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1999



ANNUAL REPORT TO THE PUBLIC

on the FERNALD Environmental Management Project

Prepared by:



Ohio Environmental Protection Agency
OFFICE OF FEDERAL
FACILITIES OVERSIGHT



State of Ohio

Ohio Environmental Protection Agency

Ohio Department of Health

Ohio Emergency Management Agency

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRG	Cost Recovery Grant
D&D	Decontamination and Dismantlement
DOE	Department of Energy
FCAB	Fernald Citizens Advisory Board
FLHP	Fernald Living History Project
FRESH	Fernald Residents for Environmental Safety & Health
FRL	Final Remediation Level
GIS	Geographic Information System
GPS	Global Positioning System
IEMP	Integrated Environmental Monitoring Plan
ITRC	Interstate Technology & Regulatory Cooperation Workgroup
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
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SWU	Southern Waste Units
TCLP	Toxicity Characteristic Leaching Procedure
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria
WPRAP	Waste Pits Remedial Action Project



*The Fernald Environmental Management Project is located 18 miles northwest of Cincinnati.
(Photo courtesy of Fluor Fernald.)*

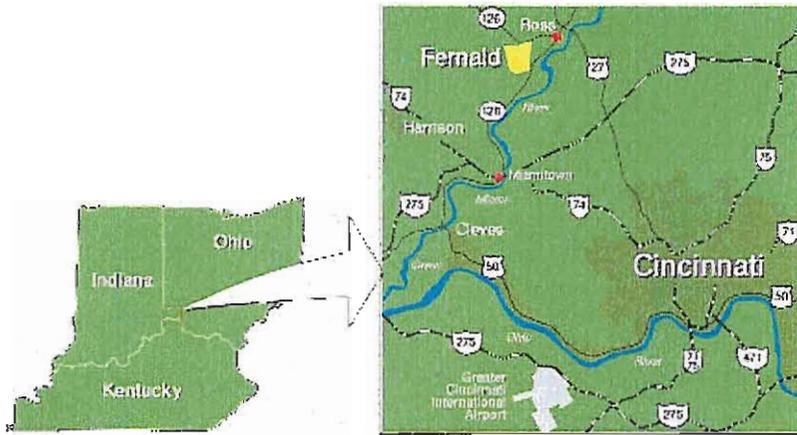
1.0 INTRODUCTION

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 by the Ohio Environmental Protection Agency (Ohio EPA) to provide interested parties a single source of information regarding Ohio's regulatory, environmental monitoring, public outreach, and planning activities at Fernald during calendar year 1999. In addition, this report completes one of Ohio's commitments under the DOE/Ohio federal funding grant.

INTRODUCTION

1.1 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.

Graphic courtesy of Fluor Fernald.

Uranium metal products for the nation's defense programs, including slightly enriched and depleted uranium, were made at Fernald. 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 Fernald assumed responsibility for cleanup from Westinghouse in 1992.

During production numerous contaminants were released and disposed which affected surrounding soil, ground water and surface water. According to an independent dose reconstruction study, an estimated 340 tons of uranium were released during production at Fernald. The study also estimates 170,000 curies of radon were released from the K-65 silos*. A risk assessment published in 1998 estimated the number of lung cancer deaths occurring between 1951 and 2088 may be increased by 1% to 12% from Fernald-related radiation exposures**.

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

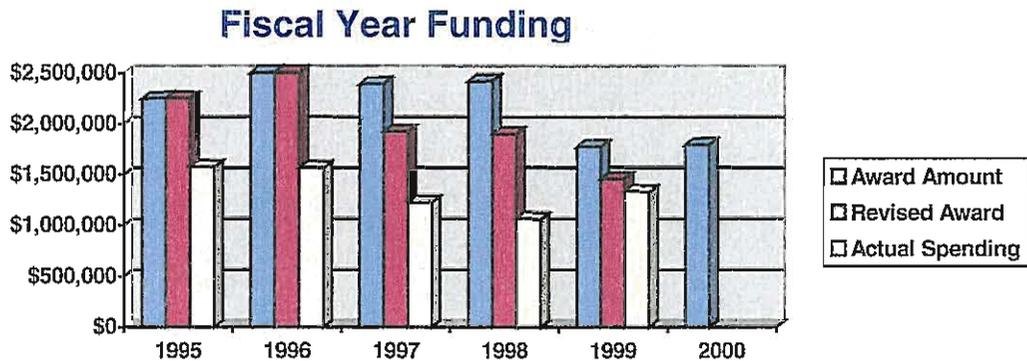
***Estimation of the Impact of the Former Feed Material Production Center (FMPC) on Lung Cancer Mortality in the Surrounding Community*, Centers for Disease Control and Prevention, December 1998.

1.2 FUNDING

Ohio EPA has a long-standing regulatory role at Fernald. The 1988 Consent Decree between DOE and the State of Ohio provided the 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 allows Ohio to provide more active oversight through the dedication of staff and resources to the project.

Ohio EPA is the State’s lead agency for implementation of the CRG. Ohio Department of Health (ODH) and Ohio Emergency Management Agency (Ohio EMA) provide support in the health physics and emergency preparedness planning, respectively. 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. An important goal of Ohio’s CRG program has been enhancing public involvement in decision making at Fernald.

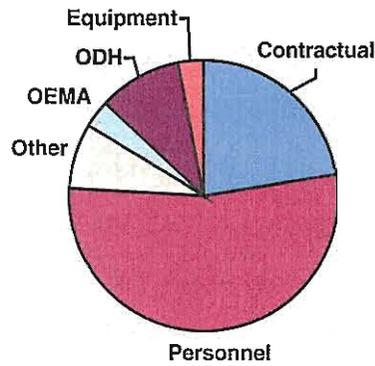
The following graph represents a profile of the funding provided to the State of Ohio by DOE for oversight at Fernald. Significantly less money was spent during fiscal year 1999 than was provided in the original grants. The dollars saved are the result of efforts by Ohio to efficiently and effectively oversee cleanup efforts at Fernald.



INTRODUCTION

The distribution of expenditures for fiscal year 1999 is provided in the figure below. Personnel expenditures include salaries, fringes, and indirect costs. Contractual expenditures include medical monitoring, laboratory, and remedial oversight contractor costs. Operating costs, supplies, training, and travel make up the “other” expenditures.

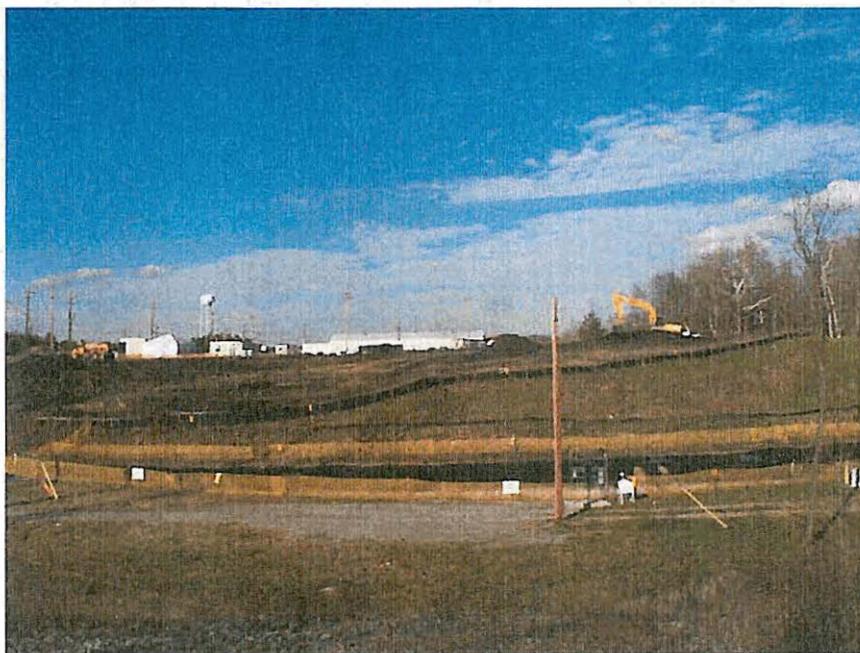
Ohio Spending Categories



2.0 ACTIVITIES AND ACCOMPLISHMENTS

Ohio continued to work diligently in 1999 to keep up with Fernald's accelerated cleanup schedule. Major construction activities in the on-site disposal facility (OSDF) and southern waste units (SWU) continued. As part of natural resources restoration, a wetland was constructed in the northeast corner of the site. Several

soils projects were completed this year, including the excavation of the old sewage treatment plant and the in situ stabilization and removal of the trap and firing range soils. Staff



from Ohio EPA's Office of

Looking north at the former location of the active flyash pile. The flyash was excavated and placed as the protective layer of waste in cell 3 of the OSDF.

Federal Facilities Oversight (OFFO) observed these and other accomplishments as a high volume of field visits improved regulatory oversight. Ohio EPA technical staff reviewed and granted State approval on numerous documents. OFFO staff participated in numerous public meetings that kept the community informed of progress at Fernald. Ohio continued efforts to maintain emergency planning operations and to work with DOE on numerous national level issues.

The overall strategy for remediation of the Fernald site continues to be a balanced approach, which includes removing the most contaminated materials for off-site disposal, while disposing of the less contaminated, high volume materials on-site. Ohio's activities and accomplishments for 1999 are further explained in the following sections.

ACTIVITIES AND ACCOMPLISHMENTS

2.1 REGULATORY OVERSIGHT

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

As part of Ohio's oversight role at the Fernald site, approximately 200 technical documents were reviewed in 1999. Most of these documents related directly to the ongoing remediation of the facility including design packages, implementation plans, certification reports, and work plans. In addition to these regulatory reviews, Ohio EPA focused significant effort on field oversight of ongoing remediation projects. During the year, Ohio EPA conducted approximately 200 site visits/inspections. The inspections included the OSDF cell and interim leachate line construction, storm water management, fugitive dust control, southern waste unit excavation, sewage treatment plant excavation and other on-site activities.

This year represented the second full year of large-scale remediation. A third cell was constructed in the OSDF and waste placement occurred in all three cells. Construction of a treatment facility for the remediation of the waste pits was completed, and waste pit excavation began.

Waste Pits Remedial Action Project (formerly OU1): The six waste pits contain approximately one million tons of soil and 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.

ACTIVITIES AND ACCOMPLISHMENTS

First loadout of waste into railcars began in February, and the first unit train to Envirocare of Utah left in April. During 1999, a total of 16 unit trains went to Envirocare,



containing a total of 89,631 tons of waste. Waste pit excavation was initiated in September 1999. The dryers for the waste pits became operational in December 1999.

The first train with waste pit materials left for Envirocare on April 26, 1999.

On-Site Disposal Facility Project (formerly OU2, OU3, OU5): Disposal of contaminated material including soil and debris continued in the OSDF. Any waste that exceeds the OSDF waste acceptance criteria (WAC) will be treated to meet the criteria or disposed off-site. No off-site waste will be allowed in the OSDF.

In early 1999, numerous leaks were found in the temporary leachate line for the OSDF. The line was shut down, and the contingency plan was implemented. After an investigation of the temporary line, it was determined that a new interim leachate line would be built and installed to replace the original line, and the permanent leachate line design and installation would be accelerated. Construction on the new permanent line will begin in 2000. The cells opened and operated with the new interim gravity leachate line in June. Waste disposal operations including building debris and soil occurred throughout the construction season in cells #1 and #2. During 1999, cell #3 was constructed including the liner and leachate collection

ACTIVITIES AND ACCOMPLISHMENTS

systems. First waste placement in cell #3 occurred in November. Approximately 280,000 yds³ of soil and debris were transferred to the OSDF for disposal.

Facilities Closure and Demolition Project (formerly OU3): All on-site buildings are being decontaminated and dismantled. All waste, except that which exceeds the WAC, will be disposed in the OSDF. During 1999, the maintenance building/tank farm complex and 16 additional site structures were demolished. Contracts were awarded for the demolition of Plant 5 and 6. Safe Shutdown, including the removal of holdup materials and de-energizing plants, was completed in 1999.

Silos Project (formerly OU4): 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



Standing on Silo 4 looking north to Silos 3, 2 and 1.

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. In 1999 the domes of Silos 1 and 2 were resealed to reduce radon emissions.

