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1996

ANNUAL REPORT TO THE PUBLIC on the FERNALD

Environmental Management Project

Prepared by:

Ohio Environmental Protection Agency
OFFICE OF FEDERAL
FACILITIES OVERSIGHT

Combined Report
Agreement In Principle (# DE-FG05-940R22206)
& Cost Recovery Grant (# DE-FG05-940R22167)

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State of Ohio

Ohio Environmental Protection Agency
Ohio Department of Health
Ohio Emergency Management Agency

Prepared and Published by:

Ohio Environmental Protection Agency
Office of Federal Facilities Oversight
Fernald Team

401 East Fifth Street
Dayton, Ohio 45402-2911
937-285-6357
internet address: http://offo2.epa.ohio.gov

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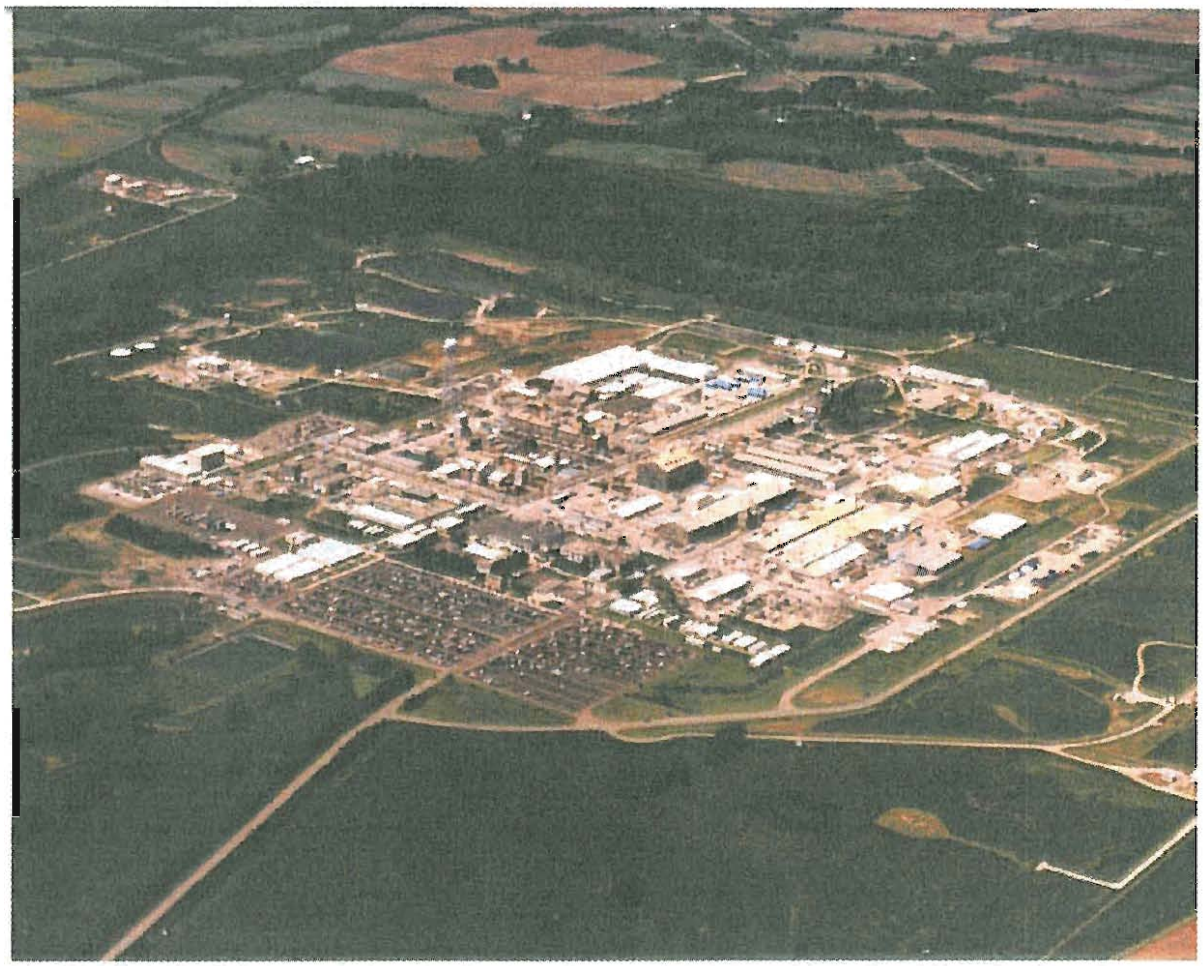
ACRONYMS

AIP	Agreement In Principle
ALARA	As Low As Reasonably Achievable
BAT	Best Available Technology
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLN	Community Leaders Network
CRG	Cost Recovery Grant
D&D	Decontamination and Demolition
DOE	Department of Energy
EMAB	Environmental Management Advisory Board
FCTF	Fernald Citizens Task Force
FFCAct	Federal Facilities Compliance Act
FRESH	Fernald Residents for Environmental Safety & Health
FRL	Final Remediation Level
FSP	Field Sampling Plan
GIS	Geographic Information System
GMA	Great Miami Aquifer
GMR	Great Miami River
GPS	Global Positioning System
IEMP	Integrated Environmental Monitoring Program
IRTEP	Integrated Remedial Technologies Evaluation Program
ITRC	Interstate Technology and Regulatory Cooperation
ITRD	Innovative Treatment Remediation Demonstration
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resources Damage Assessment
ODH	Ohio Department of Health
Ohio EMA	Ohio Emergency Management Agency
Ohio EPA	Ohio Environmental Protection Agency
OFFO	Office of Federal Facilities Oversight
OU	Operable Unit
OSDF	On-Site Disposal Facility
RCI	Rapid Commercialization Initiative
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
STGWG	State and Tribal Governments Working Group
SWDO	Southwest District Office of Ohio EPA
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria



The Fernald Environmental Management Project is located 18 miles northwest of Cincinnati.

1.0 INTRODUCTION

The purpose of this report is to document the State of Ohio's oversight activities at the United States Department of Energy's (DOE) Fernald Environmental Management Project. The report is written to provide interested parties a single source of information regarding Ohio's Fernald-related regulatory, environmental monitoring, public outreach, and planning activities during calendar year 1996. In addition, this report completes one of Ohio's commitments under the Agreement In Principle (AIP) between Ohio and DOE.

INTRODUCTION

1.1 AGREEMENT IN PRINCIPLE

The AIP outlines goals and commitments to be carried out by the State of Ohio and DOE during the Fernald cleanup and provides funding to Ohio. Ohio's objectives in this agreement are to: 1) extend agency non-regulatory oversight and review to Fernald's Environmental Monitoring Program; 2) assist in emergency preparedness planning; and 3) enhance public involvement and education. The AIP was signed in October of 1993. Implementation of the AIP began in 1994.

Ohio Environmental Protection Agency (Ohio EPA) is the lead agency for Ohio's implementation of the AIP. Ohio Department of Health (ODH) and Ohio Emergency Management Agency (Ohio EMA) provide support in health physics and emergency preparedness planning, respectively. The Office of Federal Facilities Oversight (OFFO) coordinates Ohio EPA's Fernald activities. Under the AIP, in 1996 Ohio conducted environmental monitoring, revised the draft *Field Sampling Plan* (FSP), solicited public involvement, provided monitoring data to the public, participated in national dialogues on DOE issues, and conducted emergency planning activities with local planning agencies.

1.2 COST RECOVERY GRANT

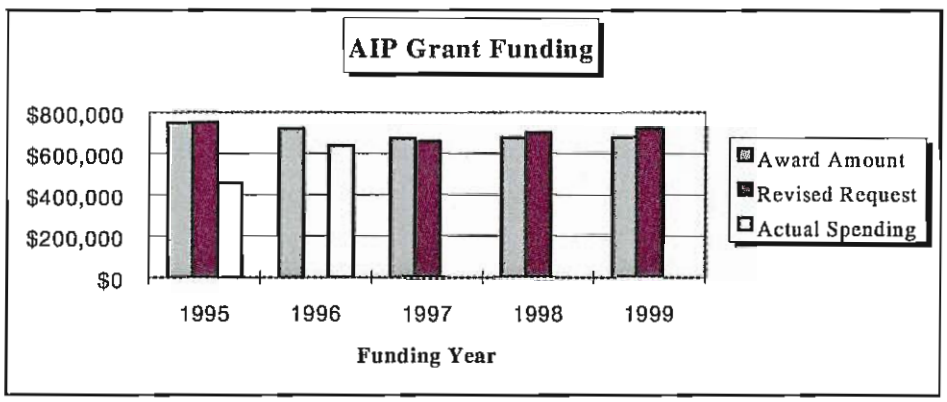
Ohio EPA has a long-standing regulatory role at Fernald. The 1988 Consent Decree between DOE and the State of Ohio provided a mechanism for recovery of costs associated with regulatory oversight. In 1993, the Cost Recovery Grant (CRG) was finalized to provide these costs in a financial assistance award, eliminating the need for annual reimbursement. This arrangement allowed Ohio to provide more active oversight early in the cleanup process through dedication of additional staff and resources to the project.

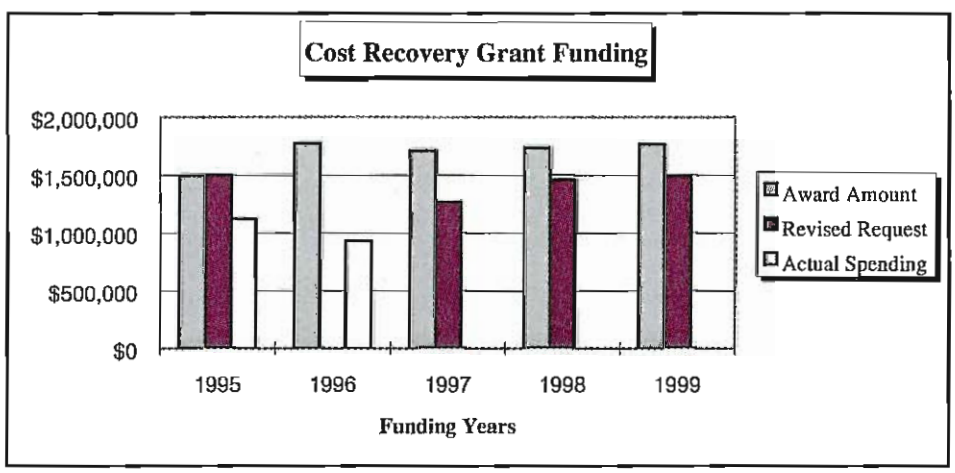
Ohio EPA is the State's lead agency for implementation of the CRG. ODH provides health physics support and data validation services. Ohio EPA conducts regulatory oversight for implementation of the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other environmental laws and regulations. In addition to regulatory activities, Ohio EPA conducts public outreach and environmental sampling under the CRG. Enhancing public involvement in decision making has been an important goal of Ohio's CRG program.

Ohio's actions under the CRG focus on oversight of the investigation and remediation of environmental contamination resulting from the facility's former production activities. Ohio's role includes the review of DOE plans and reports for site characterization and remedy selection. This review helps ensure that the selected remedies are protective of human health and the environment, comply with regulations, and are cost-effective. Ohio reviews the design and implementation of the selected remedial actions and collects environmental samples to ensure remedial action is conducted in a manner that limits impacts on the environment.

1.3 FUNDING

The graphs below represent profiles of the funding provided to the State of Ohio by DOE under the AIP and CRG for oversight at Fernald. Significantly less money was spent during State Fiscal Year 1996 than was provided in the original grants. The dollars saved are the result of efforts by Ohio to streamline costs and increase efficiency. Examples of this include optimization of sampling efforts and decreases in requested staffing. Money saved by Ohio can then be applied to cleanup at Ohio DOE sites.

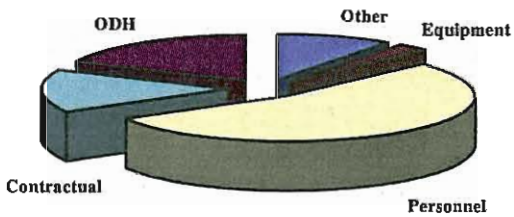




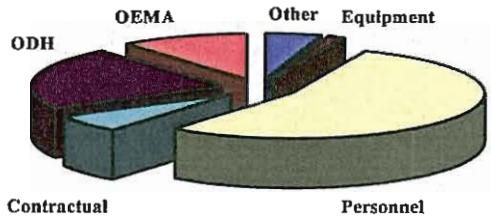
Ohio's revised funding requests for State Fiscal Year 1997 ($656,214 AIP, $1,259,853 CRG) represent 3% and 27% reductions from the original AIP and CRG funding requests, respectively.

The distribution of expenditures for State Fiscal Year 1996 (July '95 through June '96) is shown in the following figures. The figures show detailed breakdowns of Ohio EPA expenditures.

Cost Recovery Grant Spending



AIP Spending



Personnel expenditures include salaries, benefits, and indirect costs. Contractual expenditures include medical monitoring, laboratory analytical, and remedial oversight contractor costs. Operating costs, supplies, training, and travel make up the "other" expenditures.

Ohio spent $929,147 from the CRG fiscal year '96 funding. This expenditure is a 48% savings of the funds available under the original award. For AIP activities, Ohio spent $635,748 of second year funds, representing a 12% savings over the original award amount. Ohio will continue to look for opportunities to improve the efficiency and effectiveness in our programs.

1.4 SITE BACKGROUND

The site, formerly known as the Feed Materials Production Center, is a 1050 acre facility located in a rural, residential area 18 miles northwest of Cincinnati. The facility was constructed in the early 1950s and production began in 1952 with National Lead of Ohio as the operator.

Uranium metal products for the nation's defense programs were produced at Fernald, including slightly enriched and depleted uranium. Smaller amounts of thorium metal were also produced. Production stopped in July 1989 to focus resources on environmental restoration. In December 1989, the site was added to the United States Environmental Protection Agency's (USEPA) National Priorities List. In 1991, DOE officially ended production and the site was renamed the Fernald Environmental Management Project. Fluor Daniel Fernald (formerly Fernald Environmental Restoration Management Corporation or FERMCO) assumed responsibility for cleanup of the Fernald site from Westinghouse in 1992.

Environmental Threats

Ground Water: The Fernald site is located over the Great Miami Aquifer, which is designated a sole source aquifer and considered a valued natural resource. Ground water is contaminated with above background concentrations of uranium out to approximately one mile south of the site in what is referred to as the "south plume". DOE provided bottled water for residents in the south plume area from February 1991 until 1996 when a public drinking water system became operational. In 1993, the south plume removal action was implemented to slow the off-site migration of the uranium plume.

Waste Pits: The six waste pits used during operations contain approximately 475,000 tons of waste, including uranium, thorium, and other radioactive and chemical contaminants. The pits range in size from a football field to a baseball diamond, and vary in depth from 13 to 30 feet. Two of the pits have water covers,

one has a synthetic cap, and the other pits have soil covers. The waste pits are either in close proximity to, or in contact with, the Great Miami Aquifer and are contributing to ground water contamination. In 1991, a successful removal action was implemented to reduce stormwater runoff from the waste pits into Paddy's Run. This removal action significantly reduced the contaminant levels reaching Paddy's Run from the waste pits.

Silos: There are four concrete silos at Fernald that were constructed to store radioactive materials. Two of them, referred to as the K-65 silos, contain high radium-bearing residues, one contains lower-level dried uranium residues, and one has never been used. To reinforce the structurally flawed K-65 silos, a soil berm was added in the 1960s and enlarged in the early 1980s. In 1991, bentonite clay was injected into the tops of the two K-65 silos to cap the high radium residues and reduce radon emissions from the silos. The silos continue to retain the potential to release significant volumes of radioactive contaminants.

