other improvements to Silos 1 and 2 included: sealing the vents in the domes in 1979; installing plywood covers on the domes in 1986; and adding a polyurethane coating in 1987 to reduce weathering and to help lower radon emissions. A radon treatment system (RTS) was also installed to draw air from the silos, remove moisture and radon through a charcoal-adsorption process, and recirculate clean air back into the silos. The lower radon emissions, as a result of the RTS, then allowed workers to safely apply a layer of bentonite clay over the K-65 residues within the silos. The bentonite clay layer has reduced the amount of radon escaping from the silos into the environment and would help prevent the release of contaminants into the air if a natural disaster (e.g., a tornado) should occur or if the silo domes were to collapse.

Silo 3 received metal oxides generated from FEMP refinery operations. The cold metal oxides in Silo 3 have a significantly lower direct radiation field and radon emanation rate than the K-65 residues in Silos 1 and 2; however, there is concern that dust particles would escape in the event of the silo structure were to collapse.

Silo 4 was never used for material storage and remains empty today, except for some rainwater that has accumulated in the silo through the leaky silo dome. Silo 4 is not considered a current or potential threat to human health and the environment.

SUMMARY OF OPERABLE UNIT 4 RISKS

The chemical and radiological constituents present within the stored waste inventories and environmental media within Operable Unit 4 present certain risks to human and environmental receptors. Statistical evidence indicates that humans have about a one in three (33 percent) chance of developing cancer during their lifetime from all causes (American Cancer Society 1992). Federal regulations designed to protect human health require that any risk from exposure to non-naturally occurring carcinogenic materials at a waste site not add greater than a one in ten thousand chance of developing cancer.

DOE conducted a baseline risk assessment which estimates the risks that could occur in and around the FEMP site in the event no further cleanup actions are taken. With the assistance of computer models, these risks are evaluated for the situation as it presently exists and for how it could exist up to 1000 years in the future.

The Operable Unit 4 baseline risk assessment examined five exposure scenarios which included hypothetical receptors. In each of the five scenarios presented, the term "receptor" refers to a person whose health conditions may be affected by Operable Unit 4 contaminants. The baseline risk assessment also utilized two "source terms" as a way to predict risk. The "current source term" assumed that the silos remain in much the same condition as they are today. The "future source term" assumed that the Silos 1 and 2 domes collapse and the Silo 3 structure collapses completely.

For the purpose of this Fact Sheet, one hypothetical receptor (the on-property resident farmer) during "future source term" was selected to provide a relative indication of the baseline risks associated with Operable Unit 4. No such resident farmer currently exists at the facility, and the calculated risks represent the maximum the hypothetical receptor can reasonably be expected to receive during a lifetime. For the on-property resident farmer, the maximum contribution of risk from Operable Unit 4 came primarily from four exposure mechanisms: consumption of foodstuffs grown in contaminated soils and irrigated with contaminated water, consumption of contaminated groundwater, inhalation of resuspended Silo 3 particulates and direct radiation. The maximum reasonable exposure from these pathways results in an incremental lifetime risk of developing cancer of 1 in 1, or unity.

Based on the results of the site investigations and risk calculations, the risks associated with Operable Unit 4 exceed generally accepted regulatory thresholds, thereby necessitating the implementation of remedial actions. It is important to consider that DOE and EPA have already decided that the FEMP site will undergo cleanup and remediation. The baseline exposure scenarios are used to show why cleanup is necessary and to identify the sources of contamination and the potential routes by which humans or the environment could be exposed to these contaminants. It is also important to note that the DOE maintains fences and guards to limit access to the FEMP site. To minimize risks to existing offsite residents attributable to Operable Unit 4 residues, DOE continues to monitor and maintain the Operable Unit 4 waste storage facilities.

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives were developed to address the concerns associated with Operable Unit 4. These alternatives were developed by examining available cleanup technologies and process options that were potentially applicable to the waste materials within Operable Unit 4. These alternatives were screened to eliminate those that were considered to be impractical to implement or ineffective in addressing the hazards associated with the specific waste materials. The alternatives that passed the screening process were subjected to a detailed analysis to examine the environmental, as well as human health impacts of each

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alternative.

For more in-depth information on remedial alternatives, refer to the *Feasibility Study Report for Operable Unit 4*, available for review in the Administrative Record at the Public Environmental Information Center, 10845 Hamilton-Cleves Road, Harrison. (See map on page 14)

The waste materials within Operable Unit 4 exhibit a wide range of properties. Most notable is the elevated direct radiation associated with the K-65 residues versus the much lower direct radiation associated with the cold metal oxides in Silo 3. Even more significant are the much lower levels of contamination associated with the soils and building materials, such as concrete, within the Operable Unit 4 study area. To account for the wide range of properties of the waste materials within Operable Unit 4 and for the varied cleanup alternatives applying to each type of waste, Operable Unit 4 was divided into three subunits. These subunits, listed below, are used in the detailed evaluation of alternatives.

