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CONF-970335--

**CHARACTERIZATION AND REMEDIATION OF SOIL  
PRIOR TO CONSTRUCTION OF AN ON-SITE  
DISPOSAL FACILITY AT FERNALD**

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For presentation at Waste Management '97  
Tucson, Arizona, 3/2-7/97

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## ABSTRACT

### CHARACTERIZATION AND REMEDIATION OF SOIL PRIOR TO CONSTRUCTION OF AN ON-SITE DISPOSAL FACILITY

During the production years at the Feed Materials Production Center (FMPC), the soil of the site and the surrounding areas was surficially impacted by airborne contamination. The volume of impacted soil is estimated at 2.2 million cubic yards. During site remediation, this contamination will be excavated, characterized, and disposed of.

In 1986 the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE) entered into a Federal Facility Compliance Agreement (FFCA) covering environmental impacts associated with the FMPC. A site wide Remedial Investigation/Feasibility Study (RI/FS) was initiated pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act (CERCLA). The DOE has completed the sitewide RI/FS process and has received approval of the final Records of Decision (RODs). The name of the facility was changed to the Fernald Environmental Management Project (FEMP) to emphasize the change in mission to environmental restoration.

Remedial actions which address similar scopes of work or types of contaminated media have been grouped into remedial projects for the purpose of managing the remediation of the FEMP. The Soil Characterization and Excavation Project (SCEP) will address the remediation of FEMP soils, certain waste units, at- and below-grade material, and will certify attainment of the final remedial limits (FRLs) for the FEMP. The final remedial limit is the concentration of a given contaminant which would be allowed to remain in soil, sediment, and groundwater following the implementation of remedial actions.

The FEMP will be using an on-site facility for low level radioactive waste disposal. The facility will be an above-ground engineered structure constructed of geological material. The area designated for construction of the base of the on-site disposal facility (OSDF) is referred to as the "footprint". Prior to construction, the footprint must be free of contamination. Contaminated soil within the footprint must be identified and remediated. The success of characterization and remediation will be verified through a certification process required and approved by the regulatory agencies.

Material exceeding the OSDF waste acceptance criteria (WAC) will be disposed of at an appropriate commercial or federal disposal facility.

Characterization, remediation, and certification activities are guided by the Remedial Action Work Plans (RAWPs) developed by the SCEP. Excavation of Phase I of the first of seven remediation areas is complete. Certification and reseeding will be completed in the spring of 1997.

## **CHARACTERIZATION AND REMEDIATION OF SOIL PRIOR TO CONSTRUCTION OF AN ON-SITE DISPOSAL FACILITY**

### **INTRODUCTION**

During the production years at the Feed Materials Production Center (FMPC), the soil of the site and the surrounding areas was superficially impacted by airborne contamination. The volume of impacted soil is estimated at 2.2 million cubic yards. During site remediation, this contamination will be excavated, characterized, and disposed of. The name of the facility was changed to the Fernald Environmental Management Project (FEMP) to emphasize the change in mission to environmental restoration.

The FEMP will be using an on-site facility for low level radioactive waste disposal. The facility will be an above-ground engineered structure constructed of geological material. The area designated for construction of the base of the on-site disposal facility (OSDF) is referred to as the "footprint". Prior to construction, the footprint must be free of contamination. Contaminated soil within the footprint must be identified and remediated. The success of characterization and remediation will be verified through a certification process required and approved by the regulatory agencies.

Characterization, remediation, and certification activities are guided by the Remedial Action Work Plan (RAWP) for the Soil Characterization and Excavation Project (SCEP). Phase I, which involves characterization, excavation, certification, and reseeded has been successfully completed.

### **ORIGIN OF CONTAMINATION**

The FEMP, formerly known as the FMPC, is a 1050-acre U.S. Department of Energy (DOE) facility located Northwest of Cincinnati near the small rural community of Fernald, Ohio. The primary mission of the FMPC during its 38 years of operation was the production of high-purity uranium metal. The high-purity metal was shipped to other DOE or U.S. Department of Defense facilities for use in the nation's weapons program.