ACTIVITIES AND ACCOMPLISHMENTS

In 1999 Rocky Mountain Remediation Services was awarded a contract to remediate Silo 3 contents using chemical stabilization. A Record of Decision (ROD) Amendment will be completed for the K-65 Silos (1 and 2) during 2000. In order to support the revised Feasibility Study required by the ROD Amendment, proof of process testing was initiated on four technology types for the K-65 silo waste. Proof of process testing was completed in early 1999. A proposal to accelerate retrieval of the K-65 waste and transfer it to new on-site tanks was developed in 1998, and the contract was awarded to Foster Wheeler Environmental in 1999, with construction beginning in 2000.

Soils Characterization and Excavation Project (formerly OU2 & OU5):

Contaminated soils are being excavated and soils meeting the waste acceptance criteria are placed in the OSDF. Soils Project activities in 1999 included excavation, certification, stabilization, and restoration. Excavation and disposal of soils and flyash continued in the southern waste units in 1999. The old sewage treatment plant, including surrounding soils and at and below grade structures was remediated.

Certification of this area will be completed in 2000. Approximately 3500 yd³ of lead-contaminated soil from the trap and firing ranges were chemically stabilized in place before being disposed of in the cell.

Materials from the active flyash pile were used as the protective layer in the bottom of OSDF cell #3.

Approximately 280,000 yds³ of

soil and debris were excavated during 1999.



By December 1999 three feet of flyash material was placed and graded as the protective layer of waste in cell 3 of the OSDF.

ACTIVITIES AND ACCOMPLISHMENTS

Certification of areas attaining the final remediation levels (FRL) was first completed in 1998 and continued in 1999. Sampling, analysis, and statistical evaluations occurred for both remediated areas as well as those areas not requiring remediation. Approximately 350 acres of the site have been certified as meeting cleanup levels.

Aquifer Restoration and Waste Water Project (formerly OU5): 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 uranium approximately one mile south of the site in what is referred to as the “south plume.” DOE provided bottled water for residents in the plume area from February 1991 until 1996 when a public drinking water system became operational. In 1993, the south plume removal action was started to slow off-site migration of the uranium plume.



A Geoprobe™ is used to install a monitoring well in the South Field. The demonstration project showed this to be an efficient and inexpensive way to install wells to help characterize site ground water.

The Great Miami Aquifer is being remediated by a combination of ground water extraction and injection. More than two billion gallons of water were treated at the advanced wastewater treatment plant in 1999. The use of reinjection wells as part of the ground water remediation was a one-year demonstration project completed in 1999.

Resource Conservation and Recovery Act (RCRA): The annual hazardous waste compliance evaluation inspection was completed in April 1999, and Fernald was

found in compliance and received no violations. At a later inspection Fernald staff reported a leaking container incident to Ohio EPA in October 1999. Two metal box containers had leaked low-concentration hazardous waste at two locations on-site. Due to the low concentrations of constituents there was no threat to the environment or public health. CERCLA reportable quantities were not exceeded, however the circumstances involved in the release led Ohio EPA to issue a Notice of Violation for improper storage and failure to detect and remedy leaking containers. During 1999 more legacy hazardous waste was shipped off-site and RCRA Integrated Closure activities were completed on several Hazardous Waste Management Units.

Natural Resource Damage Assessment (NRDA): Ohio EPA is the designated Natural Resource Trustee for the State of Ohio Fernald settlement. The Trustees act as guardians for the public natural resources impacted by Fernald. Other Trustees for Fernald include DOE and the Department of Interior. One goal of the Trustees is to integrate natural resource restoration into the ongoing CERCLA remediation activities at the site. Another goal of the Trustees is to have the restoration activities lead to settlement of the State of Ohio's NRDA claim against DOE.

During 1999 the Trustees worked toward resolution of NRDA claims and settlement of the State of Ohio's NRDA lawsuit. Negotiations led to the drafting of a Memorandum of Understanding



Looking northwest at the A1PI wetland in June following construction and seeding.

ACTIVITIES AND ACCOMPLISHMENTS

amongst the Trustees. During 2000, the memorandum will be finalized along with the Natural Resource Restoration Plan and the Master Use Plan. The Restoration Plan lays out the objectives for ecological restoration activities at the site. The Master Use Plan will address the issue of public use of the site following remediation and restoration. Over 800 acres of the site will undergo natural resource restoration to become native grasslands, riparian buffers, forests, and wetlands.

Ecological restoration activities during 1999 included the construction and planting of a 12-acre area that includes six acres of wetlands in an area previously stripped of topsoil as part of remediation. The wetland project was part of DOE's wetland mitigation requirements under the Clean Water Act. During the wetland mitigation project, Ohio EPA funded the University of Dayton to conduct research on the use of wetland donor soils to improve mitigation success. The research focuses on vegetation quality along with microbial and mycorrhizal activity in the treatment plots compared to control plots within the mitigation area. Other restoration research activities at the site include reforestation planting types and densities, invasive plant control and native grass establishment.

In addition to restoration activities, surveys for threatened and endangered species



were conducted in 1999. The Sloan's crayfish survey found a healthy population of the state threatened crayfish remain in Paddys Run. Just north of the Sloan's crayfish

A Sloan's crayfish survey is conducted in Paddys Run near PR3.3.

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area, the Indiana bat survey captured one of the Federally Endangered bats. This was the first time that the Indiana bat has been recorded on-site. The Area 8 Phase 2 restoration project to occur in 2000 will focus on expanding Indiana bat habitat along Paddys Run. During 1999 grazing leases that had previously allowed cattle access to the areas of Paddys Run occupied by Sloan's crayfish and the Indiana bat were terminated. This should aid in improving habitat for these two important species.

ACTIVITIES AND ACCOMPLISHMENTS

2.2 PUBLIC OUTREACH

Ohio EPA's public outreach program includes open, ongoing, formal and informal communication with stakeholders, site personnel, and other regulators. Steady and interactive communication enables all parties to better understand all views on an issue. Person to person contact, along with quick, open responses from technical staff to public inquiries ensure the public is included in Ohio EPA's decision-making.

This type of public outreach results in a diverse collection of opinions and values enabling regulators to make better cleanup decisions. OFFO's public outreach program supplements our monitoring and oversight activities by fostering early



Educational Outreach: Ohio EPA joined with Fernald staff and local middle schools to plant native wildflowers in the Habitat Area along Paddys Run Road.

public involvement in important environmental decisions. In 1999, OFFO investigated and responded to numerous public and media information requests. OFFO's Internet web site continues to enhance communications with the public. Ohio EPA's new Director participated in the Safe Shutdown ceremony with DOE Secretary Richardson in March.

Meetings

OFFO representatives fully participate in all DOE and community sponsored public meetings and workshops, and give presentations when requested or appropriate. The following list includes groups with which Ohio staff regularly participates.

ACTIVITIES AND ACCOMPLISHMENTS

- Fernald Residents for Environmental Safety and Health (including 15th Anniversary Celebration)
- Fernald Citizens Advisory Board (FCAB)
- FCAB committee activities
- Fernald Living History Project
- Fernald Health Effects Subcommittee
- Interstate Technology & Regulatory Cooperation Workgroup (ITRC)
- Site Technology Coord. Group

In 1999, the FCAB continued looking at on-site and off-site issues through the newly formed remediation and stewardship committees. Ohio EPA staff regularly participates in the monthly FCAB committee meetings and in the bimonthly meetings of the full board, in ex-officio capacities. Ohio EPA also participated in special events such as the Future of Fernald workshop, the FCAB-sponsored national transportation workshop in Cincinnati, the national CAB meeting on Stewardship in Oak Ridge, TN and Nevada Test Site CAB meetings.

Ohio EPA regularly participates in meetings and promotional efforts of the Fernald Living History Project. This project involves community members and site workers in an effort to record and preserve the various perspectives that are a part of their environmental history. Interviews from 100 retired workers and community members were concluded in 1999 with assistance from DOE. OFFO Chief, Graham Mitchell was interviewed in September for this project. Also in 1999, the University of Cincinnati, working with the living history group, received a \$50,000 grant from the Ohio Environmental Education Fund for a project during calendar years 2000-2001. This project, Linking Community with Environment, will include a summer workshop for 30 area high school teachers relating the environmental history of Fernald and its impact on surrounding communities. Workshop materials and a web site will be available for teachers to adapt and use in other Ohio communities whose environment has been impacted by formerly used DOE and DoD sites. Linking Community with Environment also includes 25 additional video interviews of Fernald

ACTIVITIES AND ACCOMPLISHMENTS

community members. In 1999 OFFO continued to maintain an email list server and web pages for the Living History Project.

OFFO continued to play an instrumental role as Fernald Natural Resource Trustee in future land use discussions. OFFO presented information and participated in workgroups at the Future of



At the Future of Fernald workshop the community discussed options for future use of the 1050-acre Fernald facility.

Fernald workshop in April and made regular updates to the web site on natural resource projects and activities.

In addition to these Fernald-specific groups, Ohio EPA staff also participated in numerous DOE national groups including ITRC, the State and Tribal Governments Working Group, and the Environmental Management Advisory Board.

Publications

- *1998 Annual Report to the Public on the Fernald Environmental Management Project*
- *Ohio EPA Field Notes* is a column in the FRESH bimonthly newsletter; contributions from various staff

Fact Sheets:

- Quarterly environmental monitoring results fact sheets
- Revised Fernald fact sheet, June

ACTIVITIES AND ACCOMPLISHMENTS

Presentations

- Fernald poster presentation at the Regional Town Meeting and Health Symposium in Cincinnati, January
- *The Future of Fernald*, presented at the FCAB workshop, April
- *Local Environmental Data*, presented at the Local Data Users Conference, May
- *GIS and GPS at Fernald*, presented at USEPA's GIS conference in Cincinnati, September
- *Fernald Overview*, presented at SWDO staff meeting, July
- *Ohio EPA Overview*, presented at UD biology club, November
- Enviroscape demonstration to Ross and Crosby Middle Schools, November
- Fernald presentations to graduate students at Miami University, April, June and November
- OU4 Silos 1&2 Technical Availability Session, December

On the Internet

OFFO's Fernald web site continues to be a valuable resource for providing information to both internal and external users. During the year, OFFO responded to numerous public information requests from the 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.

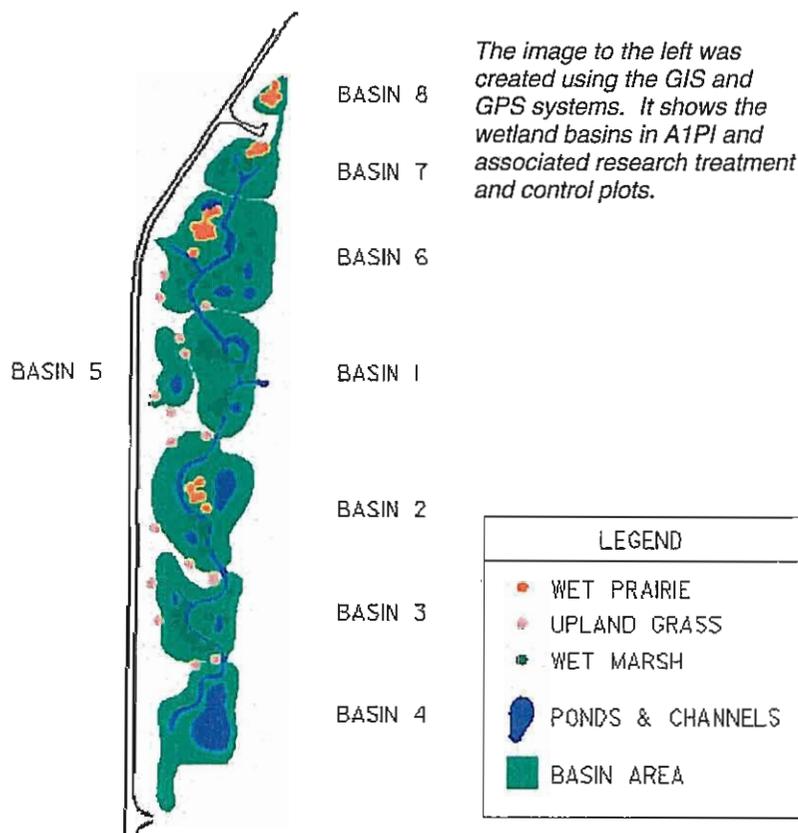
In 1999 a real-time radon monitoring data page with hourly updates from three locations was on-line for the entire year. Ohio EPA provided extensive online information for the OSDF leachate line leaks, hyporheic sampling, and other remediation and research projects. Additionally, the web server continues to host multiple web sites, including the community based Fernald Living History Project site, the southwest district site, and the Hamilton County Environmental Action Commission site. The OFFO web site can be accessed at <http://offo2.epa.state.oh.us> for more information on Fernald.