Subunit A: Contents of Silos 1 and 2 (K-65 residues and bentonite clay) and the sludge in the decant sump tank.

Subunit B: Contents of Silo 3 (cold metal oxides).

Subunit C: Silos 1, 2, 3, and 4 structures; contaminated soils within the Operable Unit 4 boundary including surface and subsurface soils and the earthen berm around Silos 1 and 2; the decant sump tank; the radon treatment system; the concrete pipe trench and the miscellaneous concrete structures within Operable Unit 4; and any debris (i.e., concrete, piping, etc.) generated through implementing cleanup for Subunits A and B ; and perched water encountered during remedial activities.

Table 1 (page 6) presents a brief description of remedial alternatives which were selected for detailed evaluation for each Operable Unit 4 subunit.

No-Action Alternative For All Subunits

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The "No-Action" alternative for Subunits A, B, and C are presented to provide a baseline for comparison with the other alternatives. Under the No-Action alternatives, designated as 0A, 0B, and 0C for each of the three subunits, the contaminated and/or uncontaminated materials within each subunit would remain unchanged without any further waste removal, treatment, or containment activities.

Alternatives 0A, 0B, and 0C would not provide for the monitoring of soil, groundwater, or radon emissions from the Operable Unit 4 facilities or soils, and would not provide for access controls (e.g., physical barriers and deed restrictions) which reduce the potential for exposure to any human or ecological receptors. No costs are associated with the No-Action alternatives.

Subunit A - Contents of Silos 1 and 2 (K-65 Residues)

Alternative 2A/Vit - Removal, Vitrification, and On-Property

- Years to Implement: 6
- Total Present Worth Cost: $43.6 million

Alternative 2A/Vit requires the removal, vitrification, and on-property disposal of the Silos 1 and 2 contents and decant sump tank sludge. The contents would be slurried and pumped through the silo dome existing manways to a vitrification (glassification) processing facility that would be built on property for processing. The vitrified material would then be disposed in an on-property disposal vault (a specially designed and constructed structure that would significantly reduce the potential for the escape of any contaminants).

Under Alternative 2A/Vit, approximately 6,796 m^3 (8,890 yd^3) of untreated materials would be removed from Silos 1 and 2. The silo contents would be combined with approximately 3,785 liters (1,000 gallons) of sludge from the decant sump tank and treated. Following treatment, approximately 2,770 m^3

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TABLE 1
SUMMARY OF OPERABLE UNIT 4 SUBUNIT ALTERNATIVES

Operable Unit 4 Subunit	Alternative	Description
Subunit A Silos 1 and 2 contents and decant sump tank sludge	0A 2A/VIT 2A/CEM 3A.1/VIT 3A.1/CEM	No action Removal, vitrification, on-property disposal Removal, cement stabilization, on-property disposal Removal, vitrification, off-site disposal at NTS Removal, cement stabilization, off-site disposal at NTS
Subunit B Silo 3 contents (cold metal oxides)	0B 2B/VIT 2B/CEM 3B.1/VIT 3B.1/CEM 4B	No action Removal, vitrification, on-property disposal Removal, cement stabilization, on-property disposal Removal, vitrification, off-site disposal at NTS Removal, cement stabilization, off-site disposal at NTS Removal and on-property disposal
Subunit C Silos 1, 2, 3, and 4 structures, soils, debris	0C 2C 3C.1 3C.2	No action Demolition, removal, on-property disposal Demolition, removal, off-site disposal at NTS Demolition, removal, off-site disposal at permitted commercial disposal site

(3,645 yd^3) of vitrified material would be packaged in containers and placed in an on-property disposal vault. Disposal of the contaminated materials from the berms, the Silos 1 and 2 structures, the material removal equipment and the vitrification systems would be managed under the selected alternative for Subunit C. Because the treated material would remain on property under Alternative 2A/Vit, a review would be performed every five years by EPA, in accordance with CERCLA, to ensure continued protection of human health and the environment.

Alternative 2A/Cem - Removal, Cement Stabilization, and On-Property Disposal

- Years to Implement: 6
- Total Present Worth Cost: $74 million

Alternative 2A/Cem addresses the removal of the Silos 1 and 2 contents, identical to the methods used in Alternative 2A/Vit, followed by cement stabilization of the K-65 residues and decant sump tank sludge and on-property disposal of the treated material. After removal of the Silos 1 and 2 contents and decant sump tank sludge, the material would be pumped to an on-site processing facility that would be built for cement stabilization. The stabilized material would then be disposed by the method proposed for Alternative 2A/Vit.