The source of contamination in environmental media at the FEMP and surrounding areas can be attributed to process operations and waste management practices. Uranium is the primary contaminant found in the site environment. Radium and thorium, frequently associated with the ores from which uranium is extracted, are also present. Fission and activation products are also found at the FEMP due to the use of reprocessed fuel as source material for uranium metal production.

The predominant inorganic chemicals associated with the production process include magnesium fluoride, nitric acid, hydrochloric acid, hydrofluoric acid, magnesium metal, calcium hydroxide, calcium-magnesium carbonate, arsenic, calcium, iron, phosphorus, sodium, thorium, and vanadium.

Organic chemicals used in the production activities include kerosene, tributyl phosphate, lubricants, cutting oils, coolants, water soluble oil, polychlorinated biphenyls (PCBs) from lubricants and electrical equipment, pesticides, herbicides, and various solvents.

Above-background concentrations of uranium were detected in the surface soil across much of the FEMP, with the highest concentrations residing within the former production area and adjacent to the Sewage Treatment Plant Incinerator. Uranium contamination of subsurface soil is typically aligned with areas where large quantities of acids or other liquids were used in the uranium purification process.

In the area of the OSDF, the primary mechanism for contamination was fallout from point source emissions, fugitive emissions, and nonroutine events. Approximately 179,000 kilograms of uranium were released to the atmosphere from FEMP operations from 1951 through 1989.

Uranium and most of the compounds formed from uranium are relatively insoluble. Airborne deposition was determined to cause surficial contamination. The vertical limitations on contamination in areas contaminated by airborne deposition has been confirmed by sample collection and analysis during the Operable Unit 5 RI/FS (DOE 1995, 1996b). Contamination is predicted to be decreased to below the final remediation levels (FRLs) by removing the top 6 inches of soil in selected areas of the site.

## SUMMARY OF ENVIRONMENTAL COMPLIANCE AGREEMENTS

In 1986 the U.S. Environmental Protection Agency (EPA) and the Department of Energy (DOE) entered into a Federal Facility Compliance Agreement (FFCA) covering environmental impacts associated with the FEMP. In response to the FFCA, a site wide Remedial Investigation/Feasibility Study (RI/FS) was initiated pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act (CERCLA). On June 29, 1990, a Consent Agreement between the two agencies became effective. This agreement established an operable unit (OU) concept for executing the RI/FS while maintaining the underlying objectives of the FFCA. The FEMP was divided into five operable units:

- Operable Unit 1 - Waste Pit Area (Clearwell, burn pit, six waste pits and the berms, liners, and material approximately 3 feet beneath the pits)
- Operable Unit 2 - Other Waste Units (solid waste landfill, lime sludge ponds, flyash piles and other South Field disposal areas, and the berms, liners and soil within the unit boundaries)
- Operable Unit 3 - Production Area (structures, equipment, utilities, drums, tanks, effluent lines, wastewater treatment facilities, scrap metal piles, feedstocks, and the coal pile in the former production facility)
- Operable Unit 4 - Silos 1-4 (including berms, underlying soils, and decant sump tank system)
- Operable Unit 5 - Environmental Media (perched ground water, Great Miami Aquifer, surface water, soil (except that associated with other operable units), sediment, flora, and fauna).

The DOE has completed the sitewide RI/FS process for the FEMP and has received approval of the final Records of Decision (RODs) for the five FEMP operable units. The five operable units are in different stages of Remedial Design/Remedial Action (RD/RA).

## REMEDIATION

Remedial actions which address similar scopes of work or types of contaminated media have been grouped into remedial projects for the purpose of managing the cleanup of the FEMP. The SCEP will address the remediation of FEMP soils, OU2 waste units, at- and below-grade material, and will certify attainment of the final remediation levels (FRLs) for the FEMP.

The final remediation level is the concentration of a given contaminant which would be allowed to remain in soil, sediment, and groundwater following the implementation of remedial actions. The final cleanup levels take into consideration factors such as worker health and safety, technical limitations on attaining the cleanup level (e.g., attaining levels below natural background or analytical detection limits), cross-media impacts, impacts to sensitive ecological receptors, and cost.