ACTIVITIES AND ACCOMPLISHMENTS

2.3 GIS AND GPS

The Geographic Information System (GIS) is a computer based mapping and information system capable of storing, manipulating and analyzing geographical information. The Global Positioning System (GPS) uses a series of satellites and a base station to reliably pinpoint geographic locations. Together the system works as a powerful tool that increases OFFO's ability to provide effective oversight at Fernald.

The GIS and GPS system allows for the association of sampling results with site information such as topography, stratigraphy, surface drainage features, and geology.



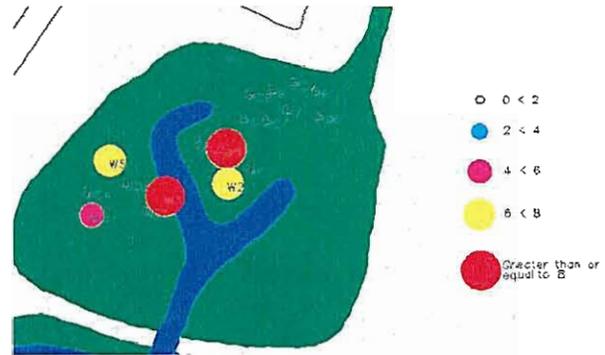
These associations can then be presented graphically, providing various depictions of the data including maps and models. OFFO's GIS and GPS capabilities allow for the independent analysis and review of DOE contractor generated data, models, maps, and

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 for the DOE cleanup of the Fernald site.

ACTIVITIES AND ACCOMPLISHMENTS

In 1999, OFFO continued to use the GIS and GPS to evaluate environmental monitoring locations. The system was also used to create sampling location maps for fact sheets. OFFO also made base station data available to several divisions within Ohio EPA as well as to USEPA.

In 1999 OFFO used GIS and GPS capabilities to map various features associated with the A1P1 wetland mitigation research project OFFO is conducting with the University of Dayton. (See Natural Resource Restoration Research under Section 3.5 for



The figure above represents floristic quality data in bubble format for wetland basin 7 of A1P1.

more on this project.) The project involves evaluating the effectiveness of using soils from various donor locations to replenish the microbial and plant communities in stripped soils at Fernald. The GIS and GPS were used to locate treatment and control plots as well as to map various vegetation and microbial data collected during the project.

ACTIVITIES AND ACCOMPLISHMENTS

2.4 EMERGENCY MANAGEMENT PLANNING

Ohio EMA reviewed the State Hazmat Plan and the attached DOE Annex and worked on revisions to the plan and the State's Hazardous Materials Memorandum of Understanding. The memorandum was finalized and signatures received from all applicable state agencies. The Governor will sign it in 2000. Ohio EMA is using the new Hotspot '98 computer program for response to radiological incidents at Fernald, specifically if it involves radon. Ohio EMA continues to attend Fernald meetings including the Cooperative Planning and Training meetings.

Ohio EMA has worked with Fernald to gather information on the truck shipments of nuclear materials from Fernald to Portsmouth. This information was relayed to the county emergency management agencies along the shipment route. Notices of other shipments were also sent to Hamilton and Butler counties.

Ohio EMA continued to prepare for site emergencies by improving its preparedness posture through training and upgrading the Ohio Emergency Operations Center, which included an October exercise and end of year response for Y2K. Ohio EMA personnel, along with county and site personnel, attended several hazardous materials courses and seminars related to response and emergency planning. Ohio EMA taught two introductory Computer Aided Management of Emergency Operations (CAMEO) courses in Columbus, which included personnel from Hamilton and Butler Counties.

Under the DOE grant provisions, Ohio EMA provided pass-through funds to the Hamilton and Butler County Emergency Management Agencies to be used for Fernald-specific issues. They used the funds to prepare hazards assessments, participate in emergency response organizations, conduct exercises and drills, digitize site-specific information, participate in periodic communications checks, upgrade their Emergency Operations Center, and monitor the periodic tests of the Fernald warning system.

3.0 ENVIRONMENTAL MONITORING

The State of Ohio has conducted environmental monitoring at Fernald since 1985. Monitoring is performed to evaluate potential impacts from remedial actions and appraise the success of ongoing cleanup activities. During 1999, on- and off-site releases were monitored through the sampling of ground water, surface water, sediment, soil, biota, and air.

Ohio EPA reviewed and commented on DOE's Integrated Environmental Monitoring Plan (IEMP) in 1999. The reviews included three quarterly status reports and one annual report covering all 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. The IEMP streamlines monitoring resources by combining monitoring for remediation projects, decontamination, and demolition operations into one program. As a result of DOE's revised IEMP, Ohio EPA conducts most of the off-property environmental monitoring at Fernald.

Ohio EPA continued its independent and split sampling programs in 1999. Independent sampling allows Ohio EPA to evaluate suspected impacts from remedial activities, evaluate additional sampling locations and analytical parameters not currently monitored by DOE, and respond to specific citizen requests. DOE's compliance with the waste acceptance criteria is also independently monitored. Split sampling provides a comparison of data between Ohio EPA and Fernald.

ODH continued to provide data validation for OFFO's sampling program in 1999. A discussion of sampling activities and results for each media is provided in Sections 3.1 through 3.6. Summary data from Ohio EPA's sampling program are included in the Appendices of this report. Complete data packages may be viewed by contacting Ohio EPA.

ENVIRONMENTAL MONITORING

3.1 PRIVATE WELLS

Ohio EPA continued to monitor three private ground water wells in 1999 for total uranium. OFFO split sampled the wells quarterly with DOE/Fluor Fernald.

The 1999 private well sampling locations are shown on the off-site sampling map in Appendix A. Private wells BOK-14, BKM-13, and NKM-12 are located down gradient of Fernald and within the uranium plume. These residents are all on public water and the wells are used for monitoring purposes only.

Private well water is analyzed for total uranium, which is 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 in ground water, as determined in the OU5 Remedial Investigation (October, 1994), ranges up to 3.1 µg/l. The highest total uranium concentration detected from the three monitoring wells during 1999 was 120 µg/l found in well NKM-12. Well BOK-14 was consistently within background in 1999. Appendix B contains the private well sampling data.

OFFO has been split sampling the three wells with Fernald since 1994. These wells have historically shown some fluctuation in their total uranium concentrations.

This is mostly due to seasonal changes in the water table. Quarterly monitoring provides information to confirm seasonal fluctuations and any contaminant

Ohio EPA found increased concentrations of uranium in one private well, possibly resulting from re-injection of ground water as part of the aquifer restoration project.

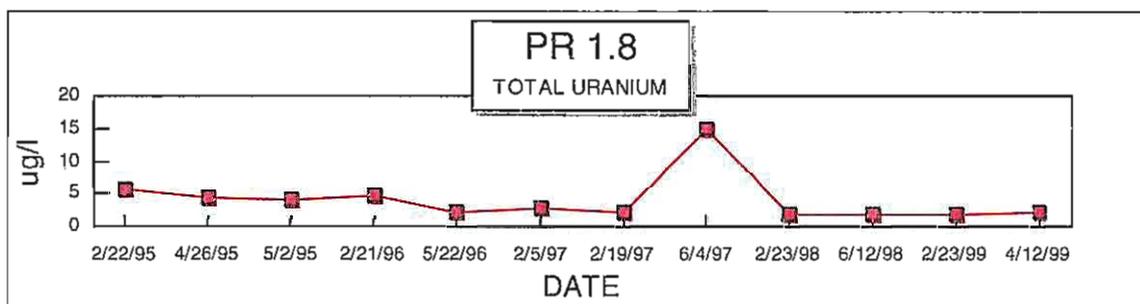
migration resulting from cleanup activities that may impact these private wells. Some increased concentrations have been noted in well NKM-12. With Fernald's re-injection and extraction system, treated water is re-injected, pushing the contaminated ground water past the private well and toward extraction wells. In time, total uranium concentrations will decrease as the ground water is cleaned up.

3.2 SURFACE WATER

Thirty-six surface water samples were taken in 1999, compared with 49 taken in 1998. Routine samples were analyzed for total uranium, radium 226, and radium 228. In addition to the routine monitoring in 1999, two samples were taken on June 14, at the inflow from a sand lens into wetland basin 1 in Area 1 Phase I.

The map in Appendix A shows all 1999 surface water sampling locations. Data can be found in Appendix C. GM26.2 and PR7.2 are background locations on the Great Miami River and Paddys Run, respectively. PR3.3 is located on Paddys 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 PR1.8 is at the Willey Road Bridge on Paddys Run. This location is at the southern boundary of the site. PR0.2 is located at the Route 128 bridge and is fed primarily by ground water. 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. WTLBSN 1 N and WTLBSN 1 S are located in wetland basin 1 in Area 1 Phase I.

The final remediation levels for total uranium, radium 226, and radium 228 in surface water in Paddys Run and the Great Miami River are 530 $\mu\text{g/l}$, 38 pCi/l, and 47 pCi/l, respectively. No sample results exceeded the FRLs.

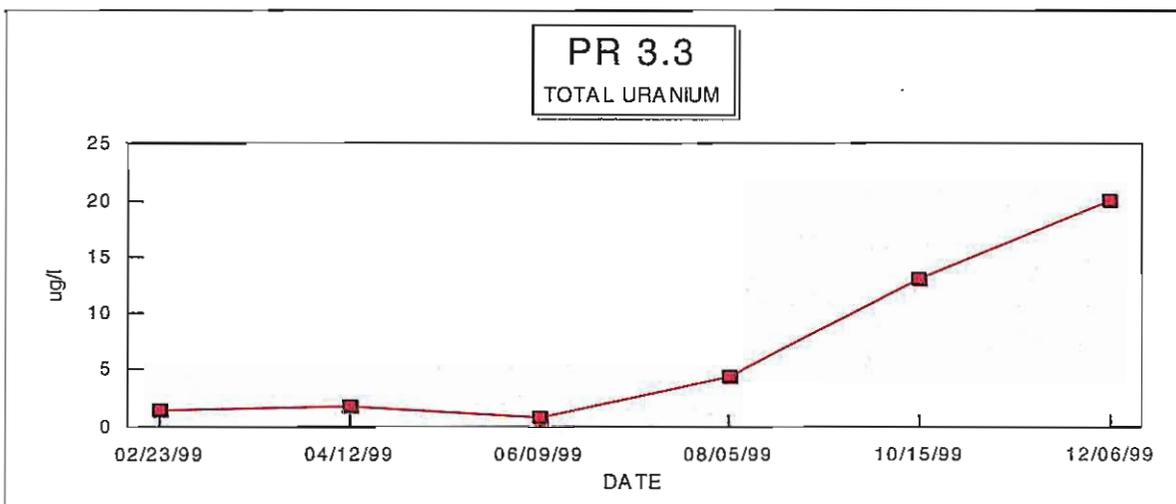


With the exception of a short time in late winter/early spring, Paddys Run at the property line (PR1.8) was generally dry. Two samples taken at this location in

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February and April continued to demonstrate low levels of total uranium (1.8 and 2.3 $\mu\text{g/l}$, respectively).

The site reported apparent increases in turbidity from the north drainage ditch into Paddys Run. This drainage ditch empties into Paddys Run at approximately river mile 3.4, just upstream of the railroad bridge. Our samples at PR3.3, just downstream of the railroad bridge, appeared to show an increasing trend in total uranium, although levels were still significantly below the FRL (530 $\mu\text{g/l}$). The site has initiated an investigation to determine what may be causing this.



3.3 SEDIMENT

Sediment samples were taken at seven locations in 1999. A total of nine sediment samples were analyzed in 1998, ten in 1997 and nine in 1996. Samples were analyzed for total uranium, radium 226, and isotopic thorium. The sample from PR4.6 was also analyzed for cadmium.

The map in Appendix A shows all 1999 sediment sampling locations. Most samples were co-located with surface water sampling points. Location PR7.2 had a gravel and cobble substrate, and did not have



Annual sediment samples are taken from the Great Miami River.

sufficient sediment to be sampled. PR4.6 at the Morgan Ross Road bridge, the DOE/Fluor Fernald background station, was sampled instead of PR7.2.