Under Alternative 2A/Cem, approximately 6,796 m^3 (8,890 yd^3) of untreated materials would be removed from Silos 1 and 2. The silo contents would be combined with approximately 3,785 liters (1,000 gallons) of sludge from the decant sump tank and treated. Following treatment, approximately 18,166 m^3 (23,903 yd^3) of cement stabilized material would be packaged in containers and placed in an on-property disposal vault using methods identical to those used in Alternative 2A/Vit. Disposal of contaminated materials from the berms, the Silos 1 and 2 structures, the material removal equipment and the cement stabilization systems would be managed under the selected alternative for Subunit C. Because the treated material would

remain on property under Alternative 2A/Cem, a review would be performed by EPA every five years in accordance with CERCLA, to ensure continued protection of human health and the environment.

Alternative 3A.1/Vit - Removal, Vitrification, and Off-Site Disposal - NTS

- Years to Implement: 6
- Total Present Worth Cost: $43.7 million

Alternative 3A.1/Vit involves the removal, vitrification, and off-site disposal of the treated Silos 1 and 2 contents and decant sump tank sludge. This alternative is identical to Alternative 2A/Vit, except the on-property disposal, monitoring, and institutional controls have been replaced by off-site transportation and disposal of the treated material. The treated material would be transported by rail or truck to the Nevada Test Site (NTS), a DOE-owned facility that currently accepts low-level radioactive material from DOE facilities for disposal.

Under Alternative 3A.1/Vit, approximately 6,796 m^3 ([illegible]90 yd^3) of untreated wastes would be removed from Silos 1 and 2 and combined with approximately 3,785 liters (1,000 gallons) of sludge from the decant sump tank and treated. Approximately 2,770 m^3 (3,645 yd^3) of vitrified material would be packaged in containers and transported to NTS for disposal. Disposal of contaminated materials from the berms, Silos 1 and 2 structures, the material removal equipment and the vitrification systems would be managed under the selected alternative for Subunit C. No five-year CERCLA reviews would be required under this alternative because all Subunit A waste would be removed from the site.

NTS is located approximately 3,200 kilometers (2,000 miles) from the FEMP site. Disposal at NTS would be very effective at precluding contact with and contaminant migration from the treated residues of Subunit A. The [illegible]MP site has an approved NTS waste shipment and certification program that is periodically audited by NTS. Efforts have been initiated to amend the curren[illegible] program to include Operable Unit 4 treated material.

Alternative 3A.1/Cem - Removal, Cement Stabilization, and Off-Site Disposal - NTS

- Years to Implement: 6
- Total Present Worth Cost: $73.1 million

Alternative 3A.1/Cem is identical to Alternative 2A/Cem, except the on-property disposal, monitoring, and institutional controls have been replaced by transportation and disposal of the treated material off site. Treated material and debris would be transported by rail or truck to NTS.

Under Alternative 3A.1/Cem, approximately 6,796 m^3 (8,890 yd^3) of untreated materials would be removed from Silos 1 and 2 and combined with approximately 3,785 liters (1,000 gallons) of sludge from the decant sump tank and treated. Approximately 18,166 m^3 (23,903 yd^3) of cement stabilized product would be packaged in containers and transported to NTS for disposal. Disposal of contaminated materials from the berms, the Silos 1 and 2 structures, the material removal equipment and the cement stabilization systems would be managed under the selected alternative for Subunit C. No five-year CERCLA reviews would be required because all Subunit A wastes would be removed from the site under this alternative.

Subunit B - Contents of Silo 3

Alternative 2B/Vit - Removal, Vitrification, and On-Property Disposal

- Years to Implement: 4
- Total Present Worth Cost: $28 million

Alternative 2B/Vit requires the removal, vitrification, and on-property disposal of the Silo 3 contents. The contents would be conveyed through the silo dome existing manways to a processing facility that would be built for vitrification. The containerized, vitrified

material would be disposed in an on-property disposal vault that would be built on site.

Under Alternative 2B/Vit, approximately 3,895 m^3 (5,093 yd^3) of untreated materials would be removed from Silo 3 and stabilized in a vitrified glass form. Following treatment, approximately 1,471 m^3 (1,935 yd^3) of vitrified material would be packaged in containers and placed in an on-property disposal vault. The Silo 3 structural materials and associated soils would be managed under the selected Subunit C alternative. Because the treated material would remain on property under Alternative 2B/Vit, a review would be performed every five years by EPA, in accordance with CERCLA, to ensure continued protection of human health and the environment.