Remediation of contaminated soils will be performed in accordance with the remedy documented in the OU5 ROD (DOE 1996a). The selected remedy for OU5 includes the following major components:

- Excavation of contaminated soil and sediment to the extent necessary to establish with reasonable certainty that the average concentrations of contaminants are below the FRLs established in the OU5 RI/FS and ROD (DOE 1995, 1996a, 1996b)

- Placement of contaminated soil and sediment which conform to concentration-based waste acceptance criteria (WAC) into the On-Site Disposal Facility (OSDF); potential treatment of soil exhibiting contaminant concentrations exceeding the WAC and subsequent placement in the OSDF or shipment off site for disposal at an appropriate commercial or federal disposal facility. No waste generated outside the FEMP will be placed in the OSDF
- Application of institutional controls such as access controls, deed restrictions, and alternate water supplies during and after remedial activities to minimize the potential for human exposure to site-introduced contaminants and ensure the continued protection of human health
- Implementation of a long-term environmental monitoring program and a maintenance program to ensure the continued protectiveness of the remedy, including the integrity of the OSDF.

The FEMP site has been divided into seven functional remediation areas. Soils associated with the OSDF and its support facilities are located in Area 1. Area 1 has been subdivided into distinct restoration area phases. Phase I of the remediation of Area 1 (A1,PI) includes:

- Relocated North Access Road
- Northern portion of the OSDF
- OSDF borrow area.

The purpose of the activities in Area 1, Phase I is to assure a contaminant-free footprint for the construction of the first two OSDF cells and to relocate the North Access Road from the OSDF footprint. This will be achieved by remediating contaminated soils and certifying that the FRLs have been met.

The scope of activities necessary for the remediation of soils can be divided into three major efforts; precertification, excavation, and certification.

Precertification includes all sampling and testing performed before certification. The precertification strategy is based on the knowledge that time and money can be saved and rework minimized by precertifying remedial areas. Precertification has the potential to provide numerous benefits, including:

- Identification of soils meeting waste acceptance criteria for the OSDF
- Verification of the areal extent of excavation prior to remediation
- Identification of the need for stormwater control systems
- Improvement of confidence in quantitative contaminant excavation
- Minimization of excavation rework
- Assurance that unexcavated areas are adequately prepared for certification.

The remediation and excavation strategy is based on excavation efficiency, the nature of contaminants present, and the mode of contaminant distribution. Upgradient areas will be remediated and certified, or isolated by engineering controls, to prevent downgradient cross-contamination.

Soil beneath permanent facilities, such as the OSDF, will not be accessible after site remediation is complete. Therefore, topsoil must be removed to provide a suitable surface for OSDF construction. The soil within the area of the OSDF will be analyzed for compliance with the final remediation levels (FRLs) prior to OSDF construction. Excavated soil will be characterized and placed in controlled stockpiles until final disposition. Soil which meets the WAC for the OSDF will be stockpiled within Area 1 of the FEMP.

As used in this paper, certification is the demonstration that remediation has been successfully completed by meeting the final remediation levels published in the ROD. The FEMP has been subdivided into certification units for the purpose of remediation management. As remediation is

completed in a unit, samples are collected and analyzed to confirm the attainment of the FRLs. The DOE then submits area specific certification reports to the U.S. EPA for concurrence. Certification units which have been completed will be secured by engineered and administrative barriers to prevent recontamination.

The U.S. EPA will be petitioned to certify final site closure after DOE has determined that all remedial actions in the ROD have been completed.

A comparability study is underway to compare the results of precertification data collected using real-time gamma detection systems to the data obtained from certification samples. Additional details on certification are discussed later in the text.

### OTHER REGULATORY INTERACTIONS

Remedial actions must comply with chemical-, location-, and action-specific applicable and relevant appropriate requirements (ARARs) and guidelines To Be Considered (TBCs). The assessment of ARARs and TBCs identified the following general compliance issues.

Management of stormwater at the FEMP is described in the Stormwater Pollution Prevention Plan. The Stormwater Pollution Prevention Plan was developed to control and contain water from contaminated areas and prevent the recontamination of soil, stormwater and groundwater. Excavation activities in Area 1, Phase I impact approximately 45 acres of potentially contaminated soil. Stormwater control included four sediment traps/basins. Sediment will be periodically removed, tested, stored in stockpiles, and disposed of appropriately. Run-off will be monitored prior to release.