Final remediation levels for sediment at Fernald have been established for the following analytes (OU5 Record Of Decision, December 15, 1995): total uranium (210 $\mu\text{g/g}$); radium 226 (2.9 pCi/g); thorium 228 (3.2 pCi/g), 230 (18000 pCi/g), and 232 (1.6 pCi/g); cadmium (71 mg/kg). No sediment sample had any analyte above a final remediation level. Results are summarized in Appendix D.

3.4 SOIL

Ohio EPA used soil sampling to monitor various aspects of the Fernald remediation in 1999. OFFO conducted several soil sampling events to evaluate compliance with the waste acceptance criteria (WAC) prior to the disposal in the OSDF. Other samples were collected to find out if applied stabilization processes would immobilize lead contamination in soil, and to determine the extent of any RCRA regulated waste.

OFFO conducted four soil sampling events in 1999 and collected a total of 13 samples from Fernald. Each sampling event had a specific compliance objective. See Appendix A for sampling locations and Appendix E for data results.

- The first sampling event consisted of collecting four split samples at the former Sludge Drying Beds in the old Sewage Treatment Plant area. The soil samples were analyzed to determine WAC compliance for total uranium (1030 mg/kg) and technitium-99 (29.1 pCi/g). All results came back below the WAC numbers.
- The next sampling activity took place at the Firing Range in Area 2 Phase I of the southern waste units. The purpose of this event was to determine total lead concentrations and to verify that the area could pass the Toxicity Characteristic Leaching Procedure (TCLP) for RCRA contaminants, which would allow for disposal in the OSDF. Before collecting the samples, a stabilizing process was applied to the area and mixed into the soil. The stabilizer was used to immobilize the lead contamination. Ohio EPA and DOE split results showed that total lead concentrations were slightly above the FRL of 400 mg/kg, but below WAC, and passed TCLP. With these results, the soil will be placed in the OSDF.
- The objectives for sampling the former Trap Range located in Area 1 Phase II were similar to the activities conducted at the Firing Range in the SWUs. A stabilizer was applied to the soil containing lead contamination and mixed. Split soil samples were collected to confirm lead contamination and determine whether

the area passed TCLP. Both Ohio EPA's and DOE's split results affirmed that the lead concentrations were slightly above the FRL, passed TCLP, and below WAC. This soil can be placed in the OSDF.

- During 1999, OFFO conducted an independent inspection and sampling event from trucks hauling excavated materials from the SWUs to the OSDF. Once in the SWUs, a randomly selected truck was dumped,



In September, Ohio EPA sampled soil from a truck leaving the southern waste units for the OSDF.

sampled, and the load remained staged until the analysis was completed. OFFO's contract lab agreed to provide 24-hour turn-around time for the analysis of these types of samples. The analyses were within WAC limits and the truckload was taken to the OSDF for disposal.

Ohio EPA will continue to work with DOE and Fluor Fernald in 2000 to monitor site soil conditions and evaluate WAC characterization prior to disposal in the OSDF.

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3.5 BIOTA

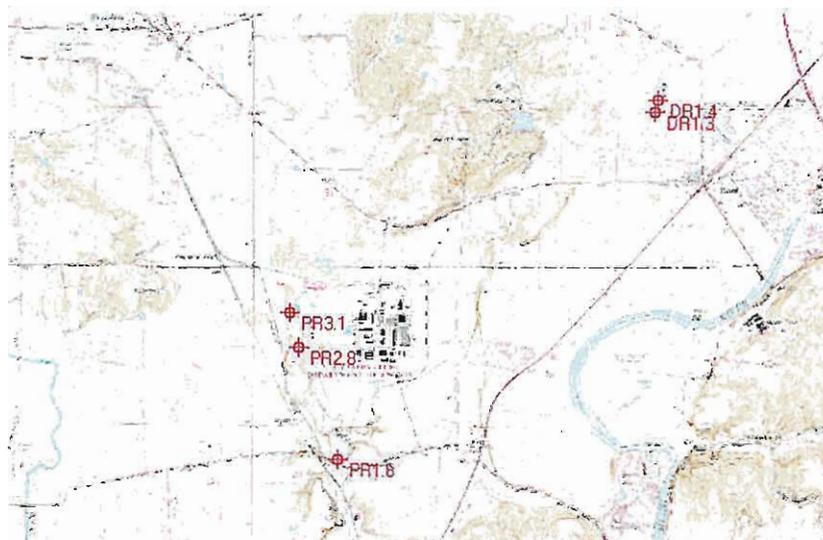
Hyporheic Organisms: Hyporheic samplers were set in Paddys Run and Dry Run from August 26, 1998 to December 8, 1998 and analyzed in 1999. These were placed to sample aquatic organisms in the two streams and to compare the two populations to assess any impacts that



Above, samplers at river mile 3.1 in Paddys Run were under water. The other locations were all dry as shown to the left. One of the samplers was vandalized at this location, having been pulled out of the stream bottom. The map below shows the five sampling locations.

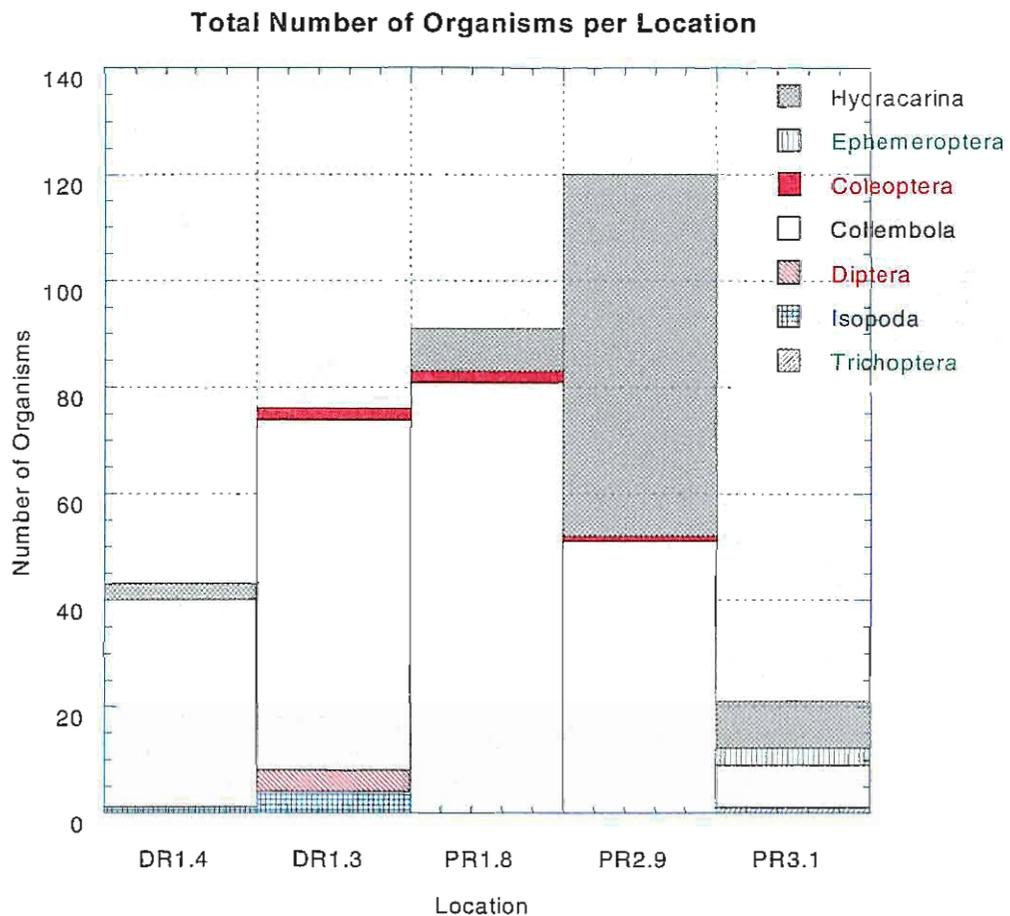
the site may have on the aquatic biota. During periods of flooding or drying of the stream, aquatic organisms seek refuge in the streambed. When the samplers were retrieved, only those at PR3.1 were in water. The other locations were dry and the sandy substrate of the streambed was moist at best, and completely dry in most cases.

Twenty-five samplers were set in five locations (five per location in a



transect across the stream). Three locations were in Paddys Run and two were in Dry Run.

Springtails (*Collembola*) and water mites (*Hydracarina*) dominated the locations, other than PR3.1. Rove beetles (*Coleoptera: Staphylinidae*), which are known to be predators of the springtails, were found. The only truly aquatic species were found at PR3.1, which was inundated at the time of retrieval of the samplers. At this site both mayfly (*Ephemeroptera*) and caddisfly (*Trichoptera*) nymphs were found. It was evident that the substrate becomes too dry at the other locations to support aquatic macroinvertebrates. There did not appear to be any significant differences in the organisms in Paddys Run and Dry Run.



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Natural Resource Restoration Research: Most of the ecological restoration work at Fernald will occur in areas of highly disturbed soils. Therefore, Ohio EPA is interested in methods to assess and ensure restoration activities are developing along a path that will lead to stable ecological communities. The high degree of disturbance raises the question of how well plant communities will develop. While methods exist for evaluating above ground plant community structure, little information exists on how to evaluate subsurface interactions and community development. OFFO is interested in evaluating a method for characterizing the essential function of subsurface community structure at various stages of both prairie restoration and wetland development. Such a method would be an invaluable tool for predicting establishment of grasslands and wetlands. Ohio EPA has contracted with the University of Dayton to analyze soil samples collected for microbial activity and diversity. An index will also be developed to evaluate soil microbial activity relative to restoration success.

The research has been conducted in a 12-acre wetland mitigation project at Fernald.



Donor soils were brought in from existing wetlands and placed in treatment plots. Paired control plots



Above, the wetland control plot within the sludge amended basin shows no germination. Right, the paired treatment plot demonstrates vegetative success. Photos taken in August, more than two months after planting.

were used to evaluate changes. In addition to conducting soil microbial analyses, plant communities in the plots were monitored using the Floristic Quality Index.

First year results showed significantly better plant communities in the donor soil plots than the control plots using the Floristic Quality Index. The donor soil plot vegetation migrated up to 2.5 feet beyond the edge of the plots demonstrating the



*This photo shows migration of Spikerush (*Elymus sp.*) outside the original treatment plot. This demonstrates the ability of donor soils to improve wetland basin vegetation.*

ability of the donor soils to improve overall wetland plant communities. This contributed to an overall improvement in the wetland system. Soil analyses show that donor soils trended higher in soil moisture, organic matter, microbial activity and biomass. Based upon the first year findings, donor soil inoculation is now used for other wetland projects on-site. During 2000 we will continue to evaluate the plant and microbial communities in donor soil versus control plots.

ability of the donor soils to improve overall wetland plant communities. This contributed to an overall improvement in the wetland system. Soil analyses show that donor soils trended higher in soil moisture, organic matter,

3.6 AIR

Ohio EPA conducts air monitoring and surveillance at Fernald. Ohio EPA operated six high volume air samplers for the collection of particulate samples and three radon monitors for the continuous monitoring of radon-222 gas. The objectives of Ohio EPA air sampling are to verify the effectiveness of the DOE environmental air monitoring network and to measure environmental impacts from remediation.

High Volume Air Sampling

Ohio EPA conducts high volume air sampling to determine concentrations of selected particulate contaminants present in the air from Fernald activities. These samplers are strategically located to measure total uranium, total suspended particulates (TSP), and other target radionuclides present in the air. Four air samplers are located on-site, and two are located in nearby communities. These locations were chosen based on the potential impacts from specific activities, prevailing wind direction, availability of utilities, locations of public interest, and points where maximum concentrations may be measured. The locations are shown on the maps in Appendix A.

Ohio EPA compares on-site location total uranium concentrations with background location concentrations and the concentrations listed in the National Emission Standard for Hazardous Air Pollutants (NESHAP) for radionuclides. The on-site concentrations were greater than the off-site concentrations, and all concentrations were less than the NESHAP concentrations.