Alternative 2B/Cem - Removal, Cement Stabilization, and On-Property Disposal

- Years to Implement: 4
- Total Present Worth Cost: $37.4 million

Alternative 2B/Cem uses the methodology presented in Alternative 2B/Vit, followed by treatment of the Silo 3 contents by cement stabilization, and on-property disposal of the stabilized material. After removal of the silo contents, the material would be conveyed to a processing facility that would be built on site, for cement stabilization and disposal.

Under Alternative 2B/Cem, approximately 3,895 m^3 (5,093 yd^3) of untreated materials would be removed from Silo 3 and stabilized in a cement form. Approximately 5,999 m^3 (7,894 yd^3) of stabilized material would be packaged in containers and placed in an on-property disposal vault. The Silo 3 structural materials and associated soils would be managed under selected Subunit C alternative. Because treated material would remain on property under Alternative 2B/Cem, a review would be performed every five years by the EPA, in accordance with CERCLA, to ensure continued protection of human health and the environment.

Alternative 3B.1/Vit - Removal, Vitrification, and Off-Site Disposal - NTS

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- Years to Implement: 4
- Total Present Worth Cost: $28 million

Alternative 3B.1/Vit involves the removal, stabilization, and off-site disposal of the Silo 3 contents. Alternative 3B.1/Vit is identical to Alternative 2B/Vit, except the on-property disposal, monitoring, and institutional controls have been replaced by transporting the treated material by rail and/or truck to NTS for disposal.

Under Alternative 3B.1/Vit, approximately 3,895 m^3 (5,093 yd^3) of untreated materials would be removed from the silo. Approximately 1,471 m^3 (1,935 yd^3) of the vitrified material would be packaged in containers and transported to NTS for disposal. Alternative 3B.1/Vit would have to meet applicable off-site requirements which include NTS material acceptance criteria and U.S. Department of Transportation regulations pertaining to the transport of hazardous and radioactive materials. No five-year CERCLA reviews would be required because all Subunit B wastes would be removed from the site under this alternative.

Alternative 3B.1/Cem - Removal, Cement Stabilization, and Off-Site Disposal - NTS

- Years to Implement: 4
- Total Present Worth Cost: $36 million

Alternative 3B.1/Cem is identical to Alternative 2B/Cem except the on-property disposal, monitoring, and institutional controls have been replaced by transportation of the treated material off site. Treated material and debris would be transported by rail or truck to NTS, a DOE-owned facility that currently accepts low-level radioactive material from DOE facilities for disposal. Under Alternative 3B.1/Cem, approximately 3,895 m^3 (5,093 yd^3) of contaminated materials would be removed from Silo 3. Approximately 5,999 m^3 (7,894 yd^3) of stabilized material would be transported to NTS for disposal. No five-year CERCLA reviews would be

required because all Subunit B wastes would be removed from the site under this alternative.

Alternative 4B - Removal and On-Property Disposal

- Years to Implement: 2
- Total Present Worth Cost: $22 million

Alternative 4B involves removal of the Silo 3 contents, packaging, and on-property disposal of the untreated material. This alternative is identical to Alternative 2B, except it does not include treatment.

Under Alternative 4B, approximately 3,895 m^3 (5,093 yd^3) of contaminated materials would be removed from Silo 3 and packaged in containers for disposal in an on-property disposal vault. The Silo 3 structural materials would be managed under the selected Subunit C alternative. Because the untreated material would remain on property under Alternative 4B, a review would be performed every five years by EPA, in accordance with CERCLA, to ensure continued protection of human health and the environment.

Subunit C - Silos 1, 2, 3, and 4 Structures, Soils, and Debris

Alternative 2C - Demolition, Removal, and On-Property Disposal

- Years to Implement: 2
- Total Present Worth Cost: $34.3 million

Alternative 2C involves demolition of the Silos 1, 2, 3, and 4 structures and disposition of contaminated materials from the removal of the earthen berm, decant sump tank, process piping, and trenches. Alternative 2C further addresses excavation of contaminated soils within the Operable Unit 4 boundary and disposition of the contaminated debris generated as a result of implementing remedial actions for Subunits A and B. Contaminated materials would be placed into interim storage if neccessary, and final disposition of that material would be determined as part of the Record of Decision for Operable Units 3 and 5. Placing the Operable Unit 4 disposal decision in abeyance provides for an integrated site-wide disposal approach for soil and debris. In addition, Operable Unit 4 would be able to take advantage of any applicable waste minimization initiatives developed for soil and debris by Operable Units 3 and 5.