Short-term fugitive dust emissions are expected during remediation activities such as excavation, transportation, soil spreading, soil compaction, and soil staging. Controls used to minimize fugitive dust emissions include covers and physical barriers, moisture adjustments, water spray, vehicle speed restrictions, crusting agents, operational controls, wind screens, seeding, dust alerts, and temporary shut down. Fugitive dust emission abatement is triggered by action levels based on visual monitoring. Action level parameters are: "No visible emissions from any unpaved roadway, parking area, and any material storage piles except for a period of time not to exceed 13 minutes during any 60 minute period." The FEMP has adopted a 6-minute administrative action level to achieve compliance. The sitewide Integrated Environmental Monitoring Program will verify regulatory compliance.

Site wetlands were delineated in 1993. Dredge and fill activities are subject to the substantive permitting requirements of the Army Corps of Engineers and the State of Ohio requirements which were established pursuant to Sections 401 and 404 of the Clean Water Act. The impacts to wetlands under this scope occur above the headwater region of Paddy's Run and are authorized under Nationwide Permit No. 26. Area 1 does not lie in a floodplain, so a floodplain assessment is not required.

Sitewide surveys for threatened and endangered (T&E) species have been completed. Silt from remedial activities could impact state-threatened aquatic invertebrate species. Sedimentation ponds and other siltation control systems are employed to protect potentially impacted T&E species.

The National Historic Preservation Act requires that historic data be recorded on archaeological sites eligible for listing on the National Register of Historic Places. The Native American Graves Protection and Repatriation Act requires repatriation of certain cultural items discovered at the FEMP.

Areas within the scope of Area 1, Phase I have been surveyed for the presence of cultural resources. The FEMP is committed to preserving unexpected cultural discoveries. Discoveries of principle concern are prehistoric burials. During excavation, several rock slabs characteristic of grave markers were



unearthed. The presence of these stones increased the concern that unexpected burials would be unearthed. However, throughout Phase I no unexpected burials were unearthed.

## **CHARACTERIZATION**

The FEMP has undergone the transition from a production facility to an environmental restoration project. Extensive characterization work has been performed on the soil within the boundaries of the facility. Useful soil characterization information originates from two sources, production knowledge and analytical data from physical samples.

Extensive historical information has helped define the nature and extent of contamination present in specific areas. This production knowledge was used in the early characterization sampling efforts to select sampling locations and determine the type of analytical testing to be performed on physical soil samples.

Beginning in 1986, physical soil samples were collected and analyzed. This soil characterization data was assembled into a sitewide environmental database used as the basis of the OU5 Remedial Investigation and Feasibility Study Reports (DOE 1995, 1996b), which were submitted to the regulatory agencies. This soil analytical database continues to be updated as additional information is generated.

The soil analytical database currently contains over 200,000 records and serves as the basis for the remedial design effort. Although the soil database is extensive, there are several factors that limit its usefulness in determining the extent of contamination. These factors include:

- Biased sampling - Areas suspected of being contaminated were sampled more intensively. This makes it difficult to use the database to define the horizontal boundaries of contamination.
- Depth Profile - The expense and difficulty of obtaining soil samples at depth resulted in fewer subsurface data points making it difficult to define the vertical extent of contamination.
- Type of Analytical Tests - Analytical tests conducted on the soil samples obtained during the characterization efforts were influenced (biased) by production knowledge. Analytical data for total uranium, isotopic uranium, thorium, and radium predominate. Data for other site-specific contaminants, including inorganics (metals) and organics, are less numerous.
- Detection Limits - Soil samples were sent for analytical testing without knowledge of the cleanup levels of various contaminants and detection levels were not always set low enough.

The Operable Unit 5 Feasibility Study (DOE 1996b) estimated that the volume of contaminated soil to be excavated is 2.2 million cubic yards. Nearly all of this material is considered low level mixed waste and meets the waste acceptance criteria (WAC) for placement into the OSDF. Existing characterization data indicates that approximately 35,000 cubic yards of soil contaminated with uranium and technetium would exceed the WAC for the OSDF and require shipment and disposal off site.