Past Releases*: According to an independent dose reconstruction study, an estimated 340 tons of uranium were released during production at the Fernald. The study also estimates 170,000 curies of radon were released from the K-65 silos. Numerous other radioactive and hazardous materials have contaminated the soils and ground water at the Fernald site.

* These estimates are reconstructions of past releases and are based on incomplete data. The review of historic data was conducted by Radiological Assessments Corporation (*The Fernald Dosimetry Reconstruction Project,* August 1996).

2.0 ACTIVITIES AND ACCOMPLISHMENTS

In 1996, significant strides were made in the cleanup of Fernald. The final Record of Decision (ROD) was approved, officially signifying the transition from investigation and characterization to remedial action. The implosion of a second building (Plant 4) was a visual indicator of progress. Work plans for the on-site disposal facility (OSDF) were approved by regulatory agencies and site excavation began.

To help facilitate oversight of cleanup progress, Ohio continued to work diligently in 1996 to keep up with the accelerated cleanup schedule. Ohio EPA technical staff reviewed over 100 documents, and granted State approval on 53 documents. To assist in these and other regulatory functions, Global Positioning System (GPS) and Geographic Information System (GIS) equipment were fine tuned for more accurate and efficient applications. A significant amount of time was spent addressing critical issues such as media and public relations and funding. This included substantial improvements to the Office of Federal Facilities Oversight web site. Additionally, Ohio continued efforts to maintain high quality emergency planning operations and to work with DOE on numerous national level issues. Ohio's activities and accomplishments for 1996 are further explained in the following sections.

2.1 REGULATORY OVERSIGHT

Remedial investigation activities were initiated as part of a 1986 Federal Facility Compliance Agreement between the USEPA and DOE. In 1988, a Consent Decree between the State of Ohio and DOE was signed, which also required completion of a CERCLA cleanup. Following the 1989 listing on the National Priorities List, a CERCLA Consent Agreement was signed by USEPA and DOE in 1990. Although multiple agreements requiring cleanup exist, Ohio EPA and USEPA work together on all aspects of the project.

Ohio staff reviewed over 100 documents in 1996 in order to fulfill its regulatory functions. These included decision documents, investigation reports, remedial design documents, and implementation documents. In addition to these oversight activities, Ohio EPA conducted RCRA and Clean Water Act inspections of the Fernald site.

In 1996, progress was made by DOE and Fluor Daniel Fernald in the initial phases of the actual site cleanup work. The last ROD for Fernald was approved which set the final criteria for site remediation. The focus has now transitioned from the study phase to the design and implementation of cleanup actions.

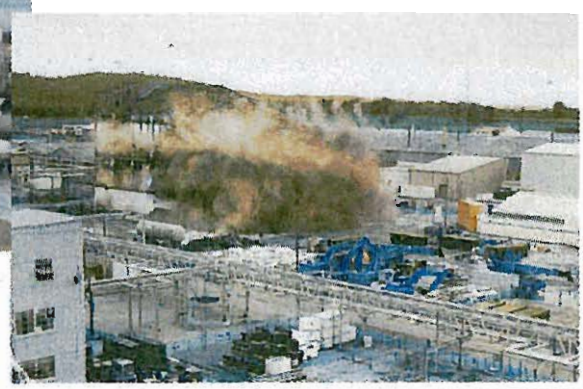
The site is divided into five operable units (OU), each one having its own selected cleanup remedy. Most operable units are now well into remedial design with some remedial actions underway. The following is a brief description of each OU's cleanup plan and progress over the past year.

Operable Unit 1: *Waste storage area, including six waste pits, a clearwell and a burn pit.* The ROD requires excavation of the waste pit contents, thermal drying, and shipment by rail to a commercial disposal facility. During 1996, remedial activities included excavation and stock piling 18,100 cubic yards of contaminated surface soil destined for off-site disposal and 17,748 cubic yards stockpiled for OSDF, installation of stormwater controls and utilities upgrades, and improved railroad access.

Operable Unit 2: *Other waste units, including flyash piles, south field disposal area, lime sludge ponds, and solid waste landfill.* The ROD requires excavation of the wastes and disposal in the OSDF, with off-site disposal for waste exceeding the OSDF waste acceptance criteria. The ROD ensures that no off-site waste will be allowed in the OSDF. During 1996, the design for the OSDF was approved by Ohio EPA and USEPA. Additionally, a test pad for cap and liner construction was successfully installed and tested.

Operable Unit 3: *Former production area, including all buildings, equipment, and inventoried hazardous material.* The final ROD was signed in September 1996 requiring decontamination and demolition (D&D) of all buildings on-site. All waste except that specified in the ROD is destined for disposal in the OSDF. During 1996, D&D of Building 4A was completed with its implosion on August 24, 1996. Additionally, safe shutdown was completed on Plant 9 and the Pilot Plant. In 1996, remote overpacking of 5,600 drums containing thorium residue was initiated, with over half of the containers completed.

Fernald's Building 4A before D&D.



Building 4A during implosion.

Operable Unit 4: *Silos 1-4, including the K-65 silos, their contents, and associated piping and soils.* The ROD requires vitrification of silo contents and off-site disposal at the Nevada Test Site. After substantial delays, the Vitrification Pilot Plant initiated testing of non-radioactive surrogate materials. During testing operations, the facility

encountered significant problems with the slurry feed and off-gas systems. After initiating the last of three testing campaigns, the melter developed a leak in late December. The leak resulted in the discharge of the melter contents and the indefinite suspension of testing operations. During the course of testing operations the facility successfully generated over 68,296 pounds of glass. Efforts are now underway to assess the potential for vitrification in the OU4 remediation strategy. In addition to testing operations, 4,500 gallons of liquid waste was pumped from the K-65 decant sump in 1996.

Operable Unit 5: *Environmental media, including ground water, surface water, soil and vegetation not included in the other OUs.* The ROD requires excavation of contaminated soils, placement of those soils meeting the waste acceptance criteria in the OSDF, and extraction and treatment of contaminated ground water from the Great Miami Aquifer. During 1996, excavation of contaminated soil in Area 1 Phase 1 was initiated. Approximately 45 acres were excavated to a depth of 6 inches, generating 42,000 cubic yards of soil and 3,000 cubic yards of debris stockpiled for placement in the OSDF. Installation of an injection well network and an associated ground water investigation were initiated in late 1996. Construction was initiated on ground water remediation facilities including the installation of reinjection wells. An investigation to further define ground water contamination in the south plume was started. A sump was installed in the pilot plant drainage ditch to reduce the discharge of contaminated water to Paddy's Run.

The overall strategy for managing these five OUs has been a balanced approach. This approach includes removing the most contaminated materials for off-site disposal, while disposing of the lesser contaminated materials on-site.

Federal Facility Compliance Act (FFCAct): The FFCAct of 1992 mandates that treatment plans be developed for mixed wastes at DOE sites. Mixed wastes contain both hazardous and radioactive components. The Ohio EPA Director's Findings and

Orders defining compliance with the FFCAct requirements for mixed waste were finalized in 1995. Significant progress on treatment and disposal of FFCAct wastes occurred during 1996. According to the Fernald 1996 annual update to the Site Treatment Plan, treatment and/or disposal has been completed for approximately 77% (by volume) of the mixed wastes initially identified for treatment. Of the eight treatment options identified in the approved treatment plan, seven of these have treated 100% of the wastes originally identified for those options.

RCRA/CERCLA Integration: In early 1996, Director's Findings and Orders addressing RCRA/CERCLA integration at Fernald were issued by Ohio EPA. The Orders were a joint effort between Ohio EPA, DOE, and Fluor Daniel Fernald to eliminate duplication of effort under two regulatory programs. The result should be a cleanup program that is streamlined, comprehensive, and compliant with both laws.

RCRA Oversight: Ohio EPA completed an annual RCRA Compliance Evaluation Inspection and numerous other issue-specific inspections at Fernald during 1996. As a result of these inspections and reporting by DOE, notices of violation were issued during 1996. All violations were corrected by DOE in a timely and satisfactory manner. Due to declining waste inventories and imminent closure of the hazardous waste storage units, Ohio EPA issued Director's Findings and Orders exempting Fernald from the formal hazardous waste permitting process. This exemption applies as long as Fernald complies with all applicable hazardous waste regulations and manages the waste in accordance with procedures outlined in the facility's September 1994 permit application. Also in 1996, Ohio EPA certified that three former hazardous waste management units at Fernald have been closed in accordance with the Director's performance standards.

Natural Resource Damage Assessment: Ohio EPA is the authorized agency to act as natural resource trustee for the State of Ohio. Other trustees for Fernald include DOE and the Department of Interior. The trustees' role is to act as guardians for

public natural resources impacted by Fernald. Significant progress was made during 1996 in defining natural resource impacts and damages. A draft impact assessment was developed and reviewed, and discussions were initiated concerning possible on-site restoration activities. The trustees for Fernald worked closely with the Fernald Citizens Task Force (FCTF) Natural Resources Subcommittee during the year. The goal of the Fernald trustees is to integrate natural resource restoration activities into the CERCLA remediation efforts at the site. Another goal of the trustees' efforts is to have the restoration activities result in settlement of the State of Ohio's natural resources damage claim against DOE. Ohio's activities as a natural resource trustee include review and oversight of threatened and endangered species surveys, protection of the state threatened Sloan's crayfish populations in Paddy's Run, and wetland mitigation oversight.

Stormwater and Fugitive Dust: During 1996, Ohio EPA focused significant effort on oversight of remedial activities to minimize impacts on the environment. Two primary areas of focus were the control of stormwater and fugitive dust. Sediment ponds and silt fences are two of the tools currently being employed to control stormwater runoff. The planned expansion of the Advanced Waste Water Treatment Plant will also decrease the uncontrolled discharge of contaminated stormwater by increasing the volume of water treated before discharge. Ohio EPA conducted a National Pollutant Discharge Elimination System permit inspection as well as several informal stormwater inspections over the course of the year.

Fugitive dust generation (fugitive air emissions are those that don't typically come from a stack) is expected to increase as soils are excavated during remediation. DOE has agreed with Ohio EPA's request to develop a BAT (Best Available Technology) plan to control fugitive dust. Ensuring finalization and implementation of this plan will be a primary focus of Ohio EPA during 1997.

2.2 PUBLIC OUTREACH

Ohio EPA's public outreach program is designed to supplement monitoring and oversight activities by involving the public in important environmental decisions. Since every decision at Fernald ultimately affects the public, their inclusion and understanding of the cleanup process is essential. Ohio EPA conducts its own public meetings, prepares fact sheets and press releases, and coordinates numerous other activities to ensure the public is included in decision making. These activities are in addition to full participation in DOE/Fluor Daniel Fernald sponsored events, Fernald Citizens Task Force (FCTF) meetings, Fernald Community Reuse Organization (CRO), and other public outreach activities. Ohio EPA's Fernald team is committed to encouraging early and meaningful public participation in cleanup decisions. Public availability and working partnerships with all stakeholders continue to be priorities for Ohio.

Meetings

The following list includes Fernald meetings in which Ohio participated. Many of the meetings are for groups with which Ohio staff meet regularly or on a recurring basis. Some of these were initiated and conducted by Ohio.

Citizen addresses Fernald quarterly public meeting.

Public Meetings:

- FRESH bi-monthly meetings*
- FCTF ex-officio participant*
- FCTF subcommittee activities*
- Community Leaders Network*
- Community Reuse Organization*
- Quarterly Community Meetings
- Silos Independent Review Team*
- Ohio EPA's *Field Sampling Plan***

- OU3 Availability Session**
- Silo 3 Alternatives**
- OU3 Public Hearing
- On-Site Disposal Facility Workshop
- FCTF trip to Envirocare in Utah
- FCTF trip to Nevada Test Site
- Fernald Open House
- 10 Year Vision
- Dose Reconstruction Study
- Fernald Health Effects Subcommittee*
- Reuse/Recycling Public Workshop
- OU2 60% Design Public Workshop
- Plant 4 Implosion
- OU1 Workshop
- IEMP and OSDF Monitoring Workshop
- OU4 Vitrification Pilot Plant
- Plant 4 Case Study—Recycling Methodology

*OFFO staff participated in the recurring activities of these groups

**These public meetings were sponsored by OFFO

Ohio EPA has an open door policy when it comes to public inquiries or requests for information. OFFO attempts to proactively address public concerns by sponsoring organized meetings with local residents to work through complex issues. Availability sessions are a tool the group uses to bring together Ohio EPA technical staff and local citizens. The purpose of the meetings is to provide open and candid availability of Ohio EPA staff. These sessions are held to clarify difficult issues, to further explain programs and policies within the agency, and to assist with public review of technical documents (such as the Silo 3 Alternatives and our *Field Sampling Plan*). Additionally, staff members were active in other community outreach programs, such as SWDO CARES and Adopt-a-School. These are environmental education programs geared towards the general public and children respectively.

OFFO representatives also participate in all DOE sponsored public meetings and workshops, and give presentations where requested or appropriate. This includes participating in meetings of the FCTF as an ex-officio member. Beginning in 1996, the task force structure was changed and four subcommittees were formed to look at waste disposition, environmental monitoring, natural resources, and transportation issues. At least one OFFO staff member participates in each subcommittee.

The Fernald Community Reuse Organization (CRO) was formed in 1996 to provide recommendations to the Department of Energy on social and economic development issues resulting from downsizing at Fernald. The CRO membership is made up of Fernald area citizens and employees. Ohio EPA participates as an ex-officio member of the group. The CRO focuses on the following issues:

- community planning issues
- economic development and work force issues
- planning for distribution of Fernald's capital assets

The CRO's recommendations will build upon the broad land use recommendations provided by the Fernald Citizen's Task Force.

What's in Print?

The following is a list of 1996 Ohio-generated resources relating to Fernald:

Publications:

- *Ohio EPA's Use Of Geographic Information System(GIS) and Global Positioning System (GPS) In Environmental Remediation Oversight On The Fernald Environmental Management Project,* published for the International Graphic Users Group conference, written by Randy Earle, Kelly Kaletsky, and Tom Schneider, May 1996
- *Environmental Remediation Oversight,* published for Eco-Informa '96 conference, written by Randy Earle, Kelly Kaletsky, and Tom Schneider, November 1996
- *1995 Annual Report to the Public on the Fernald Environmental Management Project*

Presentations:

- *Ohio EPA's Use Of GIS and GPS In Environmental Remediation Oversight On The Fernald Environmental Management Project,* presented at the International Graphic Users Group conference by Randy Earle, May 1996
- Presentation on *Use Of GIS In Environmental Remediation Oversight* at the Environmental Regulatory Compliance Management Seminar by Randy Earle, May 1996
- *A Regulatory Perspective to CLN,* presented at Eco-Informa '96 by Tom Schneider for the Community Leaders Network, November 1996
- *Integrating GIS and GPS In Environmental Remediation Oversight,* presented at Eco-Informa '96 by Kelly Kaletsky, November 1996

Fact Sheets:

- Revised Fernald Environmental Management fact sheet
- Revised Fernald Team reference sheet
- Silo 3 Alternatives fact sheet
- Quarterly Environmental Monitoring results fact sheets

Media Relations:

- Letter to the Editor of the Cincinnati Enquirer
- Operable Unit 3 joint press release

On the Internet:

OFFO was on-line all of 1996. During the year, OFFO responded to numerous public information requests from the Internet in addition to normal mail and phone inquiries and news media requests. The first comprehensive and current Fernald Internet page was created by OFFO in 1995. Internet users can quickly view information about the Fernald cleanup and contact Ohio EPA staff with further questions. The sharing of Fernald successes and problems worldwide may assist other cleanup sites conducting similar activities.