Under Alternative 2C, approximately 24,634 m^3 (32,214 yd^3) of contaminated material would be placed into interim storage/above-grade disposal vault, and a volume of approximately 30,280 liters (8,000 gallons) of decant sump tank water would be sent to the FEMP site's Advanced Wastewater Treatment facility. Because material would remain on FEMP property under Alternative 2C, a review would be performed every five years by EPA, in accordance with CERCLA, to ensure continued protection of human health and the environment.

Alternative 3C.1 - Demolition, Removal, and Off-Site Disposal - NTS

- Years to Implement: 2
- Total Present Worth Cost: $75.5 million

Alternative 3C.1 is identical to Alternative 2C, except the on-property disposal, monitoring, and institutional controls would be replaced by transporting the material by rail or truck to NTS for disposal.

Under Alternative 3C.1, approximately 24,634 m^3 (32,214 yd^3) of contaminated material would be transported for disposal at the NTS facility, and a volume of approximately 30,280 liters (8,000 gallons) of decant sump tank water would be sent to the FEMP site's Advanced Wastewater Treatment facility. Alternative 3C.1 would be required to meet applicable off-site requirements, which include NTS material acceptance criteria and the U.S. Department of Transportation regulations pertaining to the transport of hazardous and radioactive materials.

Alternative 3C.2 - Demolition, Removal, and Off-Site Disposal (Permitted Commercial Disposal Site)

- Years to Implement: 2
- Total Present Worth Cost: $44 million

Alternative 3C.2 is identical to Alternative 3C.1, except the off-site disposal at NTS has been replaced by off-site disposal at a permitted commercial disposal site. One such site is located near Clive, Utah, approximately 3,058 kilometers (1,900 miles) from the FEMP site. The facility has been permitted by the State of Utah to accept mixed waste and is authorized to accept naturally occurring by-product materials such as those in Subunit C.

The facility is currently in operation and would be capable of accepting waste from Subunit C. Due to the relatively long distance from the FEMP site, coordination with several states would be required for transportation of the materials. Additionally, an exemption from DOE Order 5280.2A, which prohibits disposal of DOE wastes at a commercial facility, would be needed before waste could be transported to the disposal site.

EVALUATION OF REMEDIAL ALTERNATIVES

Specific legal requirements for remedial actions are specified under CERCLA Section 121, as amended. These requirements include protection of human health and the environment, compliance with applicable or relevant and appropriate requirements (ARARs), a preference for permanent solutions which use treatment as a principal element (to the maximum extent possible), and cost-effectiveness. To determine whether alternatives meet the requirements, EPA has identified nine criteria in the National Contingency Plan (EPA 1990) which must be evaluated for each alternative selected for detailed analysis. The factors reviewed under each of these criteria are summarized in Table 2 (page 11). Table 3 (page 12) is an evaluation of remedial alternatives table which compares each alternative for each subunit against these criteria.

IDENTIFICATION OF THE PREFERRED REMEDIAL ALTERNATIVES FOR OPERABLE UNIT 4

Based on the detailed analysis of the alternatives performed during the Feasibility Study, the preferred alternative identified in the Proposed Plan for Subunits A and B are as follows:

Subunit A: Alternative 3A.1/Vit - Removal, Vitrification, and Off-site Disposal - NTS

Subunit B: Alternative 3B.1/Vit - Removal, Vitrification, and Off-site Disposal - NTS

On the basis of current information, DOE believes these alternatives would provide the best performance when compared to the other Subunits A and B alternatives, with respect to U.S. EPA's nine evaluation criteria.

The initially preferred alternative for Subunit C has been selected principally due to cost. Given the margin of potential error (+50/-30) in the rough order of magnitude cost estimates, alternatives 2C and 3C.2 are sufficiently equal in comparison (See Table 3). For the sole purpose of evaluating the performance of an overall preferred remedial alternative for OU4, the preferred alternative identified for Subunit C is as follows:

Subunit C: Alternative 2C - Demolition, Removal, and On-Property Disposal

For Subunit C, integration of this subunit with Operable Units 5 and 3 is recommended to take advantage of waste minimization opportunities due to much greater quantities of similar materials being addressed by those operable units.

TABLE 2
EVALUATION CRITERIA

1. **Overall protection of human health and the environment:** Examines whether a remedy would provide adequate overall protection to human health and the environment. Evaluates how risks would be eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls included in the alternative.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):** Determines if a remedy would meet all pertinent environmental laws and policy siting requirements.

3. **Long-term effectiveness and permanence:** Evaluates the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

4. **Reduction of toxicity, mobility, or volume through treatment:** Reviews the anticipated performance of the proposed treatment technologies for their abilities to reduce the hazards of, prevent the movement of, or reduce the quantity of waste materials.

5. **Short-term effectiveness:** Evaluates the ability of a remedy to achieve protection of workers, the public, and the environment during construction and implementation.