## **AREA 1, PHASE I ENGINEERING STRATEGY AND DESIGN**

The soil beneath permanent facilities, such as the OSDF, will not be accessible after site remediation is complete. Therefore, the engineering design considered the requirements for attaining the final remediation levels and certification. The engineering design also considered the requirements for the construction of the OSDF. As the design evolved, sequencing of excavation and support activities received increased attention. The principle design constraints were:

- The nature and extent of contamination
- Volumes of waste generated
- Existing and proposed utilities

- Interim storage
- Final disposal
- Regulatory compliance
- Existing natural drainage patterns
- Removal of topsoil, drainage tiles, trees, etc.

The planned excavation limits, depths, and quantities of soil identified in the design package for Area 1, Phase I were derived from existing RI analytical data and refined based on precertification sampling. The data confirmed that the depth of contamination was limited to the first few inches of soil. The planned remedial boundaries changed due to circumstances encountered during remediation.

Precertification sampling was completed before excavation to aid in determining the need for storm water controls, identify areas of uranium contaminants in excess of WAC, and refine the footprint.

The basic design of the remedial action for Area 1, Phase I was excavation by stripping 6 inches of soil from the area. Some areas, with particularly low levels of contamination, were excluded from excavation. The basic design was consistent with the capabilities of standard excavation equipment and provided an adequate excavated depth to remove deposited contaminants.

### **EXCAVATION**

The following activities were performed to accomplish remediation of Area 1, Phase I:

- Remediation of the northern end of the OSDF footprint by removing contaminants exceeding the FRLs at the site, thus allowing subsequent construction of the OSDF on clean soil
- Remediation of an area for relocation of the FEMP North Access Road. The relocation of the North Access Road was necessary because the existing North Access Road is located within the footprint of the OSDF
- Stripping the top soil from an area being utilized for subsequent construction of the FEMP North Rail Yard. Although unrelated to OSDF construction, the top soil stripping for placement in the OSDF was performed as a good management practice that would reduce the likelihood of future contaminated runoff from the North Rail Yard
- Clearing and grubbing trees and removing agricultural drainage tiles.

All excavations were shallow (6 inches) and were accomplished using standard excavation equipment.

In the areas excavated, sediment and erosion controls were implemented. Prior to excavation, the area drained to existing channels at the site without treatment. Since the excavated area was considered to be less contaminated than the prior conditions, the effluent from the sediment and erosion control systems was allowed to flow to the existing drainage channels as well. Because of the limited nature of the excavation, the sediment and erosion controls represented a large fraction (33%) of the overall cost of the project.

The excavated material (i.e., soil suspected of contamination greater than the FRLs) was placed in two stockpiles on opposite sides of the existing North Access Road that splits Area 1, Phase I. That material consisted of approximately 60,000 cubic yards of soil and a limited amount of debris (concrete, drainage tile, trees and stumps). The different types of debris were segregated but were placed adjacent to the soil stockpiles. Separate soil/debris stockpiles were located on each side of the North Access Road to avoid crossing the existing North Access Road. The run-off from the stockpiles (both soil and debris) was captured in a basin and transferred to the site wide stormwater treatment system which is designed to remediate contaminated run-off.

Following excavation, fine grading and seeding was implemented in the excavated areas. The fertilizer was analyzed for radiological isotopes due to the potential for radiological interference during subsequent certification analyses. The selected fertilizer was a 34-0-14 mix to avoid the uranium content associated with the phosphate component of typical fertilizers.

As the excavation progressed, various unanticipated materials were discovered (e.g., contaminated tree trunks, drainage tiles, grave markers). Contaminated material was excavated, certified and then placed in a controlled interim stockpile awaiting ultimate disposal in the OSDF, or stockpiled or containerized and moved to a staging area to await off-site shipment if the material exceeds on-site WAC.

### **SAMPLING AND ANALYSIS**

The OU5 ROD (DOE 1996a) specifies 80 soil constituents of concern (COCs) for which FRLs are established. The soil FRLs are COC-specific concentration values that are allowed to remain in residual (postremedial) soils. The FRL development process considered human health risk, ARARs, cross-media impacts, and analytical detection limits. Review of the spatial distribution of the existing soil characterization data revealed that the specific COCs uranium, thorium, and radium made the greatest contribution to the volume of soil that required excavation and also posed 90 percent of the threat to human health. This pattern of contamination was consistent with the known production history of the site and the mechanism of airborne dispersion thought responsible for contamination of soil with these COCs.