In 1996 many additions were made to the web site, including, two clickable maps (with federal facilities in Ohio and Fernald sampling locations), video with sound from building implosions (Plants 7 and 4), and various hot issue items and fact pages. New software for more enhanced, user-friendly web site development and maintenance was explored and purchased at the end of 1996. OFFO staff attended the *Internet and the Environment Conference* in November to learn more about possible applications for our web site.

More information about the Fernald cleanup and other Ohio federal facilities activities can be found at:

http://offo2.epa.ohio.gov

2.3 GPS AND GIS

Global Positioning System

Ohio EPA's Fernald team uses a Global Positioning System (GPS) to enhance oversight activities, in particular, the environmental monitoring program. GPS uses a series of satellites and a base station to reliably pinpoint geographic locations. In early 1996, the Ohio Department of Transportation surveyed in the exact location of the OFFO base station, thus allowing accuracy of field measurements to within a few inches.

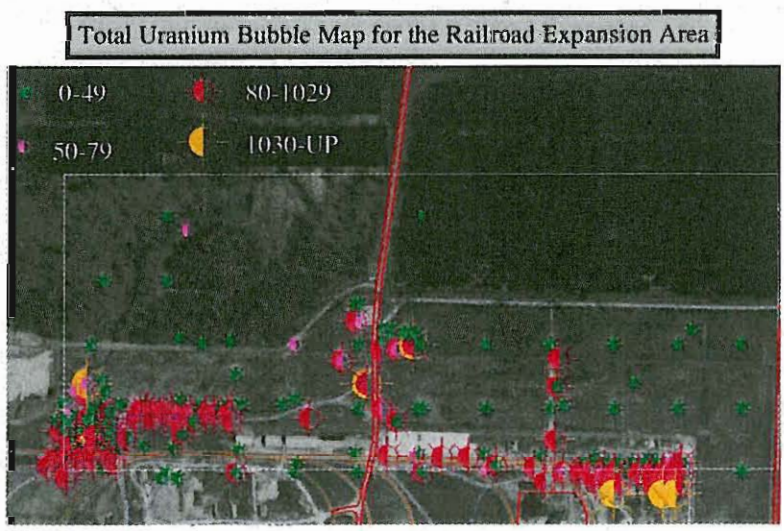
In 1996, OFFO continued to successfully use the GPS to determine surface water sampling locations under CRG funding and private well locations under AIP funding. The geographic data from Ohio EPA's environmental monitoring program continued to be entered into our local database for GIS analysis and interpretation. In 1996, OFFO staff reviewed GPS database location codes to ensure accurate query results. GPS data was used to create sampling location maps for fact sheets and public meetings. Recently, data has been posted on OFFO's Internet web site which allows other Ohio EPA divisions to make use of the GPS base station.

OFFO continues to use GPS equipment to determine sampling locations and efforts are underway to identify additional uses for the equipment. The GPS can also be used to record positional information for roads, trails, bridges, culverts, dwellings, land use, vegetation and wetland areas, creeks, rivers, addresses, test wells, and soil samples. The GPS will be used to determine former locations of buildings after demolition has taken place. It will be an important part of the certification sampling program once areas are fully remediated.

Geographic Information System

The Geographic Information System (GIS) is a computer based mapping system capable of storing, manipulating, and analyzing geographical information. OFFO is developing and using a GIS for two important reasons: first, the system provides powerful analytical capabilities previously unavailable; second, the system completes many existing tasks more effectively.

Not all relationships between data at the Fernald site are obvious. Due to the complex nature of contaminant transport at Fernald, relationships may exist between parameters which would not be realized without the sophisticated analytical capabilities of the GIS. The system allows technical staff to associate all existing data on waste materials and contamination with site information such as topography, stratigraphy, surface drainage features, and geology. These associations can then be analyzed and presented on maps that reveal visual correlations. These comparisons cannot be made easily without the GIS's capacity to manipulate and integrate various types of data. GIS provides the tools necessary to effectively use the tremendous volume of data which has been collected at Fernald.



Availability of the GIS allows OFFO to perform independent analysis and review of DOE contractor generated data, models, maps, and designs. OFFO's independent analysis has increased regulatory confidence and the efficiency of design reviews. This system helps OFFO provide more efficient and cost-effective oversight

design reviews. This system helps OFFO provide more efficient and cost-effective oversight for the DOE cleanup of the Fernald site. The projects described below show how OFFO uses GIS to enhance regulatory and environmental monitoring oversight.

AIP Activities: OFFO has developed an environmental monitoring database which includes sample locations and sample results for Ohio EPA and Fluor Daniel Fernald. This data is stored in the OFFO GIS database where it can be retrieved and manipulated to create maps, graphs, database reports, and models of the contamination at and in the vicinity of Fernald. These outputs can then be analyzed and used to help make responsible monitoring decisions. OFFO also used GIS to help determine the sampling locations included in OFFO's draft*Field Sampling Plan.* These sampling locations were selected after analyzing current sampling locations and drawing conclusions from the corresponding data.

CRG Activities: Ohio EPA uses the GIS extensively in an effort to help technical staff analyze data. The GIS gives OFFO the ability to perform analyses that differ from what is presented in Fluor Daniel Fernald and DOE technical documents. Rather than reviewing only the data and maps produced by Fluor Daniel Fernald, OFFO manipulates and analyzes the data in an interactive mode. This interaction improves the review process for OFFO.

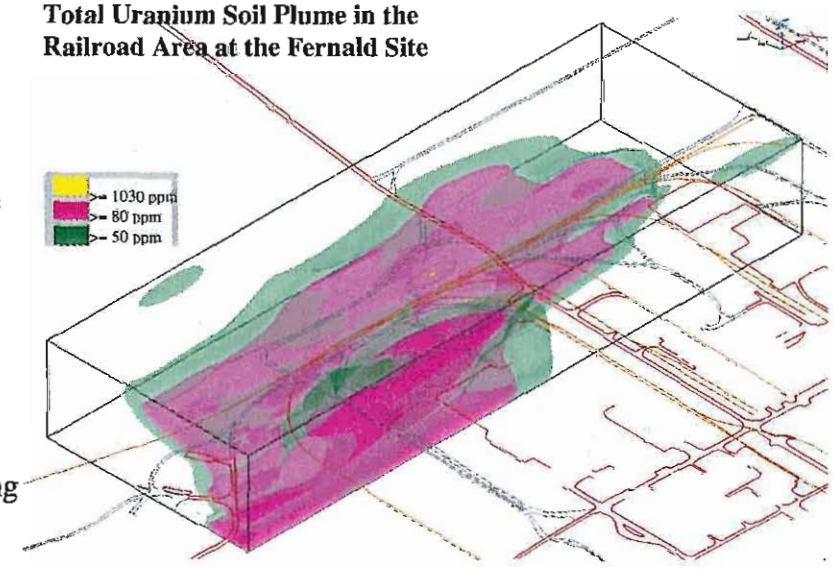
An environmental modeling project initiated by OFFO involved the use of bubble mapping and three dimensional solid block modeling in order to evaluate the distribution of total uranium in the soil for a railroad yard expansion just north of the former production area.

This project involved selecting data from the soils database in order to create a contamination bubble map with four contaminant range categories. The uranium concentrations of importance are those greater than or equal to 80 mg/kg which is the

WAC is the maximum concentration of a contaminant allowed for disposal in the on-site disposal facility and was developed to protect the underlying GMA from additional contamination. Ohio EPA's evaluation of the data supported DOE's conclusion that soils exceeding the WAC were localized to one area within the planned excavation.

The soil data was then imported into a three dimensional (3D) modeling program in order to create a plume model which estimates the distribution of contamination based upon the soil data. A site map was then overlaid on the model. The 3D model was useful for determining the possible extent of uranium contamination above the FRL, while the bubble contaminant map provided the best reference for selecting areas requiring preliminary excavation of soils with uranium concentrations exceeding the WAC.

Total Uranium Soil Plume in the Railroad Area at the Fernald Site



Ohio EPA also worked with the DOE's Sandia National Lab and Fluor Daniel Fernald on the potential use of geostatistics for pre- and post-certification sampling on soil remediation projects at Fernald. This resulted in a pilot project by the Ohio EPA to determine the feasibility of using geostatistics in soil remediation at Fernald. Ohio EPA examined a small triangular area within the railroad area using bubble mapping, geostatistics, and probability mapping. Ohio EPA concluded that the use of geostatistics could be applied to the Fernald site when the soil contamination is

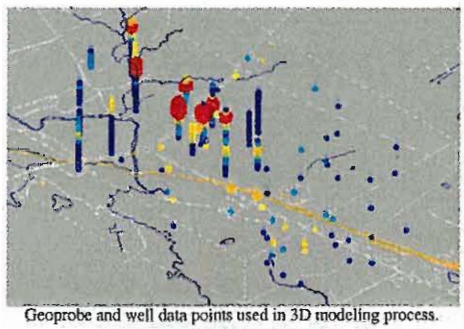
geostatistics, and probability mapping. Ohio EPA concluded that the use of geostatistics could be applied to the Fernald site when the soil contamination is spatially correlated. Ohio EPA will continue to evaluate the potential use of geostatistics where applicable at the Fernald.

In late 1996, Ohio EPA started a project aimed at evaluating data generated during the ongoing investigation to verify the configuration of the total uranium concentrations in the south plume. The investigation conducted by DOE utilizes a geoprobe to collect ground water samples along vertical intervals within the south plume. This vertical sampling allows for a 3D view and better understanding of the hydrogeologic conditions and factors affecting plume migration. Ohio EPA utilized the three dimensional modeling capabilities of the GIS along with data generated from the investigation and routine modeling to develop a 3D model of the plume as it exists today. As a result of this modeling effort Fluor Daniel Fernald and DOE are increasing their use of advanced GIS analytical tools for plume analysis.

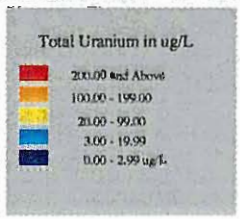
Ohio EPA created a 3D ground water plume model in order to improve understanding of the total uranium ground water plume. The plume model estimates the distribution of contamination based upon the total uranium ground water data points. These data points were contoured using special 3D algorithms in order to create a 3D plume model of total uranium ground water contamination. A site map was then overlaid on the ground water model.

The model is updated as new geoprobe data are received and thus is in a constant state of evaluation and refinement. The 3D model is used by Ohio EPA to visualize the current plume configuration and to evaluate proposed sampling, extraction, and injection well locations. Ohio EPA has shared the 3D model views with DOE and compared them to cross sections generated by DOE. The continued refinement of this model over the course of 1997 will allow for better understanding of the south plume and thus, more effective remediation.

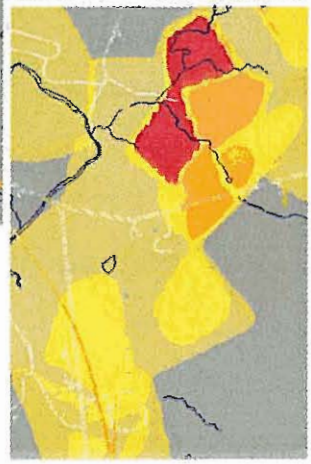
Ohio EPA has successfully developed and implemented a GPS/GIS program which is being integrated into the environmental remediation oversight process. We are improving the data analysis process by creating maps and models with environmental data that has been generated at Fernald. This information, which is generated using GIS and environmental modeling tools, is then incorporated into the decision making process for site remediation.



Geoprobe and well data points used in 3D modeling process.



3D plume model displayed from topview.



GIS also provides a tool for demonstrating and educating the public and other stakeholders about the methods of cleanup and the progress toward full remediation at Fernald. It is Ohio EPA's belief that the system has helped the agency provide better oversight for the State of Ohio.

2.4 PROGRAMMATIC AND NATIONAL ISSUES

In 1996, the Office of Federal Facilities Oversight continued efforts to be proactive in addressing regulatory, legislative, and DOE programmatic issues with potential implications for the cleanup activities at Fernald. Through OFFO, the State of Ohio has also continued participation in numerous national initiatives relating to the DOE complex.

Increased participation in the budget process and project prioritization is one of the many activities funded under the AIP and CRG at Fernald. To this end, OFFO staff have participated in several budget and prioritization meetings. This included substantial participation in the risk data sheet prioritization meetings held by the Ohio Field Office as part of the development of their 1998 budget submittal.

Ohio also participated in a series of meetings throughout the year regarding the continuing evolution of the Fernald Ten Year Plan. The plan changed significantly as DOE headquarters reduced Fernald's funding and required development of Ten Year Plans by all environmental management sites. Ongoing issues surrounding Operable Unit 4 also forced some restructuring of cleanup plans and may significantly impact the site cleanup strategy.

Interaction with other states individually and through national organizations continues to be an important component of Ohio's oversight program. OFFO staff worked with national organizations focusing on both programmatic and technical issues.

Major contributors to the DOE dialogue regarding programmatic issues include the National Governor's Association (NGA), State and Tribal Governments Working Group (STGWG), and DOE's Environmental Management Advisory Board (EMAB). It should be noted here that funding from DOE is not obtained for the majority of Ohio's participation with EMAB.

Ohio's participation in EMAB includes two very important committee assignments: the 10 Year Plan Committee and the Science Committee. The 10 Year Plan Committee is providing DOE with important guidance on how to proceed with implementation of accelerated cleanup programs. This group's guidance has already helped ensure that appropriate levels of stakeholder participation occur as DOE tries to focus on more rapid and efficient cleanups. The Science Committee advises DOE on development of a science program that allows the Department to operate effectively into the next century.

As a representative of the NGA, Ohio EPA staff participated in the initial stages of what is being called the National Dialogue on Nuclear Materials and Wastes. This DOE sponsored effort will focus on the ultimate storage and disposal of nuclear materials across the DOE complex and will allow governments and citizens alike to work with DOE so that equity and other issues are considered.

Throughout 1996, OFFO staff worked with many groups concerned about technical issues related to DOE cleanups. These include the Community Leaders Network (CLN), the Western Governors Association Interstate Technology and Regulatory Cooperation (ITRC) Work Group, the Site Technology Coordinating Group (STCG), the Integrated Remedial Technologies Evaluation Program (IRTEP), and the Innovative Treatment Remediation Demonstration (ITRD).

OFFO has participated in the DOE Office of Science & Technology's Community Leaders Network since 1993. CLN is a network of individuals associated with sites across the DOE complex who provide feedback for DOE's technology development activities. CLN members participate in budget reviews, priority setting, technology demonstrations, and technology conferences. OFFO representatives participated in the Mixed Waste and Subsurface Contaminants Focus Areas and the Planning Committee. Also in 1996, OFFO members acted as the Planning Committee Chair/CLN Vice-Chair and the Subsurface Contaminants Focus Area/CLN liaison.

CLN provides OFFO the opportunity to comment on DOE's technology development activities as well as to bring back information on new technologies to Ohio and the local DOE sites. Technologies from the Decontamination and Dismantling Focus Area were tested at a Large Scale Demonstration project at Plant 1 in 1996.