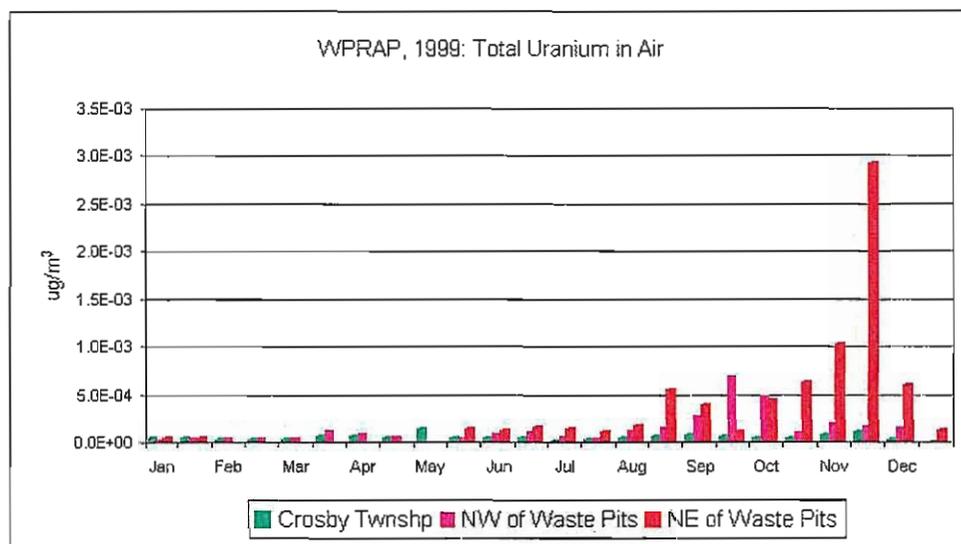
The Waste Pits Remedial Action Project (WPRAP), on-site disposal facility, southern waste units, and off-site locations are monitored with Ohio EPAs high volume air samplers.

Waste Pits Remedial Action Project: Ohio EPA has high volume air samplers located northeast and northwest of the waste pits, (FNAPS01 and FNAPS04 respectively). The northeast waste pit sampler has been operational since July 1996, while the northwest waste pit sampler has been operational since the end of

September 1998. Total uranium and TSP samples are collected from each of these locations biweekly. A monthly sample was also analyzed for isotopes of thorium and radium-226.

The 1999 average TSP concentration at the northeast waste pit location was nearly the same as the 1998 concentration. The TSP concentration at the northwest location was 39% higher than in 1998. Both waste pit samplers measured TSP concentrations less than the background location in 1999.

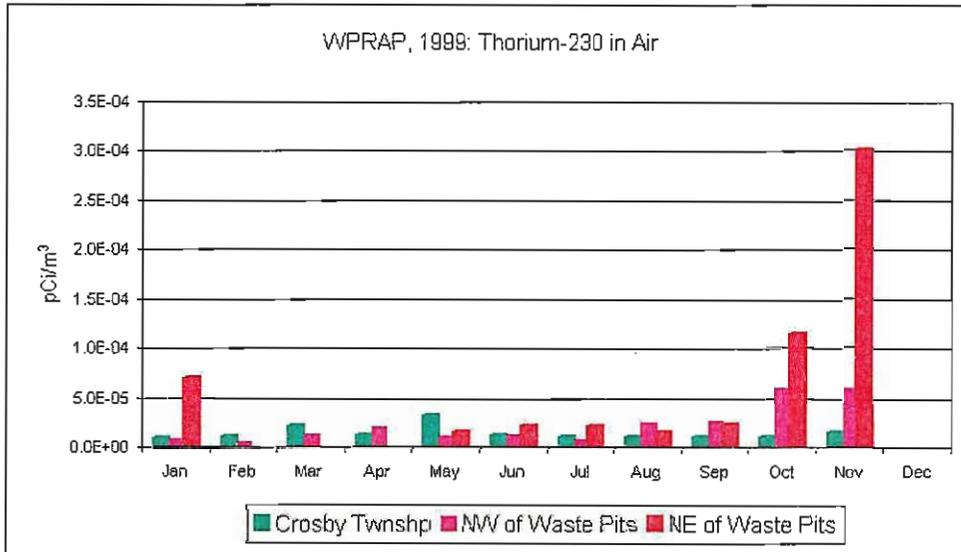
The 1999 average total uranium concentration measured at both waste pit locations was more than 200% greater than the 1998 average concentrations. Both locations had total uranium concentrations significantly greater than the concentrations measured off-site. There is a significant trend in total uranium concentrations during the last quarter of 1999. The concentrations were still less than the NESHAP concentrations. These results reflect the increase in remediation activities in the waste pit area during 1999.



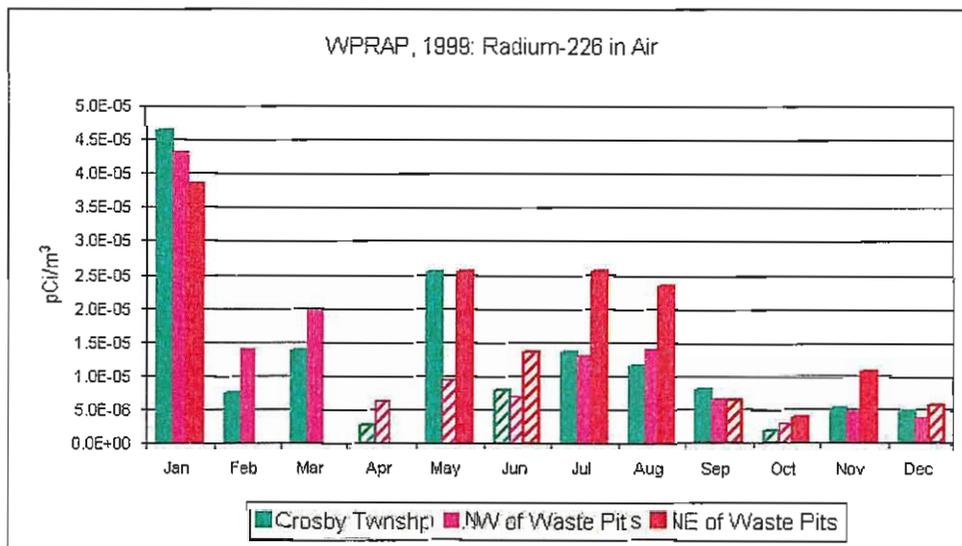
Isotopes of thorium (Th-232, Th-230, and Th-228) were also analyzed at the waste pit locations. 1999 thorium-232 and thorium-228 concentrations were similar to the results collected during the end of 1998 and to concentrations measured at the

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background location. The thorium-230 concentrations increased during the last quarter of 1999 and were higher than the concentrations measured at the background location. All of the thorium concentrations measured in 1999 were less than the NESHAP concentrations.

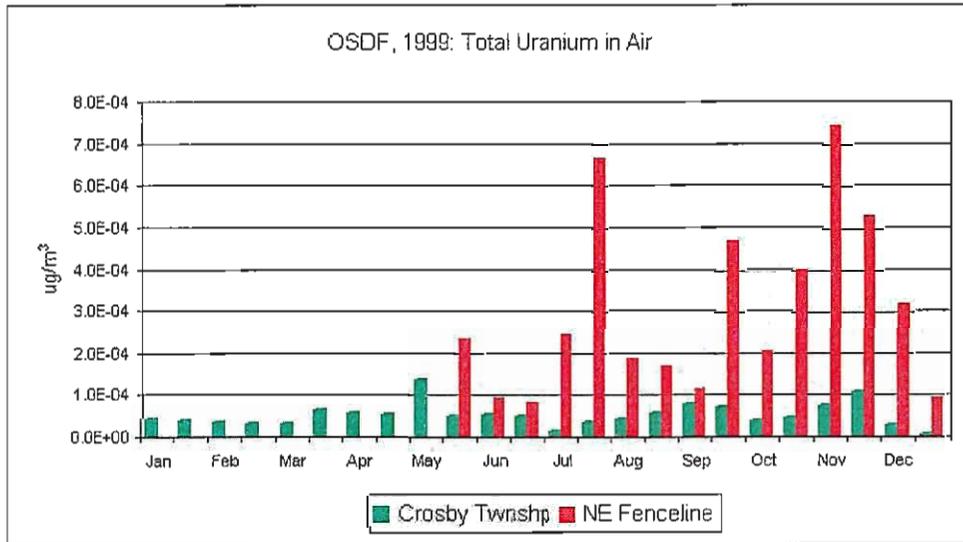


Radium-226 concentrations in air were also measured at the waste pit monitors in 1999. The results were similar to the results measured during the end of 1998 and were similar to the concentrations measured at the background location.



On-Site Disposal Facility: The location of FNAPS02 is on Fernald’s east fence line slightly north of the OSDF. Samples have been collected from this location since August 1996. This sampling location was out of service until the end of May 1999. Total uranium and total suspended particulate samples are collected from this location biweekly.

The 1999 average total uranium concentration was approximately the same as the concentration measured in 1998 during the same time period and nearly six times greater than the concentrations measured off-site. These increases were expected during the placement of waste in the OSDF. The measured concentrations remain well below the NESHAP standard.

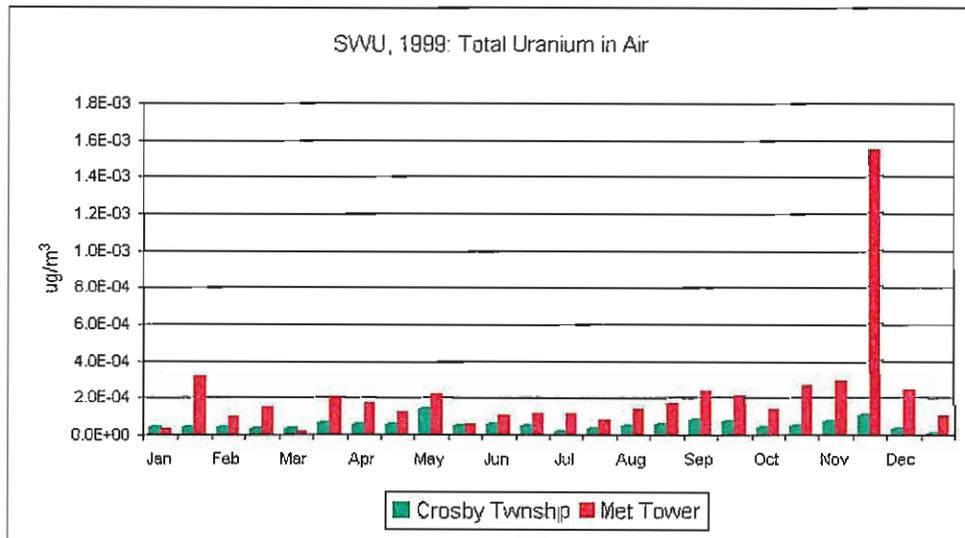


The 1999 average TSP concentration was essentially the same as 1998, and was similar to the concentrations measured off-site.

Southern Waste Units: FNAPS03A, is north-northeast of the southern waste units near the site Meteorological Tower. Samples have been collected from this location since July 1998. Total uranium and total suspended particulate samples are collected from this location biweekly.

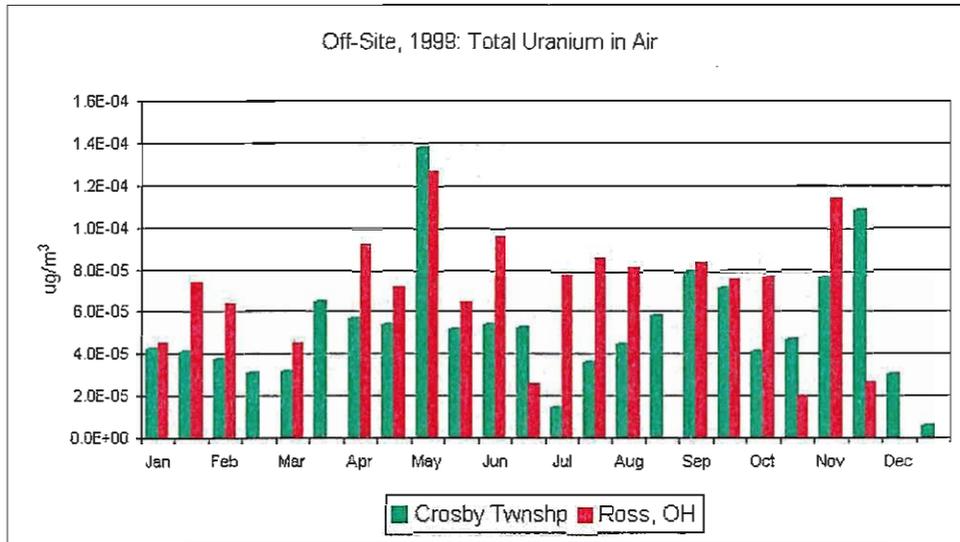
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The 1999 average total uranium concentration was approximately 40% greater than the concentration measured in 1998 and over 90% higher than the concentrations measured at background. The concentrations remained well below the NESHAP standards. These higher than background concentrations may be due to continuing activities in the southern waste units during 1999 and the fact that the monitoring location is near the center of the site.