The other COCs were present in the soil less frequently due to localized airborne or direct releases. The regulators agreed that remediation strategy would focus on the primary radiological COCs uranium, thorium, and radium on a sitewide basis due to their dominant and encompassing nature. The other COCs, termed secondary contaminants, would be dealt with on a more localized basis dictated by demonstrated distributions and knowledge of use in the production process.

Available data indicates that over 300 acres of the 1,050 acre facility contain contaminated soil which must be excavated. Preliminary calculations indicated that thousands of characterization samples would be required to affirm the excavation boundary. To reduce the associated cost and time, the SCEP developed, tested, and deployed stationary and mobile real time gamma detection instrumentation systems. These systems are capable of resolving environmental levels of gamma discernable radionuclides including the primary soil COCs uranium, thorium, and radium. Categorizing the contaminants by applying sitewide spatial analysis and using real-time analytical methods to perform characterization has demonstrated the potential for significant cost savings for the project.

Until the capabilities of the real-time analytical systems are fully demonstrated to the regulators, it will be necessary to rely on physical samples and laboratory testing to confirm that the soil FRLs have been met by excavation. Analytical testing of soil is divided into two elements based on end use of the data. Precertification encompasses all soil sampling and analytical testing performed prior to certification sampling. Precertification testing is performed on excavated soil to demonstrate confidence of successfully achieving certification. Certification sampling is the structured and pre-approved soil sampling and analytical testing that will statistically confirm that contaminant FRLs have been achieved.

### **DATA MANAGEMENT**

Effective management of existing and newly acquired characterization data, including real-time instrument readings, requires a management system with the following capabilities:

- Real-time data collected in the field will be reviewed on an immediate basis by the operator and field manager in order to establish the resolution and other quality parameters of the data; if

- errors are recognized rapid recollection can be done without remobilization.
- Newly acquired laboratory and real-time data will be collected, checked for quality control, downloaded, and assimilated for review on a timely basis for later retrieval.
- Qualified data retained in the project database will be stored in conjunction with other key parameters such as project designation, location coordinates, time of collection, soil moisture and density, level of excavation, and other relevant field details.
- Data will be accessible by select end users for review and mapping for decision-making purposes. Data quality will be sufficient to use for reporting to regulators and other stakeholders, including the public.

Effective data management requires integration across functional project and department lines including on- and off-site laboratories, field crews, information systems, and the project. Quality Control standards are maintained diligently through the duration of the project.

### CERTIFICATION

At the FEMP, certification is defined as sampling and analysis performed after excavation to demonstrate that the average concentration of COCs in residual soil does not exceed the established FRLs at a specified confidence limit. Remediated areas in Area 1, Phase I are certified in discrete elements called certification units (CUs). CUs are of three different dimensions based on demonstrated or suspected level of contamination interpreted from existing data and production history. CU1s are 200'x 200' in dimension and are the smallest of the basic certification units. CU1s are established in areas that have demonstrated contamination above the FRLs, are in close proximity to areas with demonstrated contamination, or have a high likelihood of contamination based on production history. A CU1 may be reduced in size when it is necessary to adapt to field conditions, but the same number of samples will be obtained.

A certification unit with the dimensions of 400' x 400' is classified as a CU2. CU2s are established in areas that have a minimal degree of demonstrated or suspected contamination or are adjacent to CU1s and the boundary of contamination is not clearly defined. Like CU1s, CU2s may be decreased in dimension to conform to excavation requirements while still retaining the same number of samples. Homogenous zones are larger certification units (CU3s) which do not exceed 15 acres in size. Homogenous zones are established in areas that do not have demonstrated contamination, but coverage is desired to ensure these areas are in compliance with FRLs. Homogenous zones are used mainly in locations that do not require remediation.

The approach for certification sampling and analytical testing requires a design that will ensure adequate samples are collected from each CU. In order to determine the critical minimum quantity of samples that need to be collected from each certification unit, estimations of the postremedial target level of each contaminant and postremedial variability of data are made. In the case of Area 1, Phase I, the number of physical samples required for primary radiological contaminants is 12 and for secondary contaminants is 9. The numbers of certification samples are based on the achievement of a postremedial target level of 75 percent of the FRL and the calculated postremedial variabilities of radium and arsenic respectively. Radium and arsenic were the conservative choices because they have the highest value for variability.