During 1996, OFFO became involved in the Western Governors Association, Interstate Technology and Regulatory Cooperation (ITRC) Work Group. ITRC works with USEPA, DOE, DOD, and private industry to evaluate new technologies and establish mechanisms for timely acceptance by state regulators. OFFO participated in several ITRC activities during 1996 including review of the draft American Society for Testing and Materials, Expedited Site Characterization standard and the Site Characterization and Analysis Penetrometer System Volatile Organic Compound detector analysis. ITRC was awarded a National Performance Review Hammer Award for 1996 work to build a government that works better and costs less.

The Site Technology Coordinating Group Stakeholder Subcommittee was formed to provide a mechanism for stakeholders to provide input to the STCG. The purpose of the STCG is to proactively represent Fernald's technology needs to the DOE Research and Development establishment and to provide Fernald's technology to potential users within the government and commercial industry. Technologies evaluated by the Stakeholder's Subcommittee include the Real-Time Analytical Laboratory, new methods to decontaminate concrete and steel surfaces, a newly-developed gasoline-oxygen cutting torch for steel.

OFFO's activities in the IRTEP have involved the planning of a project sponsored by the Rapid Commercialization Initiative (RCI) of the United States Department of Commerce. One of the objectives of this initiative is to expedite and promote the development of new technologies by making it easier for companies to bring ideas from concept to commercial use. RCI is teaming with IRTEP to bring the Terra-Kleen Response Group, Inc., Solvent ExtractionTechnology to bear on a tri-mixed

waste disposal problem at Fernald. Tri-mixed waste is waste that is regulated as hazardous under RCRA, as PCB-contaminated under the Toxic Substances Control Act, and as radioactive under the Atomic Energy Act. The goal of the Terra-Kleen demonstration is to treat up to 2500 drum equivalents of tri-mixed waste. Ohio EPA's involvement included evaluating work plans and facilitating regulatory approvals.

2.5 EMERGENCY MANAGEMENT PLANNING

The Ohio EMA reviewed Fernald's hazards assessment. In an effort to validate the conclusions of this hazards assessment, Ohio EMA also developed an independent hazards assessment for the site. Ohio EMA's independent hazards assessment was included in Revision 6 of the *USDOE Facilities Annex* to the *State of Ohio Hazardous Materials Emergency Management Plan.* Both hazards assessments indicate that the 5-mile Emergency Planning Zone around the site should be reduced to a 2-mile EPZ. Ohio EMA is investigating the impact of reducing the zone.

Ohio EMA continued to prepare for emergency events at Fernald by improving its preparedness posture through training. Ohio EMA personnel attended radiological emergency response training at the Nevada Test Site, and Computer Aided Management of Emergency Operations training instructed by the USEPA and National Oceanic and Atmospheric Administration. Together with the OEPA, DOE, Butler County EMA, and Hamilton County EMA, Ohio EMA continued its support of monthly Community Planning and Training sessions conducted at the Ross Township Fire Department.

The Fernald Community Planning and Training meetings served as a launching pad for many emergency management projects. Issues concerning joint public information, hazards assessments, emergency response mutual aid, communications, and warning were processed by the attendees. Many of these issues directly impact Butler and Hamilton Counties. Under the provisions of the AIP, Ohio EMA provided funds to each county's emergency management agency in order to deal with Fernald-specific issues.

Butler County EMA and Hamilton County EMA have used their AIP funds for such initiatives as: preparing independent hazards assessments; participating in emergency response coordination organizations; conducting exercises and drills with the site; digitization of site-specific information; participation in periodic communications

checks; and monitoring periodic tests of the Fernald warning system. Both Butler County EMA and Hamilton County EMA have continued to revise and refine Fernald-specific emergency plans and procedures.

Emergency plans and procedures at all levels of government are developed in order to assist in the effective response and mitigation of any emergency at Fernald. The majority of plans and procedures are designed for response to an on-site event, but efforts are in progress for dealing with transportation emergencies.

3.0 ENVIRONMENTAL MONITORING

The State of Ohio has conducted environmental monitoring at Fernald since 1985. Monitoring is performed to evaluate potential impacts to the public and the environment. Monitoring is also used to judge the success of ongoing cleanup activities. On and off-site releases have been monitored through regular sampling of environmental media, including ground water, surface water, soil, sediment, fish, air, grass, and produce.

In July of 1994 through the AIP, Ohio EPA's Office of Federal Facilities Oversight expanded the State's previous sampling efforts. Primary objectives of the AIP sampling program include monitoring impacts of past and ongoing releases at Fernald, evaluating DOE's environmental monitoring program, and informing the public of environmental monitoring data. In 1996, Ohio submitted a draft *Field Sampling Plan* (FSP) to the public, DOE, and Fluor Daniel Fernald. The draft sampling plan is a working document, required by the AIP, that defines Ohio's environmental monitoring program, objectives, sampling locations, parameters, analytical methods, standard operating procedures, and data validation process. Sampling procedures were implemented in 1996 and include both split and independent sampling. A public meeting was held to receive comments on the draft.

Ohio EPA continued its split sampling program with DOE and Fluor Daniel Fernald. The program enables Ohio EPA to generate data which assists in evaluating DOE's environmental monitoring program. Split sampling provides a mechanism for quality control through use of the same analytical method at different laboratories and subsequent comparison of resulting data. OFFO collected samples with Fluor Daniel Fernald on most environmental media at the site including private well water, surface water, sediment, soil and grass, and fish from the Great Miami River (GMR). Split samples of local produce and soil were added to the program. Data validation for the sampling program was provided by the Ohio Department of Health. A discussion of sampling activities and results for each media is provided in Sections 3.1 through 3.7.

Summary data from Ohio EPA's sampling program are included in the Appendices of this report. More detailed information on sample results may be obtained by calling Ms. Donna Bohannon at (937) 285-6453.

Ohio's AIP environmental monitoring program includes independent sampling as well as split samples. Independent sampling allows Ohio to evaluate additional locations and analytical parameters not currently monitored by DOE and to respond to specific citizen requests. In doing this, Ohio can determine whether DOE's monitoring program is appropriate or requires expansion in locations or parameters. In 1996, OFFO collected frequent independent samples including surface water, private well water, soil and grass, local produce and soil, and air.

In addition to AIP sampling, Ohio EPA conducted environmental monitoring as a part of its ongoing regulatory oversight program. This monitoring is aimed at evaluating and reducing the impacts of remedial actions on the environment. Funding for this monitoring is provided in the Cost Recovery Grant. During 1996, three sampling events took place under this program. One event evaluated soil excavation compliance with the on-site disposal facility waste acceptance criteria. The second event evaluated the effectiveness of a remedial action to control surface water releases to Paddy's Run. The third event focused on sampling stormwater during heavy spring rains. Ohio EPA will continue to implement this monitoring program as necessary to ensure remedial actions are adequately protecting the environment.

In 1996, Ohio EPA also reviewed DOE's draft *Integrated Environmental Monitoring Plan* (IEMP). The IEMP is an effort to refine and coordinate site environmental monitoring activities. The IEMP integrates monitoring associated with various regulatory oversight programs such as RCRA and CERCLA with the current monitoring program required by DOE Orders. In addition, the IEMP reduces off-site surveillance monitoring by DOE because of historically low data results. These changes were made to streamline the use of monitoring resources by combining

monitoring for remedial projects, decontamination, and demolition operations into one program. Additionally, the on and off-site sampling efforts of Ohio EPA should provide a mechanism to observe potential impacts to the surrounding environment from remedial activities. As a result of the proposed changes outlined in the draft IEMP, Ohio EPA will conduct most of the off-property environmental monitoring at Fernald. The second draft of the IEMP is scheduled to be submitted in early 1997. Following finalization of the IEMP, Ohio EPA will finalize the FSP to ensure appropriate integration of the two programs.

3.1 PRIVATE WELLS

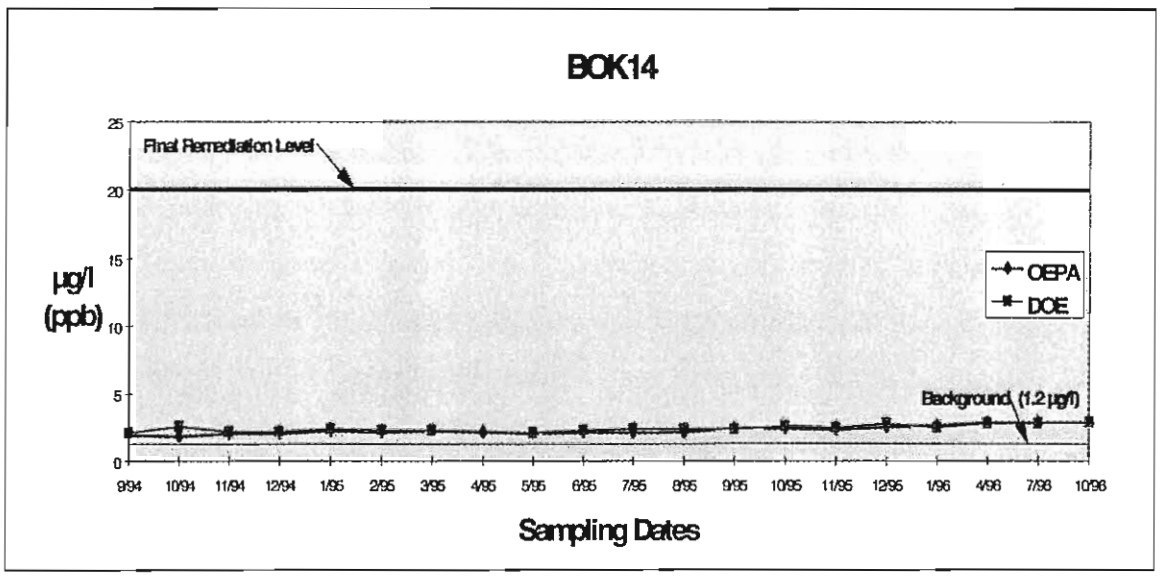
Private well monitoring constituted a smaller portion of Ohio EPA's AIP environmental monitoring program than in previous years. The total number of private wells routinely sampled was reduced from 17 wells in 1995 to three by the end of 1996. The reduction in well sampling resulted from the Spring 1996 completion of a public water supply system. All homeowners attaching to the water supply were required to abandon their wells or install approved backflow prevention devices, thus significantly reducing the number of wells available for sampling. OFFO split sampled private wells with DOE/Fluor Daniel Fernald on a quarterly basis during 1996. In addition to the AIP split sampling, OFFO independently sampled one private well (REQT2) at the request of a homeowner.

The map in Appendix A shows all 1996 private well sampling locations. Private wells BOK14, DS15, NKM12, MKM13, and RS39 are located down gradient of Fernald and generally within the area of contamination. Wells DS15, NKM12, BKM13, and MKM13 are located directly in the >20 µg/l plume and RS39 is on the edge of the Great Miami River.

As a result of the water supply installation and a revision of DOE's environmental monitoring program, the routine private well monitoring program will focus on quarterly sampling of BOK14, BKM13, and NKM12. OFFO will split sample these wells with Fluor Daniel Fernald. Quarterly monitoring will provide data on changes in ground water contamination resulting from contaminant migration or cleanup activities.

Private well water is analyzed for total uranium, the primary contaminant of concern at Fernald. The USEPA proposed drinking water standard for total uranium is 20 µg/l. The ground water Final Remediation Level for total uranium at Fernald is also 20 µg/l. Local background for total uranium, as determined in the OU5 remedial investigation report, ranges up to 3.1 µg/l. The highest total uranium concentration

detected in a private well during 1996 was 160 µg/l (DS15). The lowest concentration detected out of all the private wells routinely monitored was 2.6 µg/l (BOK14). Appendix B contains the private well sampling results for 1996.



As the figure above illustrates, Ohio EPA and DOE/Fluor Daniel Fernald results have consistently shown good agreement over the course of the AIP program. In addition, the total uranium concentrations in this well have remained relatively constant over the past three years. This indicates good quality control in sampling technique and laboratory analyses of the two organizations. Private well BOK14 is the one well that has been split sampled consistently throughout the AIP program since 1994.

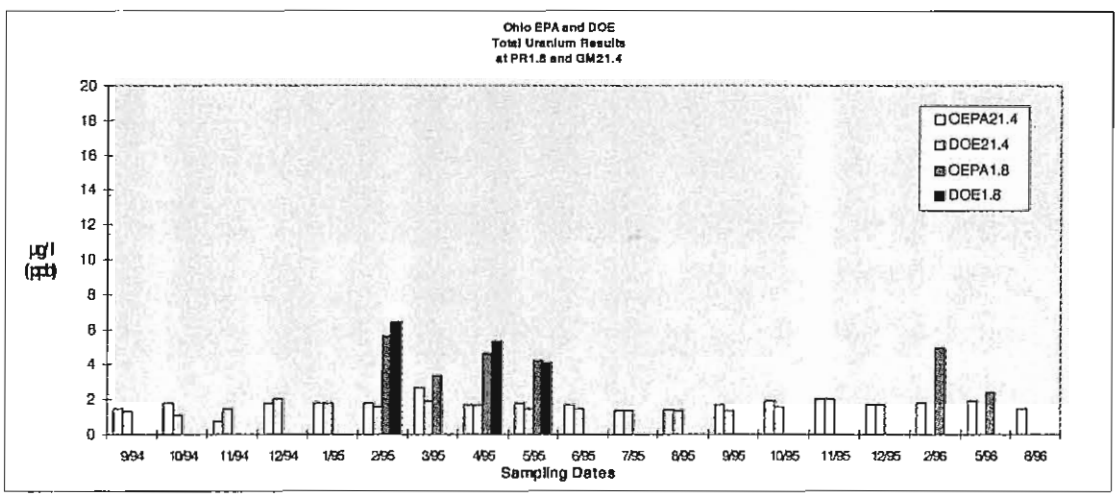
3.2 SURFACE WATER

Routine monitoring was reduced from monthly to quarterly for 1996. Surface water monitoring was reduced from 62 samples in 1995 to 37 in 1996. Reductions in the frequency of routine and split sampling were made after evaluating the results and finding good agreement between Ohio EPA and DOE/Fluor Daniel Fernald results and low levels of analytes at off-site sampling locations. In addition to the routine monitoring in 1996, two samples were taken in the vicinity of the pilot plant drainage ditch sump installation and one sample was taken from a swale near the waste pits at the time of an unusually large rain event. Samples were analyzed for total uranium, radium 226 and radium 228 (two samples taken in the vicinity of the pilot plant drainage ditch sump were analyzed for total uranium only). Of the 37 samples, 19 total uranium samples taken were split with DOE/Fluor Daniel Fernald and 18 were taken independently.

The map in Appendix A shows all 1996 surface water sampling locations. With the addition of independent sampling in 1996, location codes were changed to reflect the river mile of the sampling location. GM26.2 and PR7.2 are background locations on the Great Miami River and Paddy's Run respectively. PR3.4 is located on Paddy's Run below the confluence of the drainage ditch that drains the site north of the production area. This location is also where the state threatened Sloan's crayfish is found. Location PR3.4 is at the Willey Road Bridge on Paddy's Run off-site. PR0.2 is located at the Route 128 bridge and is fed primarily by ground water. Sample WPSWL was taken from a swale in the vicinity of the waste pits after a significant rainfall. Location GM24.6 is directly downstream of the National Pollutant Discharge Elimination System outfall from Fernald in the Great Miami River. Location GM21.4 is approximately three miles downstream of the effluent at the bridge in New Baltimore.