The average 1999 TSP measurements are similar to those measured at the background location and slightly greater than the concentrations measured in 1998. Again, these measurements may be due to Fernald's efforts in controlling fugitive emissions.

Off-Site Locations: The air sampler located in Crosby Township, AMS11, which is 2.3 miles west-southwest of Fernald, has been operational since March 1998 and serves as the background monitoring location for Ohio EPA at Fernald. The sampler located in Ross, AMS13, which is 2.4 miles east-northeast of Fernald, has been operational since May 1998. DOE formerly operated both locations. Total uranium and total suspended particulate samples are collected from each of these locations biweekly. A monthly sample from Crosby Township is analyzed for isotopic thorium and radium-226. The results from these locations are consistent and are considered indicative of background concentrations.



Radon Sampling

Ohio EPA collects continuous, or “real-time,” hourly measurements of radon-222 concentrations in ambient air. The locations are:

- FNRDN01, located west of the silos along Paddys Run Road;
- FNRDN02A, located east of the silos along the border of OU4 and the former production area;
- FNRDN03, located approximately 2 miles west-southwest of Fernald in Crosby Township, and;
- FNRDNBK, located approximately 28 miles north-northwest of Fernald in Eaton, Ohio.



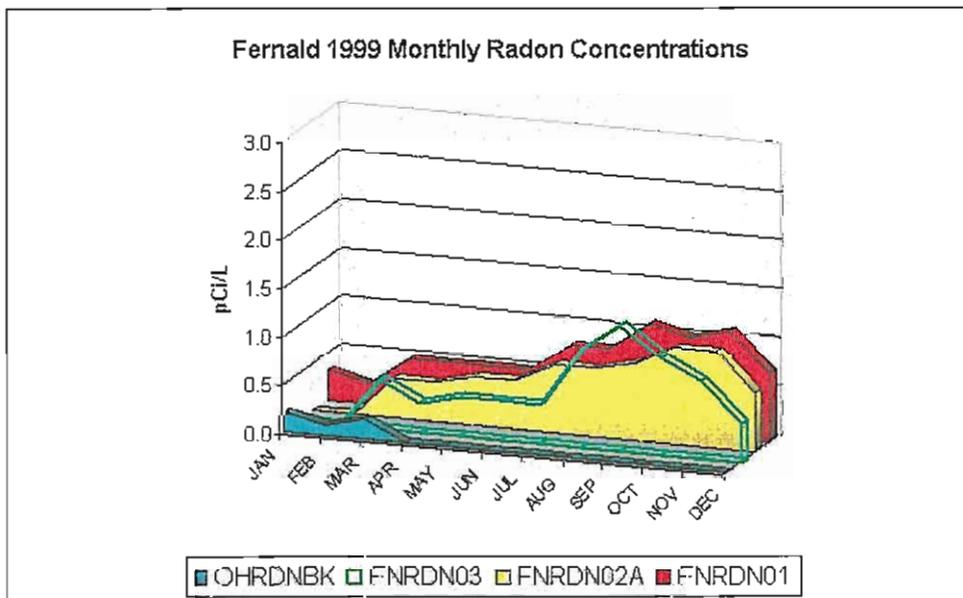
Ohio EPA changes filter at east fenceline (FNAPS02) high volume air sampler.

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The most recent hourly data is posted in “real-time” on the OFFO web site at <http://offo2.epa.state.oh.us/FERNALD/EnvMon/radon.shtml>. The locations of these stations are illustrated on the maps in Appendix A.

The primary source of radon at Fernald is the K-65 silos. These 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 into the air. There are also less significant sources of radon at Fernald, including the waste pits and silo 3. Ohio EPA uses continuous radon monitors to measure the concentrations of radon-222 present in ambient air. The locations were chosen primarily for their proximity to the K-65 silos, and to provide a method for verifying the effectiveness of DOE’s radon monitoring network.

The results for the radon monitoring locations are shown in Appendix F Table 3. The data indicates that average monthly radon concentrations from the monitors located east of the silos, FNRDN02, and the location along Paddys Run Road, FNRDN01, range from 0.1 to 1.1 pCi/l. This range of concentrations is well below the DOE Order 5400.5 limit of 3.0 pCi/l annual average at the facility fence line. The average monthly radon concentrations are illustrated in the figure below.

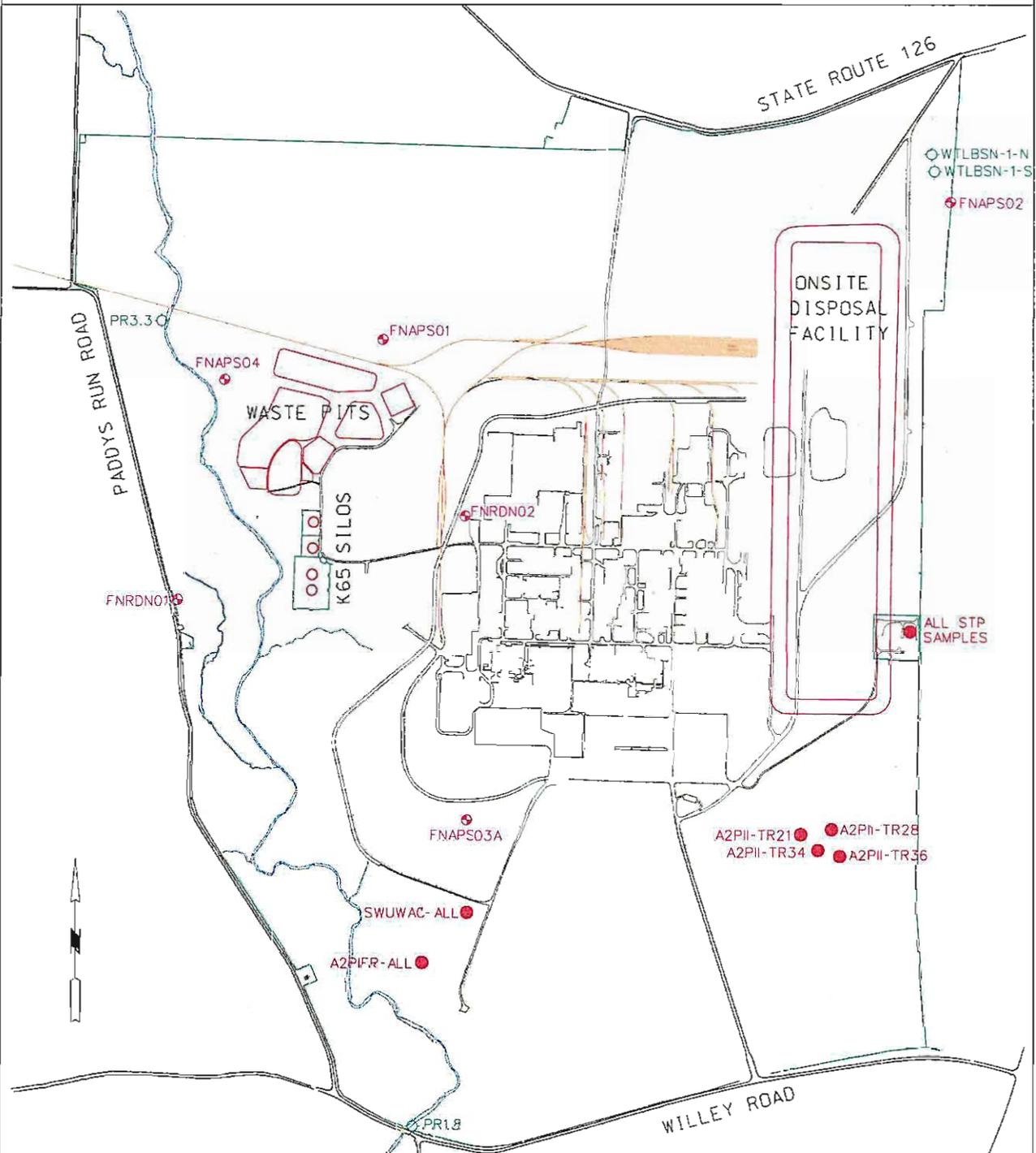


In March 1999 sampling at our Eaton, Ohio station was discontinued in favor of the Crosby Township location. The concentrations at Crosby can be compared to the concentrations at FNRDN01 and FNRDN02A to identify any immediate impacts from the silos.

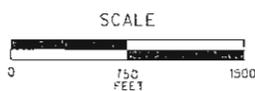
During the months of August and September the concentrations at the Crosby Township location exceeded the concentrations at the on-site locations. Research and statistical analysis revealed that this increase in radon concentration may be attributed to the drought conditions in the summer of 1999, and other possible phenomenon. The increase is not considered to be from the Fernald site. Ohio EPA will continue to observe and compare the concentrations from our locations to ensure that possible emissions from the site are detected.

Summary statistics indicate an upward trend in radon-222 concentrations during the year at all three monitoring locations. This trend is indicative of seasonal variation in ambient radon concentrations. The on-site locations indicate a slight upward trend when compared to the Crosby location. This trend may be attributed to the presence of the K-65 silos and other radon sources on-site, and will continue to be observed by Ohio EPA.

1999 OHIO EPA ON-SITE SAMPLING LOCATIONS



PROJECTION: STATE PLANE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 27
 Q:/FEWP/99RPT/ANNLRPT99.DGN



LEGEND	
	FERNALD FENCE LINE
	PADDYS RUN AND TRIBUTARIES
	RAILROAD
	SURFACE WATER/SEDIMENT LOCATION
	AIR LOCATION
	SOIL LOCATION