Samples are collected from the assigned certification units and sent for analysis to an off-site contract lab. After sample results are returned, the data is validated, mapped, and statistics are run on each analyte with an FRL for each CU sampled. A final certification report is prepared demonstrating compliance with the FRLs.

## DISPOSAL

The material excavated from Area 1, Phase I was placed in two stockpiles. The material in these stockpiles which meets the on-site waste acceptance criteria will be placed into the OSDF. The material will be examined for organic content as a surrogate parameter for compressibility. If organic content is low, the material will be used as direct cover on the OSDF liner system and will be placed in the fall 1997. If the organic content is high, the stockpile material will be held for placement in the OSDF in spring 1998.

## RESTORATION

The final land use scenario for the Fernald site is an undeveloped park. This scenario represents the best final land use given the residual human health risks and the excavation of expected soil volumes required to meet those risks.

The undeveloped park scenario also meets the Natural Resource Trustee concerns on property with respect to natural resource restoration. To meet the substantive requirements of the Clean Water Act and through negotiation with U.S. EPA, DOE is required to mitigate at a 1.5:1 ratio for planned impacts to 10 acres of on-property wetlands. U.S. EPA has indicated a preference for on-property mitigation. Therefore, DOE expects to enhance, create and/or restore 15 acres of wetlands at the Fernald site. Also, stakeholders have made clear their desire for the protection and enhancement of on-property natural resources. The Fernald Citizens Task Force has made final land use recommendations that call for the preservation of existing Fernald site natural resources and the utilization of the site to meet regulator and trustee natural resource commitments.

Perhaps the greatest driver for on-property natural resource restoration is ongoing negotiation with the Fernald Natural Resource Trustees. CERCLA Section 107 imposes potentially responsible party liability for injuries to natural resources. Natural resources are defined as "land, fish, wildlife, biota, air, groundwater, drinking water supplies, and other such resources" that are publicly owned or controlled. Trustees for natural resources have been established in the NCP and Executive Order 12580. For the Fernald site, natural resource trustees include the DOE, the U.S. Department of Interior, and the State of Ohio, as represented by the Ohio Environmental Protection Agency (OEPA). Trustees are responsible for ensuring public compensation for injuries to natural resource as a result of a release or threat of release of hazardous substances.

OEPA filed a \$206 million lawsuit in 1986 against DOE, in part for damage claims due to natural resource injuries. The lawsuit has been stayed, but still must be resolved. Together the Trustees have decided to attempt compensation for natural resource injuries through the remedial design process, rather than through the conduct of a potentially adversarial and litigation-intensive Natural Resource Damage Assessment. It is anticipated that the end-product of these negotiations will be a comprehensive, sitewide, Natural Resource Restoration Plan (NRRP) that not only meets Trustee concerns, but regulatory-driven mitigation and stakeholder desires as well. The NRRP will be fully integrated into remedial design, and will incorporate both excavated areas and existing natural resource areas that will not be disturbed.

For the OSDF, the buffer area surrounding the disposal cell will be integrated into sitewide natural resource planning. It is anticipated that the buffer area may be used as a wildlife corridor extender or connector, linking with an expanded and enhanced mosaic of deciduous woods across the northern portion of the Fernald site. Incorporating the buffer area into sitewide natural resource planning will address the concerns of both the Natural Resource Trustees and stakeholders.

## CONCLUSIONS

The contaminated environment was characterized through the RI/FS process. The remediation strategy was agreed upon by DOE and the regulatory agencies with input from stakeholders such as local community groups and nearby residents. Specific plans were prepared to precertify, excavate, and certify remediated areas as meeting established FRLs. Excavation of Phase 1 of the first of seven areas to be remediated has been successfully completed. The certification effort is well underway with projections for the first certification report to be transmitted to the U.S. EPA in the spring of 1997.

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Report Number (14) FEMP--2528  
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Publ. Date (11) 199803  
Sponsor Code (18) DOE/DP, XF  
UC Category (19) UC-700, DOE/ER

DOE