The final remediation levels for total uranium, radium 226, and radium 228 in surface water in Paddy's Run and the Great Miami River are 530 µg/l, 3.8 pCi/l, and 4.7 pCi/l

respectively. None of the routine monitoring samples taken in 1996 exceeded the FRLs. As expected, the samples taken at the pilot plant ditch sump (PD0.3) and swale at the waste pits (WPSWL) exceeded the FRL for total uranium. The results of those samples were 2200 µg/l and 600 µg/l total uranium respectively. Station PD0.25, approximately 0.05 mile downstream of the pilot plant ditch sump, was tested on the same day at 48 µg/l total uranium. A sample taken from Paddy's Run downstream of the waste pits (PR2.89) on the same day as the sample taken from the waste pit swale (WPSWL) was 2.1 µg/l total uranium. Results are summarized in Appendix C. The highest total uranium detection off-site was 4.9 µg/l at the Willey Road bridge. This is below the 20 µg/l proposed drinking water standard and far below the 530 µg/l surface water FRL.



Results downstream of the site in Paddy's Run (PR1.8) and the Great Miami River (GM21.4) have shown low levels of total uranium over the course of the AIP program. Good agreement between Ohio EPA and DOE/Fluor Daniel Fernald results are illustrated in the chart above. This is indicative of good quality control in sampling technique and laboratory analysis.

3.3 SEDIMENT

A total of eight split and independent routine samples were collected in 1996. One additional split sample was collected from the pilot plant drainage ditch sump. This sample was taken immediately after the sump was installed in the pilot plant drainage ditch. The sump was installed to reduce discharge of contaminants to Paddy's Run. A total of nine sediment samples were analyzed in 1996, increased from seven in 1995. Samples were analyzed for total uranium, radium 226, and isotopic thorium (the sample collected from the pilot plant drainage ditch was analyzed for total uranium only).

The map in Appendix A shows all 1996 sediment sampling locations. The two routine samples split with DOE /Fluor Daniel Fernald were taken at the confluence of Paddy's Run and the Great Miami River, and downstream of the confluence of the storm sewer outfall ditch in Paddy's Run. Two independent samples were taken in the Great Miami River and four independent samples were taken along Paddy's Run.

Sediment sampling along the Great Miami River.

Final remediation levels for sediment at Fernald have been established for total uranium (210 µg/g), radium 226 (2.9 pCi/g), and thorium 228 (3.2 pCi/g), 230 (18000 pCi/g), and 232 (1.6 pCi/g). No sediment sample had any analyte above the final remediation level. The highest level of total uranium (120 µg/g) was found in the

pilot plant drainage ditch sump (PD0.3). The remaining samples had levels at or near background levels. Because the area of the sump was the major source of uranium contamination in the pilot plant drainage ditch, elevated levels of total uranium were expected. Results are summarized in Appendix D. Levels of radionuclides in samples analyzed by Ohio EPA's contract laboratory have generally been higher than those analyzed by DOE/Fluor Daniel Fernald. It is believed the difference is related to water content of the samples. Another possible explanation for the different results is the use of different analytical methods by Ohio EPA and Fluor Daniel Fernald. Further investigation is planned to verify this.

3.4 FISH TISSUE

DOE/Fluor Daniel Fernald sampled fish in the Great Miami River in three locations. The upstream or background station is separated from the site by two dams. DOE/Fluor Daniel Fernald also sampled stations at the effluent pipe and the confluence of Paddy's Run. Sampling took place in the autumn at the end of the growing season of the fish. Fish feed actively through the summer months and much less so during the winter. Autumn sampling will allow measurement of the maximum contaminant uptake of the fish.

Fish collection on the Great Miami River.

Ohio EPA split one fish sample with DOE/Fluor Daniel Fernald during 1996. A common carp taken on September 18 in the vicinity of the confluence of Paddy's Run (GM20.2) was filleted and the fillets analyzed for total uranium. Refer to Appendix A for the location of the fish sample. In 1995, Ohio EPA and DOE/Fluor Daniel Fernald split both common carp and bass. Because the common carp samples had greater concentrations of total uranium than the bass in 1995, only common carp was split sampled in 1996.

The results are summarized in Appendix E. The results from 1996 are in agreement with what has been seen historically both upstream and downstream from the site. The average total uranium content of fish in the family of the common carp (Cyprinidae) has been 0.013 pCi/g upstream of the site and 0.014 pCi/g downstream of the site (using data from 1992-1995 Site Environmental Reports).

3.5 PRODUCE AND SOIL

Ohio EPA's AIP produce and soil monitoring program consisted of both split and independent sampling in 1996. This sampling provided another method of monitoring impacts of airborne emissions from remedial activities and site operations.

Produce and soil samples were collected off-site in the Fernald area. The map in Appendix A shows the locations of both sampling points. Both sampling locations are gardens, downwind from Fernald, that supply local vegetable stands. Corn and soil split samples were collected at BURWK51. Ears of corn were picked from a plant and divided into two samples. The soil sample was taken directly beneath the cornstalk. At the independent sampling location, BRN52, pumpkin and soil were collected in the same manner.

Total uranium is the primary parameter analyzed in produce and soil. Results for both these media are compared to background concentrations and historical data. Background soil concentrations for total uranium are between 2-7 μg/g in the Fernald area. Results for both split and independent soil samples are well within the background range (see Appendix F). In addition, total uranium concentrations in produce are consistent with the previous years' data. For example, historical data reveals a consistent pattern of little or no total uranium contamination in produce. However, continued public concern about uranium concentrations in produce dictates that produce will continue to be sampled during 1997.

3.6 SOIL AND GRASS

Ohio EPA's AIP soil and grass surveillance program consisted of both split and independent sampling in 1996. Collecting and analyzing soil and grass samples from areas surrounding Fernald is one method of monitoring impacts of airborne emissions generated during remedial actions and site operations. Ohio EPA split samples with DOE/Fluor Daniel Fernald at four locations and collected samples independently at two locations in 1996.

Three of the split sample locations are next to DOE air monitoring stations AMS02, AMS08A, and AMS09B (see Appendix A for locations). These stations are also adjacent to the new disposal cell construction. Collecting samples near air monitoring stations provided a good network of data points that should reflect predominant wind direction. The locations should also provide for the detection of any impacts from remedial operations such as construction of the disposal cell. A fourth split was collected at the background location, northwest of Fernald (see Appendix A for locations BSO18 and GRS18). Background samples have been collected here for the last three years.

In 1996, Ohio EPA independently sampled soil and grass at two locations, one on and one off of the Fernald site. One point was next to Ohio EPA's new air monitoring station, FNAPS02, on the east fence line next to the planned disposal cell. The second independent location, CS50, is on private property outside the east fence line and east of the disposal cell. These two positions were selected because they are in the prevailing wind direction and close to the new disposal cell. These sites are prime locations for detecting any remedial contamination during and after the installation of the new disposal cell.

Soil and grass samples are analyzed for total uranium and select radionuclides. The analytical results help determine airborne deposition from remediation activities conducted at the site and to ensure that off-site properties are not adversely affected.

Ohio EPA's soil and grass data is compared to DOE's results to verify that their environmental monitoring program is adequate, to establish background values, and to track historical trends.

DOE's final remediation level for total uranium in soil at Fernald is 80 μg/g, the ALARA (as low as reasonably achievable) level is 50 μg/g, and background varies from 2 to 7 μg/g. Since there are no action levels for total uranium concentrations in grass, the results are compared to background samples (0.002 μg/g for Ohio EPA's 1995 background data) and historical trends to measure any impacts to the environment.

The highest total uranium concentrations in soil were found at or near air monitoring stations, i.e., AMS08A with a concentration of 28 μg/g, which is consistent with expected airborne deposition from past site operations. Off-site soil samples showed considerably lower levels, such as 3.6 μg/g found at BSO18. Total uranium concentrations in all soil samples were greater than background. See Appendix G for summarized results.

A comparison of database records shows consistent analytical results in soil samples split between Ohio EPA and DOE/Fluor Daniel Fernald. These results indicate good quality control in sampling technique and laboratory analyses.

Uranium uptake in grass was not evident. This result confirms a historical trend of higher soil concentrations versus grass. This could be partially attributed to the fact that metallic substances such as uranium tend to adhere to soil more readily than they are taken up by vegetation, such as grass.

Ohio EPA grass sampling results for total uranium at the background location, GRS18, and at an indicator location, AMS02, were inconclusive. This is due to laboratory or sampling cross contamination or other possible inconsistencies in

analytical methods or sampling procedures. It should also be noted that grass is a difficult matrix to analyze and obtain consistent results across repeated analyses. The other sample locations yielded grass results which were considerably higher than 1995 results (by an approximate factor of 10) and were also inconsistent with DOE results. Due to the inconsistencies and variations in the total uranium results this year no conclusions can be drawn.

Ohio EPA also analyzed grass samples for radium 226 and radium 228. This analysis was performed due to the fact that radium has a higher affinity for uptake by plants than do the heavy metals such as uranium and thorium. Had the total uranium results been conclusive, a possible correlation between uranium and radium uptake may have been determined. Radium results are also shown in Appendix G.

Ohio EPA will continue to collect soil samples at the two independent locations, FNAPS02 and CS50, and any additional locations that may be influenced by ongoing remedial actions. Grass sampling will be discontinued unless soil results indicate that grass sampling is warranted.

During 1996, Ohio EPA collected two soil samples (AD-12 and AD-99) under the CRG to evaluate compliance with the OSDF total uranium waste acceptance criteria. The samples were collected in an area that had been previously excavated for off-site disposal and then monitored using field instruments (high purity germanium detector). Ohio EPA split sampled soils with DOE at two of the highest real field instrument readings. The sample results (Appendix H) showed the soil remaining was below the waste acceptance criteria and could be removed for disposal in the OSDF. Ohio EPA will continue to work with DOE and Fluor Daniel Fernald during 1997 to evaluate the usefulness of field instruments during remediation.

3.7 AIR

Ohio EPA initiated air monitoring and surveillance activities at Fernald in mid-1996. These activities included the installation of high volume air samplers and a radon monitor at the Fernald facility. A background station was also installed near the City of Eaton. Ohio EPA air sampling activities were initiated primarily to verify the effectiveness of the existing DOE environmental air monitoring network. Air monitoring is also conducted to measure environmental impacts from remediation.

Ohio EPA sampled for total uranium, total suspended particulates (TSP), and radon-222 in 1996. The primary radiological contaminants found in the air pathway are uranium and radon. Other contaminants such as thorium and radium may become significant as remediation activities increase at Fernald. Each of these contaminants has a different mode for entering the airborne pathway. Fugitive dust or resuspension of contaminated soils is the primary path for particulates, such as uranium, to become airborne. Large areas of Fernald have been excavated and new construction is evident throughout the site. These activities allow for the resuspension of contaminated soils into the air which may transport them off-site. Ohio EPA has high volume air samplers at select locations to measure the airborne concentration of total uranium and total suspended particulates.

The primary source of radon at Fernald is the K-65 silos. The silos contain high concentrations of radium bearing wastes from former production activities. The radium in the silos decays to radon-222 which is continuously released from the silos into the ambient air. There are also other relatively insignificant sources of radon at Fernald. Ohio EPA has installed a radon monitor at the facility fence line to measure the concentration of radon in air leaving the facility at that location. Average radon concentrations measured at the fence line to date are comparable to concentrations measured at the background location.

High Volume Air Sampling: Ohio EPA installed two high volume air samplers

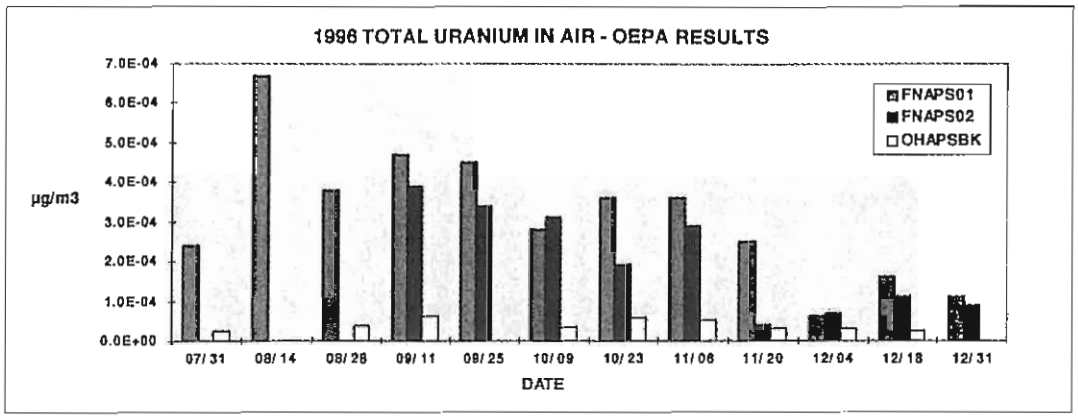
during 1996. The locations are shown on the map in Appendix A. These locations were chosen based on the prevailing wind direction, availability of utilities, and points where maximum concentrations may be measured. High volume air sampling is conducted by continuously sampling air in the breathing zone. A filter is used to collect the sample, which is analyzed every two weeks.

FNAPS01 was installed northeast of the waste pit area, co-located with DOE sampling location AMS-17A. This location became operational in the middle of July 1996. Data will be compared to DOE results and evaluated over time. The second high volume air sampling location, FNAPS02, was installed as an independent sampling location along the northeast fence line of the Fernald site. Sampling commenced at this location at the end of August 1996. Ohio EPA anticipates sampling at this location to monitor for potential off-site releases during OSDF construction and waste placement.

A background location (OHAPSBK) was installed in Eaton, Ohio which is approximately 28 miles north of the Fernald site. Sampling activities began in May 1996. This sampler is located beyond the influence of any known radiological contaminant sources, and also serves as the background location for other OFFO air sampling activities.

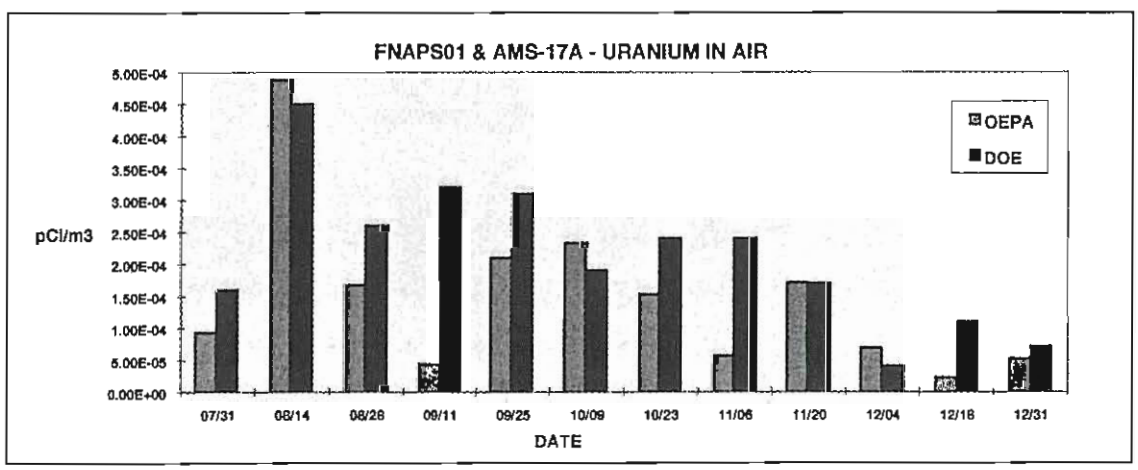
Ohio EPA uranium in air concentrations are presented in Appendix I Table 1 and in the figure below. All of the concentrations were higher than the concentrations measured at the background location but the results were less than National Emission Standards for Hazardous Air Pollutants (NESHAP) for Radionuclides concentrations. It is important to note that comparison of on-site concentrations to NESHAP concentrations is very conservative.