6. **Implementability:** Examines the practicality of carrying out a remedy, including the availability of materials and services needed during construction and operation.

7. **Cost:** Reviews both estimated capital, operation and maintenance costs of the remedy. Costs are represented as present worth costs. "Present worth" is defined as the amount of money that, if invested in the first year of implementing a remedy and paid out as needed, would be sufficient to cover all costs associated with the remedy over its planned life. Present worth costs allow remedies that would occur over different time periods to be compared on an even basis.

8. **State acceptance:** Evaluates the technical and administrative issues and concerns the State of Ohio may have regarding each of the alternatives (Will be addressed in the Comment Responsiveness Summary made available with the Record of Decision).

9. **Community acceptance:** Evaluates the issues and concerns of the public regarding each of the alternatives (Will be addressed in the Comment Responsiveness Summary made available with the Record of Decision).

To address the overall remediation of Operable Unit 4, the preferred alternatives for each of the subunits are combined to form the "preferred remedial alternative for Operable Unit 4". The alternative preferred by DOE, consists of the following major components:

- Removal of the contents of Silos 1, 2, and 3 (K-65 residues and cold metal oxides) and the decant sump tank sludge.
- Vitrification of the residues and sludges removed from the silos and the decant sump tank.
- Off-site shipment to NTS for disposal of the vitrified contents of Silos 1, 2, 3, and the decant sump tank.
- Demolition of Silos 1, 2, 3, and 4 and decontamination, to the extent practical, of the concrete rubble, piping, and other generated construction debris.
- Removal of the earthen berms and excavation of contaminated soils within the boundary of Operable Unit 4 to achieve proposed remediation levels and placement of clean backfill following excavation.
- Demolition of the vitrification treatment unit and associated facilities and decontamination or recycling of debris prior to disposition.
- On-property interim storage of excavated contaminated soils and remaining contaminated debris in a manner consistent

TABLE 3
EVALUATION OF REMEDIAL ALTERNATIVES

EVALUATION CRITERIA	SUBUNIT A - SILOS 1 AND 2 CONTENTS					SUBUNIT B - SILO 3 CONTENTS						SUBUNIT C - SILOS 1, 2, 3, AND 4 STRUCTURES, SOILS, AND DEBRIS			
	0A	2A/Vit	2A/Cem	3A.1/Vit	3A.1/Cem	0B	2B/Vit	2B/Cem	3B.1/Vit	3B.1/Cem	4B	0C	2C	3C.1	3C.2
1. Overall Protection Health & Environment	⁝⁝⁝	■	■	■	■	⁝⁝⁝	■	■	■	■	■	▦	■1	■	■
2. Compliance with ARARs	⁝⁝⁝	■2	■2	■	■	⁝⁝⁝	■2	■2	■	■	■	▦	■2	■	■
3. Long-term Effectiveness and Permanence	⁝⁝⁝	▦	▦	■	■	⁝⁝⁝	▦	▦	■	■	▦	▦	■	■	■
4. Reduction of Toxicity, Mobility, or Volume through Treatment	NA	■	▦	■	▦	NA	■	▦	■	▦	NA	NA	NA	NA	NA
5. Short-term Effectiveness	⁝⁝⁝	■	■	■	■	⁝⁝⁝	■	■	■	■	■	NA	■	■	■
6. Implementability	NA	■	■	■	■	NA	■	■	■	■	■	NA	■	■	■
7. Total Present Worth Cost ($ Million)	0	43.6	74	43.7	73.1	0	28	37.4	28	36	22	0	34.3	75.5	44
8. State Acceptance	State acceptance of the recommended alternative will be evaluated after the public comment period.														
9. Community Acceptance	By either filling out and returning the attached comment sheet or by verbally commenting on the Proposed Plan during public meeting, interested members of the public can voice their opinion on which parts of the alternative they support, which parts they have reservations about, and which parts they oppose. Community acceptance will be assessed after the public comment period and will be addressed in the Responsiveness Summary of the Record of Decision document.														

■ - Fully meets criteria ▦ - Partially meets criteria ⁝⁝⁝ - Does not meet criteria NA - Not Applicable

1 -- Assessment of protectiveness adopts the use of continued federal government ownership and evaluates risk to expanded trespasser and the off-property farmer.

2 -- Assumes substantive technical requirements for Ohio disposal facility siting are met.

with the approved *Work Plan for Removal Action 17 (Improved Storage of Soil and Debris)*.