OFFICE OF FEDERAL FACILITIES OVERSIGHT

APPENDIX A

1999 OHIO EPA OFF-SITE SAMPLING LOCATIONS

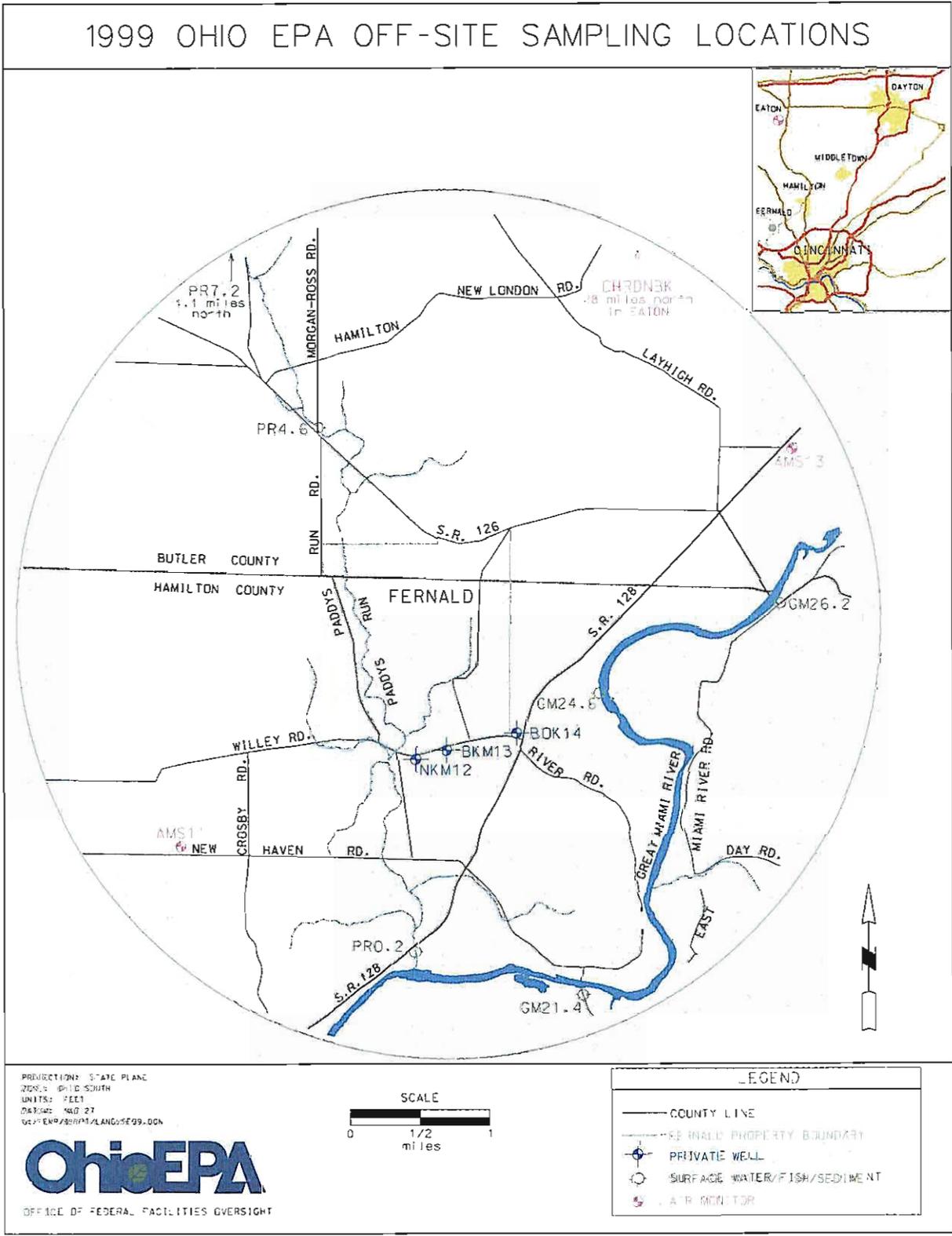


TABLE 1

PRIVATE WELLS				
LOCATION CODE	COLLECT DATE	ANALYTE	OEPA TOTAL U $\mu\text{g/l}$	DOE TOTAL U $\mu\text{g/l}$
BKM13	1/26/99	Total Uranium	33	38
BKM13	4/28/99	Total Uranium	30	31
BKM13	7/28/99	Total Uranium	32	30
BKM13	10/26/99	Total Uranium	33	27
BOK14	1/26/99	Total Uranium	3	3.2
BOK14	4/28/99	Total Uranium	3.1	3.4
BOK14	7/28/99	Total Uranium	2.9	2.8
BOK14	10/26/99	Total Uranium	3.3	2.8
NKM12	1/26/99	Total Uranium	NS*	
NKM12	4/28/99	Total Uranium	79	46
NKM12	7/28/99	Total Uranium	120	106
NKM12	10/26/99	Total Uranium	120	99

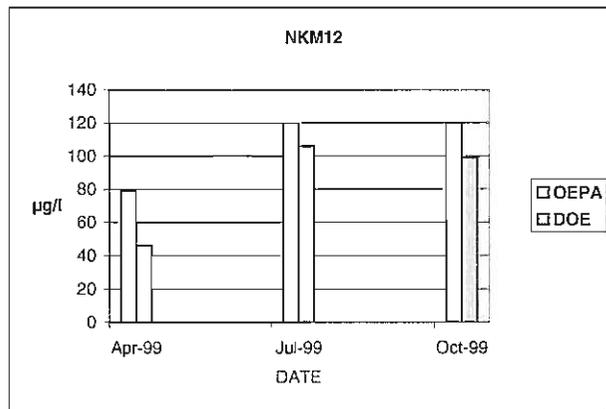
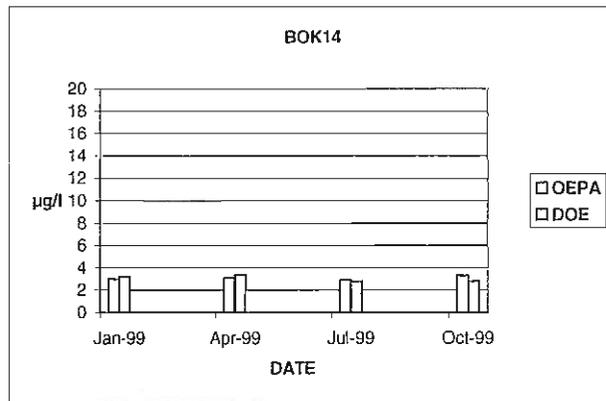
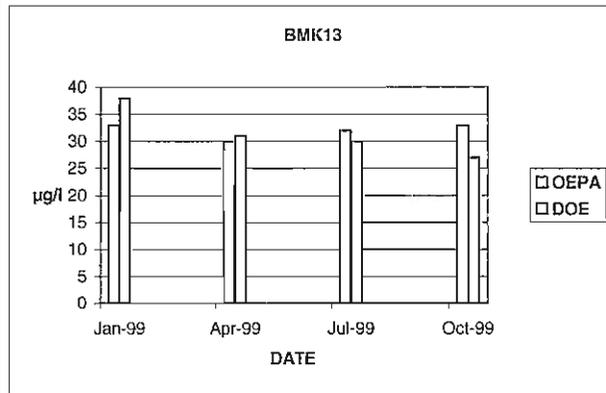
Note:

$\mu\text{g/l}$ = micrograms per liter

Total Uranium Final Remediation Level = 20 $\mu\text{g/l}$ for ground water

NS = not sampled

NS* = not sampled - well pump not operational



APPENDIX C

TABLE 1

SURFACE WATER							
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	TOTAL U $\mu\text{g/l}$	Ra-226 pCi/l	Ra-226 +/- error	Ra-228 pCi/l	Ra-228 +/- error
PR0.2	Paddys Run/Route 128 Bridge	2/23/99	3.3	0.03	0.03	2.3	0.9
PR0.2	Paddys Run/Route 128 Bridge	4/12/99	3.8	<0.088	NA	3.5	1.0
PR1.8	Paddys Run/Willey Bridge	2/23/99	1.8	0.068	0.032	1.5	0.8
PR1.8	Paddys Run/Willey Bridge	4/12/99	2.3	<0.052	NA	4.9	1.2
PR3.3	Paddys Run/RR Bridge	2/23/99	1.4	<0.052	NA	1.6	0.8
PR3.3	Paddys Run/RR Bridge	4/12/99	1.8	<0.047	NA	3	1
PR3.3	Paddys Run/RR Bridge	6/9/99	0.83	<0.079	NA	<1.1	NA
PR3.3	Paddys Run/RR Bridge	8/5/99	4.4	0.19	0.04	3.8	1.4
PR3.3	Paddys Run/RR Bridge	10/15/99	13	0.061	0.031	<1.8	NA
PR3.3	Paddys Run/RR Bridge	12/7/99	20	0.14	0.04	3.1	1.5
PR7.2	Paddys Run/Background	2/23/99	0.94	<0.084	NA	1.9	0.8
PR7.2	Paddys Run/Background	4/12/99	0.98	0.12	0.05	4	1.0
PR7.2	Paddys Run/Background	6/9/99	0.78	<0.078	NA	<1.2	NA
PR7.2	Paddys Run/Background	8/5/99	0.77	0.13	0.04	2.4	0.8
PR7.2	Paddys Run/Background	10/15/99	0.58	0.17	0.04	<1.8	NA
PR7.2	Paddys Run/Background	12/7/99	0.85	0.079	0.034	2.8	1.4
GM21.4	New Baltimore Bridge	2/23/99	1.8	0.13	0.05	1.3	0.7
GM21.4	New Baltimore Bridge	4/12/99	1.6	0.12	0.05	4.4	1.2
GM21.4	New Baltimore Bridge	6/9/99	1.6	0.079	0.039	2.2	1.0
GM21.4	New Baltimore Bridge	8/5/99	1.6	0.23	0.05	3.5	1.0
GM21.4	New Baltimore Bridge	10/15/99	1.4	0.23	0.05	<2	NA
GM21.4	New Baltimore Bridge	12/6/99	1.5	0.17	0.04	3.3	1.5
GM24.6	Down Stream FEMP Effluent	2/23/99	1.9	0.24	0.06	1.4	0.8
GM24.6	Down Stream FEMP Effluent	4/12/99	1.7	0.15	0.04	3.3	1.0
GM24.6	Down Stream FEMP Effluent	6/9/99	1.8	0.13	0.05	<1.4	NA
GM24.6	Down Stream FEMP Effluent	8/5/99	1.7	0.35	0.06	1.6	0.8
GM24.6	Down Stream FEMP Effluent	10/15/99	1.6	0.23	0.06	2.1	1.1
GM24.6	Down Stream FEMP Effluent	12/6/99	1.6	0.17	0.06	4.9	1.6
GM26.2	Venice Bridge - background	2/23/99	1.9	0.2	0.05	1.2	0.8
GM26.2	Venice Bridge - background	4/12/99	1.7	0.16	0.05	1.3	0.7
GM26.2	Venice Bridge - background	6/9/99	1.7	0.17	0.05	<1.3	NA
GM26.2	Venice Bridge - background	8/5/99	1.9	0.19	0.05	2.1	0.8
GM26.2	Venice Bridge - background	10/15/99	1.3	0.69	0.12	1.7	1.1
GM26.2	Venice Bridge - background	12/6/99	1.4	0.23	0.03	4	2
WTLBSN 1 N	Wetland Basin 1 - North	6/14/99	2.1	NS	NA	NS	NA
WTLBSN 1 S	Wetland Basin 1 - South	6/14/99	2.8	NS	NA	NS	NA

Note:

$\mu\text{g/l}$ = micrograms per liter

pCi/l = picocuries per liter

NA = not applicable

NS = no sample or sample not analyzed for parameter

Total Uranium Final Remediation Level = 530 $\mu\text{g/l}$ for surface water

TABLE 1

SEDIMENT					
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	Total U $\mu\text{g/g}$	Ra-226 pCi/g	Ra-226 +/- error
PR0.2	Paddys Run/Route 128 Bridge	7/14/99	3.1	0.63	0.09
PR1.8	Paddys Run/Willey Bridge	7/14/99	2.2	0.66	0.10
PR3.3	Paddys Run/RR Bridge	7/14/99	2.4	0.8	0.1
PR4.6	Paddys Run/Mile 4.6	7/14/99	2.2	0.68	0.10
GM21.4	New Baltimore Bridge	7/14/99	2.1	0.97	0.14
GM24.6	Down Stream FEMP Effluent	7/14/99	1.4	0.44	0.07
GM26.2	Venice Bridge - background	7/14/99	0.99	0.51	0.08

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	Th-228 pCi/g	Th-228 +/- error	Th-230 pCi/g	Th-230 +/- error	Th-232 pCi/g	Th-232 +/- error
PR0.2	Paddys Run/Route 128 Bridge	7/14/99	0.6	0.1	1.2	0.2	0.61	0.12
PR1.8	Paddys Run/Willey Bridge	7/14/99	0.36	0.010	0.65	0.14	0.25	0.07
PR3.3	Paddys Run/RR Bridge	7/14/99	0.61	0.09	0.66	0.010	0.63	0.09
PR4.6	Paddys Run/Mile 4.6	7/14/99	0.73	0.21	0.92	0.24	0.75	0.20
GM21.4	New Baltimore Bridge	7/14/99	0.79	0.15	0.95	0.17	0.68	0.13
GM24.6	Down Stream FEMP Effluent	7/14/99	0.24	0.06	0.43	0.07	0.22	0.04
GM26.2	Venice Bridge - background	7/14/99	0.7	0.1	0.84	0.15	0.65	0.12

LOCATION CODE	LOCATION CODE	COLLECT DATE	CADMIUM mg/kg
PR4.6	Paddys Run/Mile 4.6	7/14/99	<0.32

Note:
 $\mu\text{g/g}$ = micrograms per gram
 pCi/g = picocuries per gram
 mg/kg = milligrams per kilogram
 Final Remediation Level for Total Uranium = 210 $\mu\text{g/g}$ for sediment
 Final Remediation Level for Radium 226 = 2.9 pCi/g for sediment
 Final Remediation Level for Thorium 228 = 3.2 pCi/g for sediment
 Final Remediation Level for Thorium 230 = 18,000 pCi/g for sediment
 Final Remediation Level for Thorium 232 = 1.6 pCi/g for sediment
 Final Remediation Level for cadmium = 71 mg/kg for sediment
 Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

APPENDIX E

TABLE 1

SOIL - SEWAGE TREATMENT PLANT				
LOCATION CODE	COLLECT DATE	TOTAL U mg/kg	Tc-99 pCi/g	Tc-99 +/- error
AIPII-STP-S1R	7/12/99	540	27	4
AIPII-STP-S2R	7/12/99	13	15	2
AIPII-STP-61R	7/12/99	12	0.91	0.23
AIPII-STP-71R	7/12/99	32	31	4