The average concentrations for FNAPS01 and FNAPS02 were 3.2×10^{-4} $\mu g/m^3$ and 2.0×10^{-4} $\mu g/m^3$ respectively. The maximum concentration, 6.7×10^{-4} $\mu g/m^3$, was



measured at FNAPS01 from July 31 to August 14, 1996. This result is consistent with the conditions present at Fernald during this sampling period. There was no rainfall and construction activities at OU1 were ongoing. Uranium concentrations decreased in December compared to previous months, which may have been due to an increase in precipitation and a decrease in construction activities.

Ohio EPA compared the results from FNASP01 to DOE location AMS-17A. The data is available Appendix I Table 1 and presented in the figure below. In general, the



concentrations from the co-located samplers appear to be in agreement. The comparison is qualitative due to differences in sampling periods, sampling procedures and laboratory methods. Ohio EPA and DOE are working to establish criteria for the quantitative comparison of air sampling results.

Total suspended particulate (TSP) measurements are presented Appendix I Table 2. It is interesting to note that the TSP measurements do not appear to vary from location to location and that the measurements decrease at all locations in September. As more data is available Ohio EPA will study this peculiarity in more detail.

A number of occurrences affected the quality of the data produced at the air sampling locations, ranging from equipment failures and operational difficulties to power outages. At locations FNAPS01 and FNAPS02 all of the data are considered estimated. Ninety-two percent of the data reported for OHAPSBK is considered estimated and eight percent was rejected.

OFFO has initiated corrective measures to ensure that a higher percentage of data will be fully validated in 1997. These measures include adoption of the equipment manufacturer's calibration procedure, timely review of calibrations, and timely corrective actions to put the sampler in a condition where it will collect valid data.

Radon Sampling: Ohio EPA collects continuous, real-time measurements through the use of alpha scintillation detectors. The measurements are averaged and recorded hourly. This data can be retrieved and evaluated from remote locations, such as Dayton and Columbus through the use of modems.

Ohio EPA began radon sampling at location FNRDN01 in October of 1996. It is located nearly due west of the K-65 silos along Paddy's Run Road (see Appendix A). This location was chosen based on its proximity to the silos. Ohio plans to install up to two more radon samplers at Fernald. Ohio EPA also operates a radon monitor, OHRDNBK, at a background location in Eaton, Ohio. This location has been in operation since May 1996.

Ohio EPA fence line radon monitor.

The radon monitoring results for FNRDN01 and OHRDNBK are shown in Appendix I Table 3. The data indicates that average monthly radon concentrations at FNRDN01 are comparable to the background radon concentrations at OHRDNBK. Weather conditions and equipment malfunctions require Ohio EPA data to be considered estimated. The increase in radon concentrations in December at FNRDN01 is probably due to these errors. Comprehensive data analysis and review procedures will be developed in 1997 to ensure that data of higher quality can be reported with increased confidence.

Ohio EPA has compared the results from FNRDN01 to the results from DOE locations (AMS-5 and AMS-6) located along Paddy's Run Road. Radon concentrations measured by the Ohio EPA are generally lower than those measured by the DOE. This is because Ohio EPA monitoring equipment subtracts instrument background from the measurement yielding a net radon concentration. Regardless, the data indicates that average monthly radon concentrations are comparable to background radon concentrations, and are well below the DOE Order 5400.5 limit of 3.0 pCi/L annual average at the facility fence line.

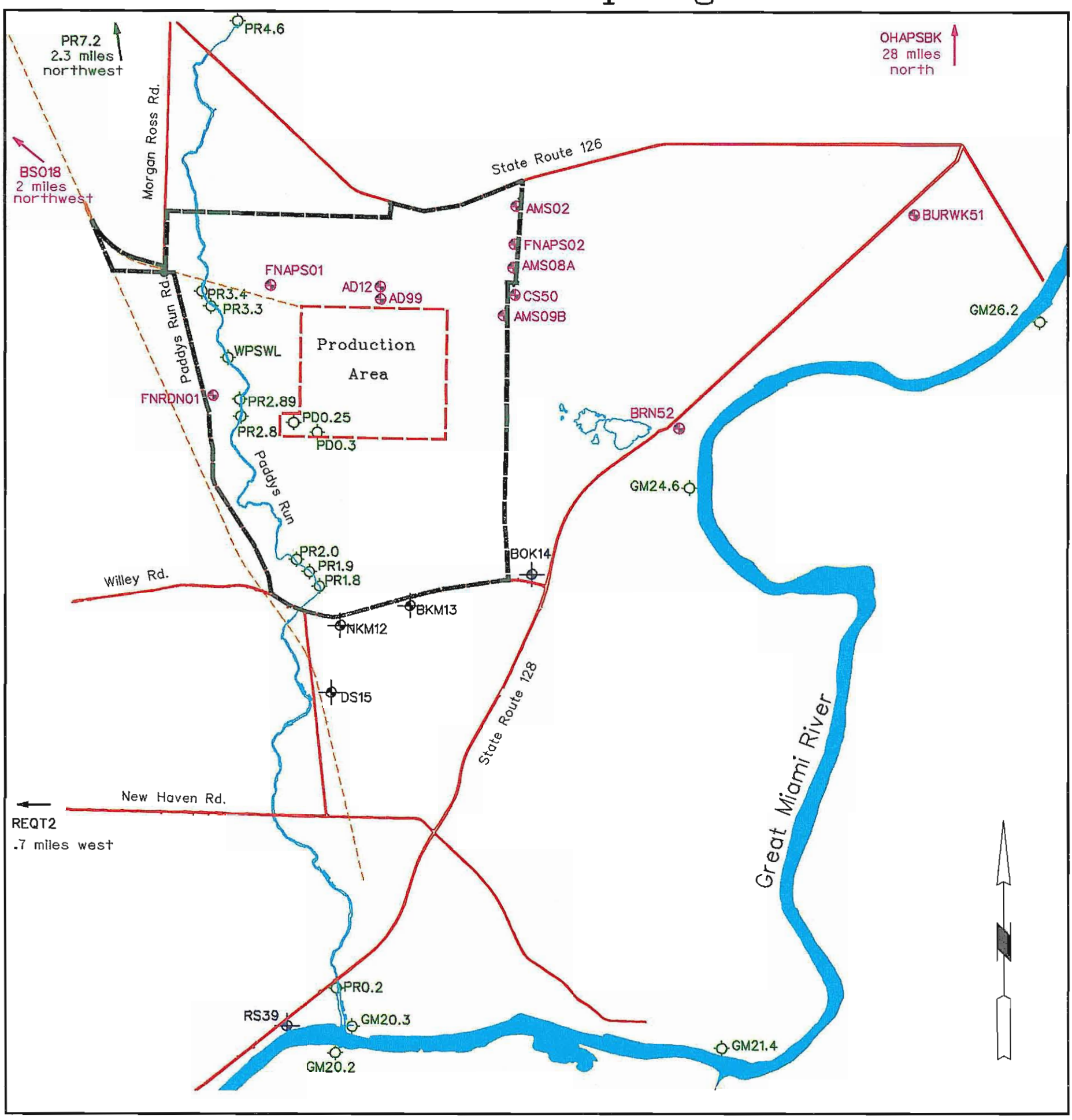
Ohio EPA has also compared the results from OHRDNBK to two DOE background locations, BKGD-1 (Fairfield in October and November, AMS 11 in December) and BKGD-2 (Miamitown). Radon concentrations measured by the Ohio EPA are

generally lower than those measured by the DOE. This, again, is because Ohio EPA monitoring equipment subtracts instrument background from the measurement yielding a net radon concentration. The background concentrations measured by the Ohio EPA are within the ranges to be expected for ambient environmental radon concentrations.

APPENDIX A

1. Map - 1996 Ohio EPA Sampling Locations

1996 Ohio EPA Sampling Locations



Projection: State Plane
Zone: Ohio South
Units: Feet
Datum: NAD 27

Scale

0 1500 3000 Feet

Produced by Ohio EPA - OFFO

-----	Production Area
-----	FEMP Fenceline
⌖	Private Well Sample
○	Surface Water/Sediment Sample
⊕	Grass/Produce/Air/Soil Sample

APPENDIX B

1. Table 1 - Private Wells

TABLE 1

PRIVATE WELLS

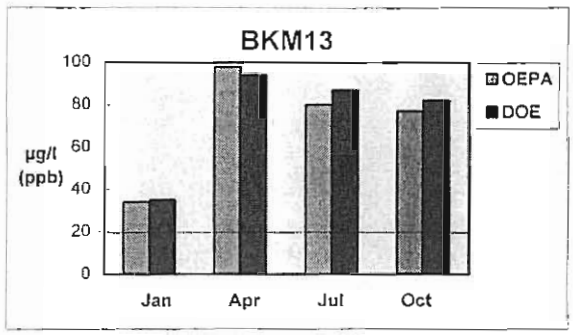
LOCATION CODE	COLLECT DATE 1996	OEPA TOTAL URANIUM µg/l (ppb)	DOE TOTAL URANIUM µg/l (ppb)
BKM13	Jan 24	34	35
BKM13	Apr 24	98	94
BKM13	Jul 24	80	87
BKM13	Oct 23	77	82
BOK14	Jan 24	2.6	2.4
BOK14	Apr 24	2.8	2.7
BOK14	Jul 24	2.8	2.7
BOK14	Oct 23	2.8	2.8
DS15	Jan 24	160	150
DS15	Apr 24	160	147
NKM12	Jan 24	130	120
NKM12	Apr 24	46	46
NKM12	Jul 24	110	124
NKM12	Oct 23	91	107
RS39	Jan 24	5.9	5.9
RS39	Apr 24	5.4	5.7
REQT2	Sep 11	<0.030	NS

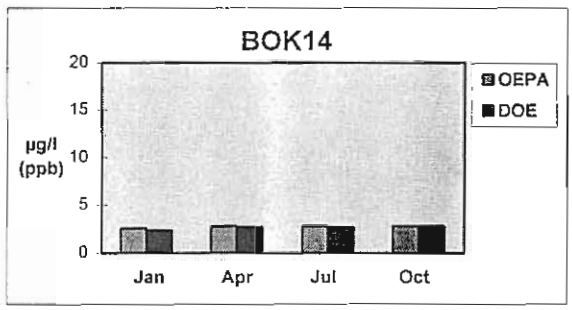
NOTE:

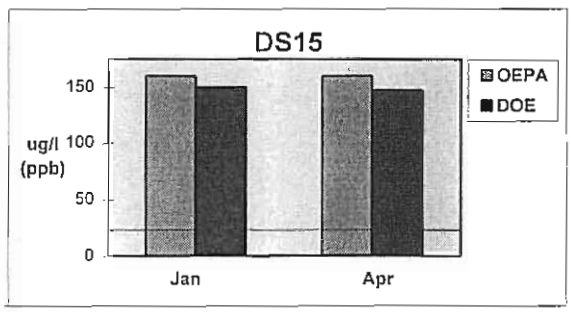
Total Uranium Final Remediation Level = 20 µg/l (ppb) for groundwater

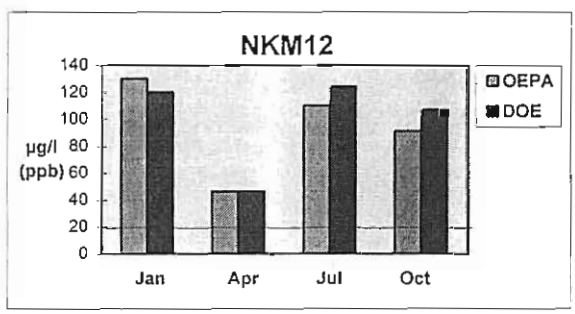
µg/l (ppb) = micrograms per liter (parts per billion)

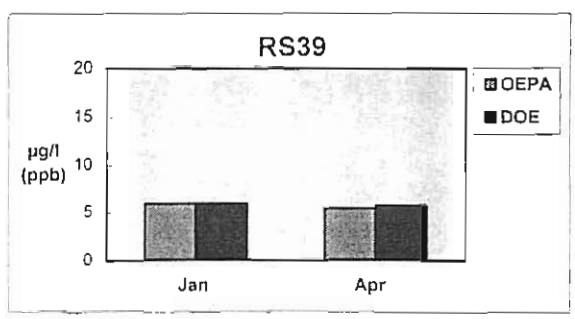
NS = Not sampled











APPENDIX C

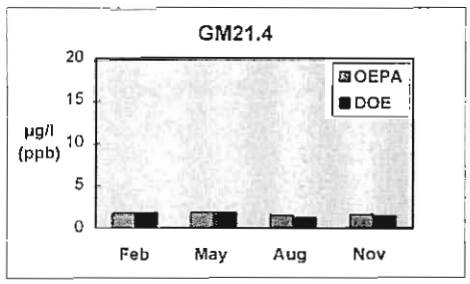
1. Table 1 - Surface Water - Total Uranium
2. Table 2 - Surface Water - Radium

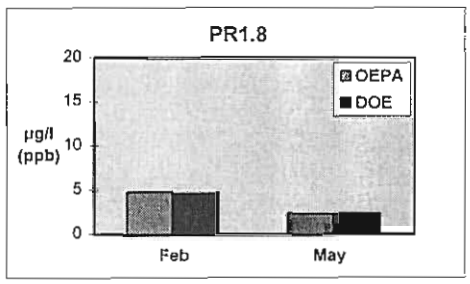
TABLE 1

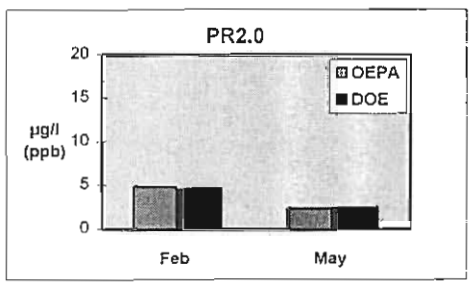
SURFACE WATER - TOTAL URANIUM

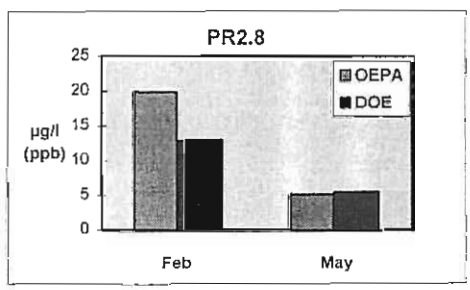
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA TOTAL U µg/l (ppb)	DOE TOTAL U µg/l (ppb)
GM21.4	New Baltimore Bridge	Feb 21	1.8	1.8
GM21.4	New Baltimore Bridge	May 22	1.9	1.8
GM21.4	New Baltimore Bridge	Aug 21	1.5	1.2
GM21.4	New Baltimore Bridge	Nov 20	1.6	1.4
GM24.6	River Mile 24.6	Feb 21	2.3	NS
GM24.6	River Mile 24.6	May 22	2.0	NS
GM24.6	River Mile 24.6	Aug 21	1.5	NS
GM24.6	River Mile 24.6	Nov 20	1.6	NS
GM26.2	Venice Bridge	Feb 21	1.7	NS
GM26.2	Venice Bridge	May 22	1.9	NS
GM26.2	Venice Bridge	Aug 21	1.5	NS
GM26.2	Venice Bridge	Nov 20	1.6	NS
PD0.25	Up Stream Weir	Apr 17	48	52
PD0.3	Pilot Plt. Ditch Sump	Apr 17	2200	2440
PR0.2	Paddys Run - Mile 0.2	Feb 21	4.3	NS
PR0.2	Paddys Run - Mile 0.2	May 22	4.8	NS
PR0.2	Paddys Run - Mile 0.2	Aug 21	3.2	NS
PR0.2	Paddys Run - Mile 0.2	Nov 20	4.5	NS
PR1.8	Paddys Run/Willey Bridge	Feb 21	4.9	4.7
PR1.8	Paddys Run/Willey Bridge	May 22	2.4	2.4
PR2.0	Paddys Run/South Fld	Feb 21	4.9	4.6
PR2.0	Paddys Run/South Fld	May 22	2.4	2.5
PR2.0	Paddys Run/South Fld	Nov 20	2.3	NS
PR2.8	Paddys Run/Dwn Stream	Feb 21	20	13
PR2.8	Paddys Run/Dwn Stream	May 22	5.2	5.6
PR2.8	Paddys Run/Dwn Stream	Nov 20	4.7	NS
PR2.89	Paddys Run/Up Stream	May 2	2.1	2.1
PR3.4	Paddys Run/RR Bridge	Feb 21	2.3	2
PR3.4	Paddys Run/RR Bridge	May 22	1.9	2
PR3.4	Paddys Run/RR Bridge	Aug 21	1.4	1.3
PR3.4	Paddys Run/RR Bridge	Nov 20	1.5	1.4
PR7.2	Paddys Run - Mile 7.2	Feb 21	0.87	NS
PR7.2	Paddys Run - Mile 7.2	May 22	0.68	NS
PR7.2	Paddys Run - Mile 7.2	Aug 21	0.64	NS
PR7.2	Paddys Run - Mile 7.2	Nov 20	1.3	NS
WPSWL	Waste Pit Swale	May 2	600	872