- Treatment of any contaminated perched water encountered during remediation at the FEMP Advanced Wastewater Treatment facility.
- Continued access controls, maintenance, and monitoring of the stored waste inventories.
- Potential minimization of the final disposal volumes for soil and debris through additional treatment of stored Operable Unit 4 soil and debris using Operable Units 5 and 3 waste treatment systems.
- Disposal of remaining Operable Unit 4 contaminated soils and debris consistent with the selected remedies for Operable Units 5 and 3.
- On-property disposal of Operable Unit 4 soils and debris which can not be dispositioned consistent with the selected

remedies for Operable Unit 5 and 3.

Under the preferred alternative, the K-65 residues and cold metal oxides would be removed from Silos 1, 2, and 3 and treated in a vitrification facility that would be built at the FEMP. The sludges from the decant sump tank would also be removed and treated in the newly constructed vitrification facility. Following treatment, the vitrified residues would be containerized and transported off site for disposal at NTS.

Following removal of the residues, the concrete silo structures would be demolished. Additionally, the existing radon treatment system and other miscellaneous structures within Operable Unit 4 would be demolished. Further, following completion of treatment, the newly constructed vitrification facility would be disassembled. Surface scabbling, acid washing and other standard decontamination technologies would be applied to the extent practical to minimize the volume of waste requiring disposal. Opportunities for recycling of generated materials would also be explored and utilized to the extent practiced.

Contaminated soils within the Operable Unit 4 boundary would be excavated to the extent necessary to attain proposed remediation levels. To achieve these cleanup levels, it is estimated that a minimum of six inches of surface soils would be removed from the entire Operable Unit 4 area. Excavated areas would be regraded, backfilled with clean soil and revegetated.

Contaminated soil and debris would either be processed through the selected remedy identified by Operable Units 5 and 3 or placed in an interim storage facility to be located in the northern portion of the site to await the finalization of the disposal decisions for soils and debris under Operable Units 5 and 3. The interim storage would be managed pursuant to the approved *Work Plan for Removal Action 17 (Improved Storage of Soil and Debris)*.

The decision regarding final disposition of the Operable Unit 4 contaminated soil and debris would be placed in abeyance to take full advantage of planned and in progress waste minimization treatment processes. This strategy would enable proper integration of disposal decisions on a site-wide basis. As currently planned treatment facilities become available under Operable Units 5 and 3 remedial actions, full consideration would be given to applying these systems to the inventoried contaminated materials from Operable Unit 4. Following the application of available waste minimization processes, the remaining Operable Unit 4 contaminated soil and debris would be disposed consistent with the selected remedies for Operable Units 5 and 3.

The total estimated present worth cost for the preferred alternative is $91.7 million. The total estimated present worth cost is less than the sum of the total costs of the preferred alternatives for Subunits A, B, and C. This is due to the fact that Subunits A and B would share common costs associated with site preparation, construction of the silos contents removal work platform and processing facilities, and packaging and transportation. Capital costs associated with construction of the on-property disposal facility have been excluded.

On the basis of current available information, DOE believes the preferred alternative for Operable Unit 4 provides the best performance when compared with the other alternatives, with respect to the evaluation criteria. DOE believes this alternative would achieve substantial risk reduction by removing the sources of contamination, treating the material for which exposures would result in the highest risk, shipping the treated residues off site for disposal, and managing remaining contaminated soils and debris consistent with site-wide strategy. DOE believes the proposed treatment alternative reduces mobility of the hazardous constituents and results in significant reduction in the volume of materials requiring disposal. DOE believes the preferred alternative for Operable Unit 4 would be protective of human health and the

environment, would comply with all regulatory requirements, would be cost-effective, and would implement permanent solutions by utilizing *treatment* as a principal element to the maximum extent practical.

COMMUNITY PARTICIPATION

Input from the public is an important element of the decision-making process for cleanup actions at the FEMP site. Comments on the proposed Operable Unit 4 remedial action at the FEMP site will be received during a formal public review period following issuance of the Final Feasibility Study/Proposed Plan-Draft Environmental Impact Statement for Operable Unit 4.

The formal public comment period will be March 7 through April 20, 1994. Oral comments may be presented at a formal public hearing that will be conducted March 21, 1994, 7 p.m., at the Plantation, 9660 Dry Fork Road, Harrison, Ohio. (See Figure 3 for locations of the Public Environmental Information Center and the Plantation).

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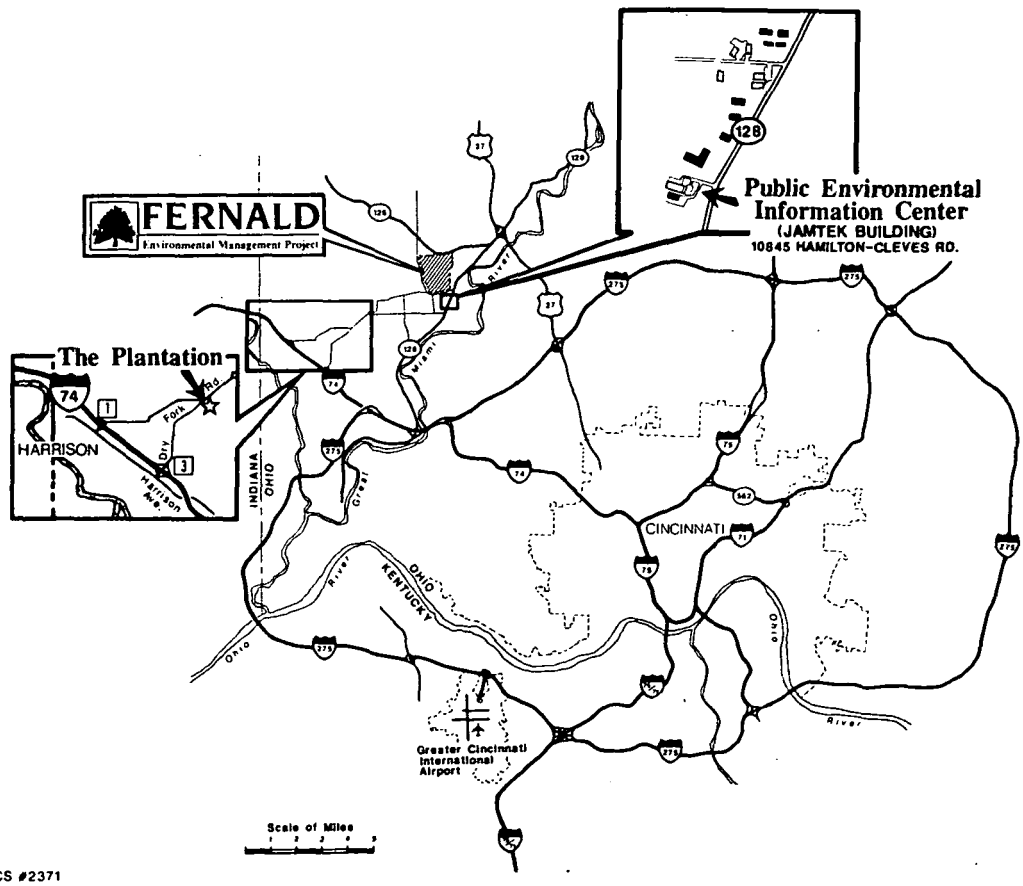
Information relevant to Operable Unit 4, including the *Remedial Investigation Report for Operable Unit 4, Baseline Risk Assessment, Feasibility Study/Proposed Plan-Draft Environmental Impact Statement for Remedial Actions at Operable Unit 4*, and supporting technical reports is in the Administrative Record located at the Public Environmental Information Center (PEIC). For information regarding the PEIC, including an updated schedule of its operating hours, please call 513-738-0164. The operating hours as of January 1, 1994 are as follows:

Public Environmental Information Center Hours

Monday and Thursday, 9 a.m. to 8 p.m.
Tuesday, Wednesday and Friday, 9 a.m. to 4:30 p.m.
Saturday, 9 a.m. to 1 p.m.

FIGURE 3 - LOCATIONS OF PUBLIC ENVIRONMENTAL INFORMATION CENTER AND PLANTATION



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COMMENT SHEET

DOE is interested in your comments on the cleanup alternatives being considered in the Feasibility Study/Proposed Plan-Draft Environmental Impact Statement for Remedial Action at Operable Unit 4. Please use the space provided below to write your comments, then fold, staple or tape, and mail this form. We must receive your comments on or before the close of the public comment period on April 20, 1994. If you have questions about the comment period, please contact Ken Morgan, the DOE Public Information Officer at Fernald, at (513) 648-3131.

Name: . . . . . .

Address: . . . . . .

City/State/Zip: . . . . . .

Phone: . . . . . .

MAILING LIST ADDITIONS:

Please add my name to the Fernald Mailing List to receive additional information on the cleanup progress at the Fernald Environmental Management Project:

YES___ **NO**___

FOR MORE INFORMATION

Additional information or related cleanup documents are available to the public at the following location:

PUBLIC ENVIRONMENTAL INFORMATION CENTER
10845 Hamilton-Cleves Highway
Harrison, Ohio 45030
(513) 738-0164 or 0165

---------- fold here ----------

---------- fold here ----------

Name_____

Address_____

_____

Place Stamp Here

Mr. K. L. Morgan
Public Information Officer
DOE Field Office, Fernald
U.S. Department of Energy
P.O. Box 398705
Cincinnati, OH 45239-8705