NOTE:
Total Uranium Final Remediation Level = 530 µg/l for surface water
µg/l (ppb) = micrograms per liter (parts per billion)
NS = not sampled









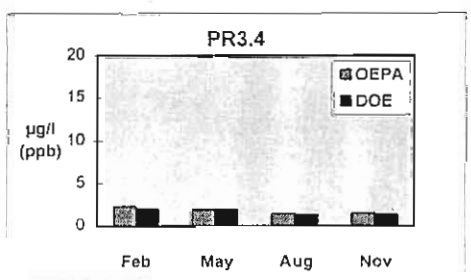


TABLE 2

SURFACE WATER - RADIUM

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA Ra226 pCi/l	OEPA Ra226 +/- error	DOE Ra226 pCi/l	OEPA Ra228 pCi/l	OEPA Ra228 +/- error	DOE Ra228 pCi/l
GM21.4	New Baltimore Bridge	Feb 21	0.28	0.05	0.14	2.7	0.78	<0.27
GM21.4	New Baltimore Bridge	May 22	0.18	0.06	0.32	2.5	0.63	<2.8
GM21.4	New Baltimore Bridge	Aug 21	0.41	0.08	NS	<1.4	0.83	NS
GM21.4	New Baltimore Bridge	Nov 20	<0.08	0.05	0.21	<2.5	1.4	<0.33
GM24.6	River Mile 24.6	Feb 21	0.29	0.06	NS	2.4	0.84	NS
GM24.6	River Mile 24.6	May 22	0.44	0.08	NS	2.0	0.61	NS
GM24.6	River Mile 24.6	Aug 21	0.29	0.06	NS	<1.2	0.66	NS
GM24.6	River Mile 24.6	Nov 20	<0.09	0.05	NS	<6.1	3.2	NS
GM26.2	Venice Bridge	Feb 21	0.14	0.04	NS	2.7	0.76	NS
GM26.2	Venice Bridge	May 22	0.28	0.06	NS	2.4	0.74	NS
GM26.2	Venice Bridge	Aug 21	0.28	0.05	NS	<1.2	0.67	NS
GM26.2	Venice Bridge	Nov 20	<0.08	0.05	NS	<2.5	1.4	NS
PD0.25	Up Stream Weir	Apr 17	NS	NS	NS	NS	NS	NS
PD0.3	Pilot Plt. Ditch Sump	Apr 17	NS	NS	NS	NS	NS	NS
PR0.2	Paddys Run - Mile 0.2	Feb 21	0.16	0.04	NS	2.0	0.77	NS
PR0.2	Paddys Run - Mile 0.2	May 22	0.14	0.04	NS	2.2	0.65	NS
PR0.2	Paddys Run - Mile 0.2	Aug 21	0.22	0.04	NS	<1.1	0.63	NS
PR0.2	Paddys Run - Mile 0.2	Nov 20	0.13	0.04	NS	0.50	1.5	NS
PR1.8	Paddys Run/Willey Bridge	Feb 21	0.17	0.04	0.22	2.1	0.77	<3.1
PR1.8	Paddys Run/Willey Bridge	May 22	0.14	0.04	0.064	2.3	0.63	<0.38
PR2.0	Paddys Run/South Fld	Feb 21	<0.08	0.05	NS	1.2	0.71	NS
PR2.0	Paddys Run/South Fld	May 22	0.12	0.03	NS	2.4	0.65	NS
PR2.0	Paddys Run/South Fld	Nov 20	<0.13	0.09	NS	<2.1	1.1	NS
PR2.8	Paddys Run/Dwn Stream	Feb 21	0.20	0.04	NS	<1.2	0.72	NS
PR2.8	Paddys Run/Dwn Stream	May 22	0.25	0.05	NS	1.1	0.49	NS
PR2.8	Paddys Run/Dwn Stream	Nov 20	<0.08	0.05	NS	<2.5	1.4	NS
PR2.89	Paddys Run/Up Stream	May 2	0.16	0.04	0.087	<1.9	1.1	<3.9
PR3.4	Paddys Run/RR Bridge	Feb 21	0.13	0.03	NS	1.5	0.75	NS
PR3.4	Paddys Run/RR Bridge	May 22	0.17	0.04	NS	2.2	0.6	NS
PR3.4	Paddys Run/RR Bridge	Aug 21	0.26	0.06	NS	<1.1	0.64	NS
PR3.4	Paddys Run/RR Bridge	Nov 20	<0.08	0.05	NS	<2.5	1.4	NS
PR7.2	Paddys Run - Mile 7.2	Feb 21	0.06	0.03	NS	0.99	0.59	NS
PR7.2	Paddys Run - Mile 7.2	May 22	0.09	0.03	NS	1.5	0.54	NS
PR7.2	Paddys Run - Mile 7.2	Aug 21	0.09	0.04	NS	<1.2	0.63	NS
PR7.2	Paddys Run - Mile 7.2	Nov 20	0.05	0.03	NS	0.09	1.1	NS
WPSWL	Waste Pit Swale	May 2	0.22	0.04	0.19	<1.9	1.1	<3.9

NOTE:

Ra 226 Final Remediation Level = 38 pCi/l for surface water

Ra 228 Final Remediation Level = 47pCi/l for surface water

pCi/l = picocuries per liter

NS = not sampled

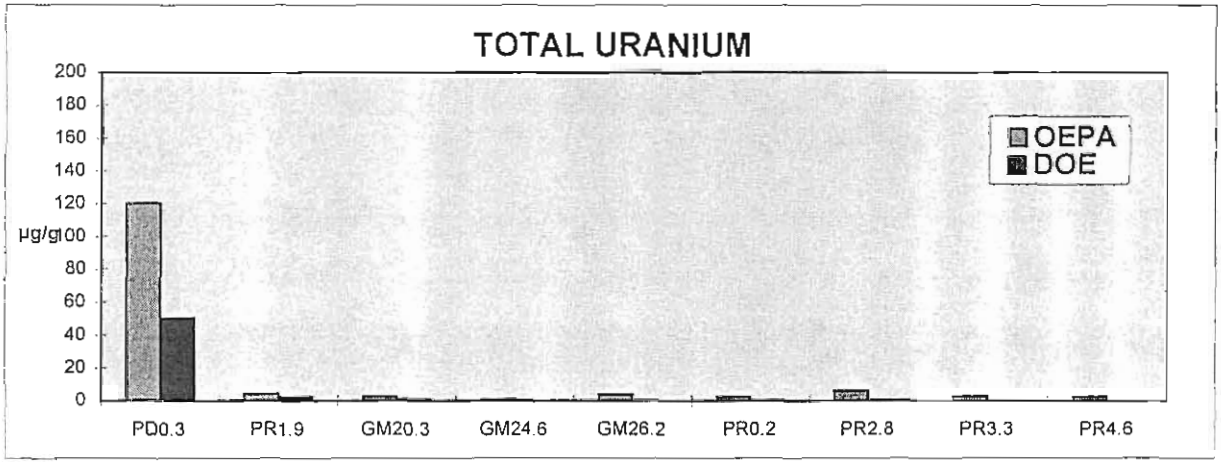
APPENDIX D

1. Table 1 - Sediment - Total Uranium
2. Table 2 - Sediment - Radium and Thorium

TABLE 1

SEDIMENT - TOTAL URANIUM

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA TOTAL U µg/g	DOE TOTAL U µg/g
PD0.3	Pilot Plant drainage ditch sump	Apr 17	120	104
PR1.9	Near storm sewer outfall ditch (31 meters)	Jun 28	4.4	2.4
GM20.3	GMR RM 20.3 - confluence PR & GMR	Jun 28	2.6	1
GM24.6	Downstream of FEMP effluent	Jul 3	0.64	NS
GM26.2	Venice Bridge - GMR River Mile 26.2	Jul 3	3.7	NS
PR0.2	Rt. 128 bridge at Paddys Run	Jul 3	2.3	NS
PR2.8	Downstream of pilot plant drainage ditch	Jul 11	6	NS
PR3.3	NW of FEMP, S. of RR bridge spanning PR	Jul 11	2.8	NS
PR4.6	Morgan Ross bridge	Jul 11	2.5	NS



NOTE:

Total Uranium Final Remediation Level = 210 µg/g (ppm) for sediment

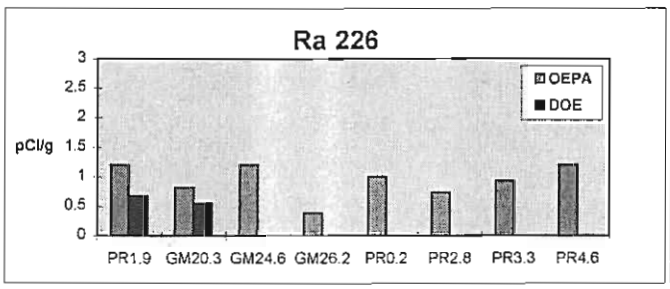
µg/g (ppm) = micrograms per gram (parts per million)

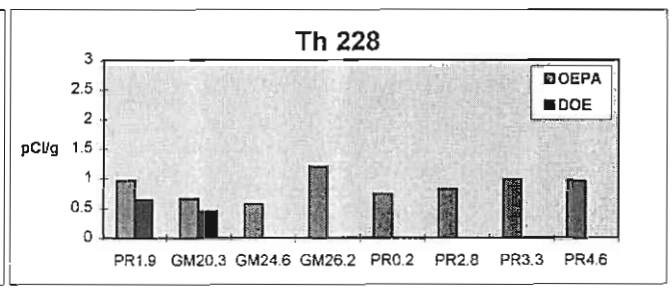
NS = not sampled

TABLE 2

SEDIMENT - RADIUM and THORIUM

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA Ra 226 pCi/g	OEPA Ra 226 +/- err	DOE Ra 226 pCi/g	OEPA Th 228 pCi/g	OEPA Th 228 +/- err	DOE Th 228 pCi/g
PR1.9	Near storm sewer outfall ditch (31 meters)	Jun 28	1.2	0.18	0.68	0.97	0.04	0.65
GM20.3	GMR RM 20.3 - confluence PR & GMR	Jun 28	0.82	0.12	0.55	0.67	0.04	0.45
GM24.6	Downstream of FEMP effluent	Jul 3	1.2	0.17	NS	0.57	0.04	NS
GM26.2	Venice Bridge - GMR River Mile 26.2	Jul 3	0.38	0.06	NS	1.2	0.04	NS
PR0.2	Rt. 128 bridge at Paddys Run	Jul 3	1.0	0.15	NS	0.74	0.04	NS
PR2.8	Downstream of pilot plant drainage ditch	Jul 11	0.73	0.11	NS	0.82	0.03	NS
PR3.3	NW of FEMP, S. of RR bridge spanning PR	Jul 11	0.92	0.13	NS	0.98	0.03	NS
PR4.6	Morgan Ross bridge	Jul 11	1.2	0.17	NS	0.97	0.06	NS

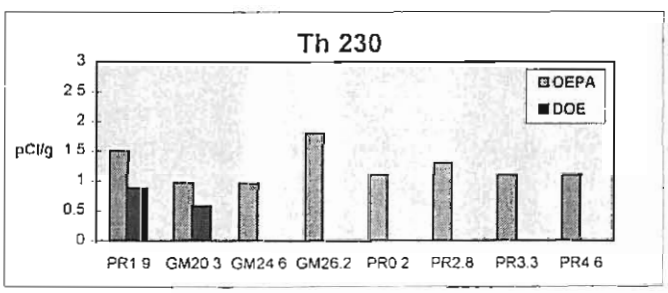


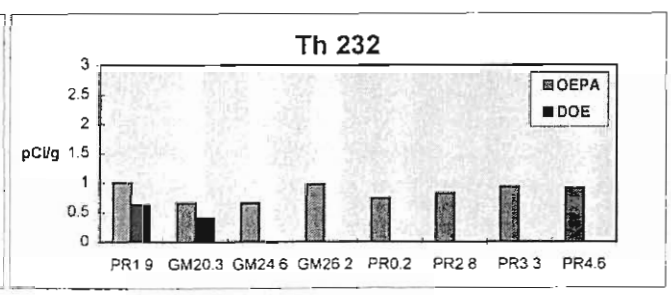


NOTE:

Ra 226 Final Remediation Level = 2.9 pCi/g for sediment
Th 228 Final Remediation Level = 3.2 pCi/g for sediment
pCi/g = picocuries per gram
NS = not sampled or sample not analyzed for parameter

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA Th 230 pCi/g	OEPA Th 230 +/- err	DOE Th 230 pCi/g	OEPA Th 232 pCi/g	OEPA Th 232 +/- err	DOE Th 232 pCi/g
PR1.9	Near storm sewer outfall ditch (31 meters)	Jun 28	1.5	0.12	0.88	1.0	0.10	0.63
GM20.3	GMR RM 20.3 - confluence PR & GMR	Jun 28	0.97	0.09	0.58	0.66	0.07	0.41
GM24.6	Downstream of FEMP effluent	Jul 3	0.96	0.08	NS	0.65	0.06	NS
GM26.2	Venice Bridge - GMR River Mile 26.2	Jul 3	1.8	0.13	NS	0.97	0.08	NS
PR0.2	Rt. 128 bridge at Paddys Run	Jul 3	1.1	0.10	NS	0.74	0.07	NS
PR2.8	Downstream of pilot plant drainage ditch	Jul 11	1.3	0.10	NS	0.82	0.07	NS
PR3.3	NW of FEMP, S. of RR bridge spanning PR	Jul 11	1.1	0.10	NS	0.93	0.08	NS
PR4.6	Morgan Ross bridge	Jul 11	1.1	0.12	NS	0.91	0.10	NS





NOTE:

Th 230 Final Remediation Level = 18000 pCi/g for sediment
Th 232 Final Remediation Level = 1.6 pCi/g for sediment
pCi/g = picocuries per gram
NS = not sampled or sample not analyzed for parameter

APPENDIX E

1. Table 1 - Fish

TABLE 1

FISH

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1996	MATRIX	OEPA TOTAL U µg/g (a)	DOE TOTAL U µg/g (b)
GM20.2	GMR RIVER MILE 20.2	Sept. 18	FISH	0.004	0.05

NOTE:
µg/g = micrograms per gram
a = wet weight
b = dry weight

APPENDIX F

1. Table 1 - Produce and Soil

TABLE 1

PRODUCE AND SOIL

LOCATION CODE	COLLECT DATE 1996	MATRIX	OEPA TOTAL U µg/g	DOE TOTAL U µg/g
BURWK-51	Aug 21	CORN	0.029	0.005
BURWK-51	Aug 21	SOIL	3.4	3.1
BRN-52	Aug 21	PUMPKIN	0.004	NS
BRN-52	Aug 21	SOIL	3.9	NS

NOTE:

µg/g = picocuries per gram

NS = not sampled

APPENDIX G

1. Table 1 - Soil and Grass

TABLE 1

SOIL AND GRASS

NEW LOCATION ID	LOCATION DESCRIPTION	COLLECT DATE 1996	MATRIX	OEPA TOTAL U µg/g	DOE TOTAL U µg/g	OEPA Ra226 pCi/g	OEPA Ra226 +/- err	OEPA Ra 228 pCi/g	OEPA Ra 228 +/- err
AMS02	Air Monitor Station 02	Jul 25	GRASS	1.5	0.069	NS	NA	NS	NA
AMS02	Air Monitor Station 02	Jul 25	SOIL	19	12	NS	NA	NS	NA
AMS08A	Air Monitor Station 08	Jul 25	GRASS	0.27	0.51	NS	NA	NS	NA
AMS08A	Air Monitor Station 08	Jul 25	SOIL	28	27	NS	NA	NS	NA
AMS09B	Air Monitor Station 09	Jul 25	GRASS	0.33	0.097	NS	NA	NS	NA
AMS09B	Air Monitor Station 09	Jul 25	SOIL	26	31	NS	NA	NS	NA
BSO18	Chapel Rd. S. of Rt. 126	Jul 25	GRASS	3.3	0.091	NS	NA	NS	NA
BSO18	Chapel Rd. S. of Rt. 126	Jul 25	SOIL	3.6	NS	NS	NA	NS	NA
FNAPS02	Air Sampler - E. fence line	Aug 8	GRASS	0.31	NS	0.032	0.01	0.37	0.39
FNAPS02	Air Sampler - E. fence line	Aug 8	SOIL	21	NS	1.1	0.13	1.3	0.25
CS50	Carl Summe residence	Aug 8	GRASS	0.46	NS	0.089	0.02	0.95	0.49
CS50	Carl Summe residence	Aug 8	SOIL	10	NS	1.1	0.12	1.1	0.2

NOTE:
GRS = grass
SL = soil
µg/g = micrograms per gram
pCi/g = picocuries per gram
NS = not sampled
NA = not applicable

APPENDIX H

1. Table 1 - Soil - WAC Samples

TABLE 1

SOIL - WAC SAMPLES

LOCATION ID	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA TOTAL U µg/g	DOE TOTAL U µg/g	OEPA U233-234 pCi/g	OEPA U233-234 +/- error	DOE U234* pCi/g	OEPA U235 pCi/g	OEPA U235 +/- error	DOE U235* pCi/g	DOE U235-236* pCi/g
AD99	Area D HPGE location 99	Jul 30	180	200	42	1.9	33	1.9	0.16	2.5	1.9
AD12	Area D HPGE location 12	Jul 30	280	400	79	3.4	52	4.2	0.26	4.3	3.2

LOCATION ID	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA U238 pCi/g	OEPA U238 +/- error	DOE U238 pCi/g	OEPA U238* pCi/g	OEPA U238* +/- error	DOE U238* pCi/g	OEPA Th 228 pCi/g	OEPA Th 228 +/- error	DOE Th 228 pCi/g
AD99	Area D HPGE location 99	Jul 30	57	2.5	47	56	4.4	54	1.8	0.13	NA
AD12	Area D HPGE location 12	Jul 30	97	4.2	64	89	5.7	82	1.4	0.12	NA

LOCATION ID	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA Th 230 pCi/g	OEPA Th 230 +/- error	DOE Th 230 pCi/g	OEPA Th 232* pCi/g	OEPA Th 232* +/- error	DOE Th 232* pCi/g	OEPA Th 232 pCi/g	OEPA Th 232 +/- error	DOE Th 232 pCi/g
AD99	Area D HPGE location 99	Jul 30	18	0.84	NA	2.3	0.52	1.8	1.7	0.12	NA
AD12	Area D HPGE location 12	Jul 30	4.3	0.23	NA	1.7	0.43	1.2	1.3	0.11	NA

LOCATION ID	LOCATION DESCRIPTION	COLLECT DATE 1996	OEPA Ra 226* pCi/g	OEPA Ra 226* +/- error	DOE Ra 226* pCi/g	OEPA Ra 228* pCi/g	OEPA Ra 228* +/- error	DOE Ra 228* pCi/g
AD99	Area D HPGE location 99	Jul 30	2.6	0.29	2.0	2.3	0.52	NA
AD12	Area D HPGE location 12	Jul 30	1.2	0.22	0.91	1.7	0.43	NA

NOTE:

µg/g = micrograms per gram

pCi/g = picocuries per gram

* = analyzed by gamma spec.

NA = not analyzed

APPENDIX I

1. Table 1 - Air Monitoring - Total Uranium
2. Table 2 - Air Monitoring - TSP
3. Table 3 - Air Monitoring - Radon

TABLE 1

AIR - TOTAL URANIUM					
OEPA LOCATION ID	OEPA START DATE 1996	OEPA END DATE 1996	OEPA TOTAL URANIUM µg/m³	OEPA TOTAL URANIUM pCi/m³*	DOE AMS-17A TOTAL U pCi/m³*
FNAPS01	Jul 19	Jul 31	2.4E-04	1.6E-04	9.34E-05
FNAPS01	Jul 31	Aug 14	6.7E-04	4.5E-04	4.88E-04
FNAPS01	Aug 14	Aug 28	3.8E-04	2.6E-04	1.67E-04
FNAPS01	Aug 28	Sep 11	4.7E-04	3.2E-04	4.39-E-05
FNAPS01	Sep 11	Sep 25	4.5E-04	3.1E-04	2.10E-04
FNAPS01	Sep 25	Oct 9	2.8E-04	1.9E-04	2.33E-04
FNAPS01	Oct 9	Oct 23	3.6E-04	2.4E-04	1.53E-04
FNAPS01	Oct 23	Nov 6	3.6E-04	2.4E-04	5.66E-05
FNAPS01	Nov 6	Nov 20	2.5E-04	1.7E-04	1.71E-04
FNAPS01	Nov 20	Dec 4	6.1E-05	4.1E-05	6.92E-05
FNAPS01	Dec 4	Dec 18	1.6E-04	1.1E-04	2.28E-05
FNAPS01	Dec 18	Dec 31	1.1E-04	7.1E-05	5.23E-05
FNAPS02	Aug 28	Sep 11	3.9E-04	2.6E-04	NS
FNAPS02	Sep 11	Sep 25	3.4E-04	2.3E-04	NS
FNAPS02	Sep 25	Oct 9	3.1E-04	2.1E-04	NS
FNAPS02	Oct 9	Oct 23	1.9E-04	1.3E-04	NS
FNAPS02	Oct 23	Nov 6	2.9E-04	2.0E-04	NS
FNAPS02	Nov 6	Nov 20	4.0E-05	2.7E-05	NS
FNAPS02	Nov 20	Dec 4	6.8E-05	4.6E-05	NS
FNAPS02	Dec 4	Dec 18	1.1E-04	7.5E-05	NS
FNAPS02	Dec 18	Dec 31	9.0E-05	6.1E-05	NS
OHAPSBK	May 14	May 24	2.9E-04	1.9E-04	NS
OHAPSBK	May 24	Jun 05	2.8E-05	1.9E-05	NS
OHAPSBK	Jun 5	Jun 18	2.5E-05	1.7E-05	NS
OHAPSBK	Jun 18	Jul 2	4.6E-05	3.1E-05	NS
OHAPSBK	Jul 02	Jul 16	3.9E-05	2.6E-05	NS
OHAPSBK	Jul 16	Jul 30	2.4E-05	1.6E-05	NS
OHAPSBK	Jul 30	Aug 13	4.1E-05	2.8E-05	NS
OHAPSBK	Aug 13	Aug 27	3.6E-05	2.4E-05	NS
OHAPSBK	Aug 27	Sep 10	5.0E-05	3.4E-05	NS
OHAPSBK	Sep 10	Sep 24	NA	NA	NS
OHAPSBK	Sep 24	Oct 8	3.5E-05	2.3E-05	NS
OHAPSBK	Oct 8	Oct 22	6.0E-05	4.1E-05	NS
OHAPSBK	Oct 22	Nov 5	5.1E-05	3.5E-05	NS
OHAPSBK	Nov 5	Nov 19	3.0E-05	2.0E-05	NS
OHAPSBK	Nov 19	Dec 3	3.1E-05	2.1E-05	NS
OHAPSBK	Dec 3	Dec 17	2.4E-05	1.7E-05	NS

NOTE:

FNAPS01 and AMS-17A are co-located air monitoring stations. However, the sample collection periods are not identical, the values are presented only for general comparison.

NA = not available

pCi/m3* = calculated assuming natural uranium

NS = no sample - not co-located with DOE

TABLE 2

AIR - TSP

OEPA LOCATION ID	OEPA START DATE 1996	OEPA END DATE 1996	OEPA TOTAL SUSPENDED PARTICULATES µg/m³
FNAPS01	Jul 19	Jul 31	29
FNAPS01	Jul 31	Aug 14	41
FNAPS01	Aug 14	Aug 28	42
FNAPS01	Aug 28	Sep 11	48
FNAPS01	Sep 11	Sep 25	23
FNAPS01	Sep 25	Oct 9	23
FNAPS01	Oct 9	Oct 23	31
FNAPS01	Oct 23	Nov 6	NA
FNAPS01	Nov 6	Nov 20	22
FNAPS01	Nov 20	Dec 4	16
FNAPS01	Dec 4	Dec 18	18
FNAPS01	Dec 18	Dec 31	NA
FNAPS02	Aug 28	Sep 11	38
FNAPS02	Sep 11	Sep 25	20
FNAPS02	Sep 25	Oct 9	19
FNAPS02	Oct 9	Oct 23	24
FNAPS02	Oct 23	Nov 6	NA
FNAPS02	Nov 6	Nov 20	18
FNAPS02	Nov 20	Dec 4	18
FNAPS02	Dec 4	Dec 18	20
FNAPS02	Dec 18	Dec 31	NA
OHAPSBK	May 14	May 24	NA
OHAPSBK	May 24	Jun 05	NA
OHAPSBK	Jun 5	Jun 18	29
OHAPSBK	Jun 18	Jul 2	39
OHAPSBK	Jul 02	Jul 16	32
OHAPSBK	Jul 16	Jul 30	24
OHAPSBK	Jul 30	Aug 13	46
OHAPSBK	Aug 13	Aug 27	48
OHAPSBK	Aug 27	Sep 10	51
OHAPSBK	Sep 10	Sep 24	NA
OHAPSBK	Sep 24	Oct 8	27
OHAPSBK	Oct 8	Oct 22	NA
OHAPSBK	Oct 22	Nov 5	NA
OHAPSBK	Nov 5	Nov 19	NA
OHAPSBK	Nov 19	Dec 3	21
OHAPSBK	Dec 3	Dec 17	21

NOTE:
NA = not available

TABLE 3

AIR - RADON

MONTH 1996	OEPA FNRDN01 pCi/l			DOE AMS 5 pCi/l			DOE AMS 6 pCi/l		
	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN
OCT.	0.4 (a)	1.1	-0.1	0.9	1.7	0.4	0.9 (c)	1.5	0.5
NOV.	0.3 (c)	1.0	0.0	0.7	1.4	0.4	0.7	1.4	0.5
DEC.	0.7 (c)	1.4	0.4	0.7	1.0	0.5	0.8	1.0	0.5

MONTH 1996	OEPA OHRDNBK pCi/l			DOE BKGD 1 pCi/l			DOE BKGD 2 pCi/l		
	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX	MIN
OCT.	0.4 (c)	0.8	0.1	0.9 (b	1.7	0.5	0.6	0.9	0.4
NOV.	0.3 (c)	0.6	0.2	0.8	1.6	0.5	0.6	1.0	0.4
DEC.	0.3 (c)	1.2	0.0	0.7	1.4	0.5	0.7	0.9	0.5

NOTE:

"(a)" indicates that OEPA location, FNRDN01, was not placed into service until October 12, 1996.

"(b)" indicates partial or complete data loss due to monitor malfunction.

"(c)" indicates partial or complete data loss due to programming error in monitor.

OTHER RESOURCES

DOE Public Environmental Information Center
JAMTEK Building
10845 Hamilton-Cleves Highway
Harrison, OH 45030
(513) 738-0164

DOE-FN Public Information
P.O. Box 538705
Cincinnati, OH 45253
(513) 648-3153
contact: Gary Stegner, Director

Fluor Daniel Fernald Public Affairs
P.O. Box 538704
Cincinnati, OH 45253
(513) 648-4068
contact: Patricia Thompson, Director

Fernald Residents for Environmental Safety and Health
P.O. Box 129
Ross, OH 45061-0129
(513) 738-8055 (phone and fax)
contact: Lisa Crawford, President

Fernald Citizens Task Force
P.O. Box 544
Ross, OH 45061
(513) 648-6478
contact: John Applegate, Chair

Community Reuse Organization
P.O. Box 38
Ross, OH 45061
(513) 648-4168
contact: David McWilliams, Chair

Fernald Health Effects Subcommittee
4770 Buford Hwy, NE, M/S F35
Atlanta, GA 30341-3724
(707) 488-7611
contact: Steve Adams, Executive Secretary

U.S. EPA -- Region V
77 West Jackson Blvd.
Chicago, IL 60604
(312) 886-0992
contact: Jim Saric, Remedial Project Manager

Fernald Team Contacts

Main Number: 1-800-686-8930
FAX: (937) 285-6404
http://offo2.epa.ohio.gov

Graham Mitchell
OFFO Chief **285-6018**

Tom Schneider
Fernald Project Manager **285-6466**

Jim Coon
Programmatic Issues..... **285-6074**

Jo Davidson
Records Manager **285-6460**

Randy Earle
GIS Manager..... **285-6038**

Laura Hafer
Public Outreach..... **285-6455**

Donna Bohannon
Environmental Monitoring.... **285-6453**

Kelly Kaletsky
Env. Monitoring/GPS **285-6454**

Rex Brown
Data Manager..... **285-6057**

Tim Hull
CERCLA Oversight **285-6075**

Tom Ontko
CERCLA Oversight **285-6073**

Bill Lohner
Air Monitoring **285-6051**

Joe Bartoszek
Surface Water **285-6464**

Mike Proffitt
Ground Water **285-6603**

Ruth Vandegrift and **Jim Colleli**
Ohio Department of Health..... **(614) 644-2727**

Allen Frederick
Ohio Emergency Management Agency ..... **(614) 799-3690**

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