TABLE 2

SOIL - FIRING RANGE			
LOCATION CODE	COLLECT DATE	TOTAL LEAD mg/L	LEAD TCLP mg/L
A2PI-FR-B1	7/13/99	458	<0.50
A2PI-FR-C1	7/13/99	372	<0.50
A2PI-FR-A1	7/13/99	417	<0.50

TABLE 3

SOIL - TRAP RANGE			
LOCATION CODE	COLLECT DATE	TOTAL LEAD mg/kg	LEAD TCLP mg/L
A1PII-TR-36-M	8/2/99	1440	<0.50
A1PII-TR-28-M	8/2/99	88.9	<0.50
A1PII-TR-34-M	8/2/99	1030	<0.50
A1PII-TR-21-M	8/2/99	229	<0.50

TABLE 4

SOIL - SOUTHERN WASTE UNIT			
LOCATION CODE	COLLECT DATE	U-238 pCi/g	U-238 +/- error
SWU-WAC-07	9/9/99	<2.4	NA
SWU-WAC-08	9/9/99	<3.3	NA
SWU-WAC-07	9/9/99	2.3	1.5
SWU-WAC-08	9/9/99	4.3	2.1

Note:

pCi/g = picocuries per gram

mg/L = milligrams per liter

mg/kg = milligrams per kilogram

NA = not applicable

Total Uranium Waste Acceptance Criteria = 1030 mg/kg for on site soil

Technetium-99 Waste Acceptance Criteria = 29.1 pCi/g for on site soil

Final Remediation Level for lead = 400 mg/kg

Toxicity Characteristic Leaching Procedure for lead = 5 mg/l

TABLE 1

TOTAL URANIUM IN AIR							
START	STOP	FNAPS01 µg/m ³	FNAPS02 µg/m ³	FNAPS03A µg/m ³	FNAPS04 µg/m ³	AMS-11 µg/m ³	AMS-13 µg/m ³
12/29/98	01/20/99	4.02E-05	NA	3.16E-05	2.85E-05	4.24E-05	4.51E-05
01/20/99	02/01/99	5.26E-05	NA	3.16E-04	5.04E-05	4.12E-05	7.40E-05
02/01/99	02/16/99	NA	NA	9.35E-05	4.20E-05	3.70E-05	6.37E-05
02/16/99	03/02/99	NA	NA	1.43E-04	4.12E-05	3.08E-05	NA
03/02/99	03/16/99	NA	NA	1.26E-05	5.26E-05	3.13E-05	4.49E-05
03/16/99	04/01/99	NA	NA	2.00E-04	1.26E-04	6.43E-05	NA
04/01/99	04/14/99	NA	NA	1.73E-04	9.34E-05	5.65E-05	9.26E-05
04/14/99	04/29/99	NA	NA	1.19E-04	6.63E-05	5.38E-05	7.17E-05
04/29/99	05/13/99	NA	NA	2.20E-04	NA	1.38E-04	1.27E-04
05/13/99	06/01/99	1.36E-04	2.35E-04	5.91E-05	4.01E-05	5.15E-05	6.43E-05
06/01/99	06/16/99	1.30E-04	9.52E-05	1.07E-04	9.99E-05	5.35E-05	9.63E-05
06/16/99	07/01/99	1.54E-04	8.46E-05	1.15E-04	1.04E-04	5.22E-05	2.60E-05
07/01/99	07/15/99	1.39E-04	2.45E-04	1.15E-04	6.30E-05	1.45E-05	7.82E-05
07/15/99	07/29/99	1.16E-04	6.66E-04	8.00E-05	4.52E-05	3.62E-05	8.58E-05
07/29/99	08/12/99	1.73E-04	1.89E-04	1.40E-04	1.22E-04	4.48E-05	8.19E-05
08/12/99	08/30/99	5.51E-04	1.71E-04	1.71E-04	1.60E-04	5.82E-05	NA
08/30/99	09/20/99	3.90E-04	1.15E-04	2.36E-04	2.79E-04	7.96E-05	8.39E-05
09/20/99	09/30/99	1.12E-04	4.69E-04	2.14E-04	7.03E-04	7.12E-05	7.53E-05
09/30/99	10/14/99	4.41E-04	2.05E-04	1.40E-04	4.93E-04	4.08E-05	7.75E-05
10/14/99	11/01/99	6.40E-04	4.02E-04	2.67E-04	1.05E-04	4.66E-05	2.02E-05
11/01/99	11/16/99	1.03E-03	7.45E-04	2.91E-04	2.06E-04	7.70E-05	1.14E-04
11/16/99	11/30/99	2.92E-03	5.32E-04	1.54E-03	1.80E-04	1.08E-04	2.68E-05
11/30/99	12/14/99	6.08E-04	3.21E-04	2.47E-04	1.57E-04	3.00E-05	NS
12/14/99	12/30/99	1.25E-04	9.50E-05	1.02E-04	1.40E-05	5.65E-06	NS

TABLE 2

TOTAL SUSPENDED PARTICULATES IN AIR							
START	STOP	FNAPS01 µg/m ³	FNAPS02 µg/m ³	FNAPS03A µg/m ³	FNAPS04 µg/m ³	AMS-11 µg/m ³	AMS-13 µg/m ³
12/29/98	01/20/99	18	NA	13	16	26	28
01/20/99	02/01/99	25	NA	81	23	29	43
02/01/99	02/16/99	NA	NA	25	16	24	32
02/16/99	03/02/99	NA	NA	31	22	24	NA
03/02/99	03/16/99	NA	NA	29	18	22	32
03/16/99	04/01/99	NA	NA	32	24	32	NA
04/01/99	04/14/99	NA	NA	143	110	81	103
04/14/99	04/29/99	NA	NA	81	109	78	94
04/29/99	05/13/99	NA	NA	62	NA	72	74
05/13/99	06/01/99	41	87	45	34	41	47
06/01/99	06/16/99	47	51	51	40	47	89
06/16/99	07/01/99	50	39	36	34	39	39
07/01/99	07/15/99	40	41	36	27	6	40
07/15/99	07/29/99	50	44	37	34	40	46
07/29/99	08/12/99	31	33	32	26	32	43
08/12/99	08/30/99	36	32	31	27	31	NA
08/30/99	09/20/99	39	39	37	31	46	51
09/20/99	09/30/99	43	41	30	22	39	34
09/30/99	10/14/99	22	24	26	20	27	32
10/14/99	11/01/99	31	45	36	31	31	11
11/01/99	11/16/99	30	41	33	30	34	51
11/16/99	11/30/99	22	34	30	21	29	6
11/30/99	12/14/99	27	33	NS	16	25	NS
12/14/99	12/30/99	16	18	19	14	18	NS

Note:

µg/m³ = micrograms per cubic meter

NS = No sample or sample not analyzed for parameter.

NA = monitor out of service due to mechanical failure

DNA = Data Not Available at publishing of 1999 Annual Report.

APPENDIX F

TABLE 3

TH-228 IN AIR			
MONTH 1999	FNAPS01 pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³
JAN	2.56E-05	3.22E-05	1.97E-05
FEB	NA	<6.82E-06	<1.53E-05
MAR	NA	<9.82E-06	<3.94E-05
APR	NA	2.41E-05	1.16E-05
MAY	<1.37E-05	<1.21E-05	<3.43E-05
JUN	1.81E-05	1.43E-05	1.28E-05
JUL	1.52E-05	7.93E-06	7.17E-06
AUG	1.17E-05	7.13E-06	1.20E-05
SEP	<7.54E-06	4.15E-06	1.24E-05
OCT	6.71E-06	<9.51E-06	<8.66E-06
NOV	1.55E-05	2.03E-05	<2.22E-05
DEC	DNA	DNA	DNA

TABLE 4

TH-230 IN AIR			
MONTH 1999	FNAPS01 pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³
JAN	6.88E-05	7.14E-06	8.85E-06
FEB	NA	3.99E-06	1.15E-05
MAR	NA	1.29E-05	2.18E-05
APR	NA	2.03E-05	1.20E-05
MAY	1.53E-05	1.02E-05	3.17E-05
JUN	2.20E-05	1.28E-05	1.30E-05
JUL	2.16E-05	7.93E-06	1.15E-05
AUG	1.59E-05	2.44E-05	1.13E-05
SEP	2.33E-05	2.55E-05	1.08E-05
OCT	1.14E-04	5.96E-05	1.15E-05
NOV	3.00E-04	5.85E-05	1.60E-05
DEC	DNA	DNA	DNA

TABLE 5

TH-232 IN AIR			
MONTH 1999	FNAPS01 pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³
JAN	3.74E-06	3.08E-06	5.34E-06
FEB	NA	5.99E-06	6.03E-06
MAR	NA	<8.05E-06	1.36E-05
APR	NA	<6.93E-06	1.07E-05
MAY	9.87E-06	6.63E-06	3.17E-05
JUN	1.37E-05	8.25E-06	9.37E-06
JUL	1.30E-05	6.45E-06	7.17E-06
AUG	1.10E-05	5.97E-06	6.63E-06
SEP	7.98E-06	<6.09E-07	7.82E-06
OCT	3.75E-06	5.92E-06	6.97E-06
NOV	1.10E-05	6.83E-06	1.18E-05
DEC	DNA	DNA	DNA

Note:

pCi/m³ = picocuries per cubic meter

NA = monitor out of service due to mechanical failure

DNA = Data Not Available at publishing of 1999 Annual Report

TABLE 6

RADIUM-226 IN AIR			
MONTH 1999	FNAPS01 pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³
JAN	3.85E-05	4.31E-05	4.64E-05
FEB	NA	1.41E-05	7.43E-06
MAR	NA	1.96E-05	1.39E-05
APR	NA	<6.24E-06	<2.63E-06
MAY	2.54E-05	<9.57E-06	2.53E-05
JUN	<1.36E-05	<7.10E-06	<7.89E-06
JUL	2.53E-05	1.32E-05	1.35E-05
AUG	2.33E-05	1.39E-05	1.15E-05
SEP	<6.25E-06	6.60E-06	8.03E-06
OCT	3.76E-06	<2.96E-06	<1.86E-06
NOV	1.07E-05	4.68E-06	5.14E-06
DEC	<5.76E-06	3.91E-06	4.78E-06

Note:

pCi/m³ = picocuries per cubic meter

NA = monitor out of service due to mechanical failure

DNA = Data Not Available at publishing of 1999 Annual Report

TABLE 7

RADON IN AIR												
MONTH 1999	FNRDN01 pCi/l			FNRDN02A pCi/l			FNRDN03 pCi/l			OHRDNBK pCi/l		
	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX
JAN	0.3	0.8	2.1	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	0.2	0.4	1.4
FEB	0.2	0.6	2.5	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	NA ¹	0.1	0.5	1.1
MAR	0.5	1.3	3.1	0.4	1.0	3.5	0.5	0.8	2.0	0.2	0.9	2.7
APR	0.5	1.4	3.3	0.4	0.9	2.8	0.3	0.7	1.8	NS	NS	NS
MAY	0.5	0.8	2.1	0.5	0.9	2.5	0.4	0.7	2.3	NS	NS	NS
JUN	0.5	1.0	9.6	0.5	1.0	2.9	0.4	1.0	2.5	NS	NS	NS
JUL	0.8	1.7	8.5	0.7	1.0	3.0	0.4	1.2	3.2	NS	NS	NS
AUG	0.8	1.3	4.7	0.7	1.2	2.9	1.0	3.2	11.7	NS	NS	NS
SEP	1.1	1.5	3.5	0.8	1.1	3.7	1.3	2.1	6.5	NS	NS	NS
OCT	1.0	2.2	4.7	1.0	2.1	4.0	1.0	1.8	4.0	NS	NS	NS
NOV	1.1	2.4	4.7	1.0	2.6	4.7	0.8	2.0	3.9	NS	NS	NS
DEC	0.7	2.0	3.4	0.6	2.0	3.6	0.4	1.5	2.3	NS	NS	NS

Note:

pCi/l = picocuries per liter

NA¹ = Unit out of service due to construction activities in OU1. Unit relocated in March 1999.

NA² = Crosby TWP location was not placed into service until March 17, 1999.

NS = not sampled

OTHER RESOURCES

DOE Public Environmental
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Delta Building
10995 Hamilton-Cleves Highway
Harrison, OH 45030
(513) 648-7480

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) 648-4898
contact: Jeff Wagner, Director

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

Fernald Health Effects Subcommittee
National Center for Env. Health
1600 Clifton Rd NE., Mail Stop E39
Atlanta, GA 30333
(404) 639-2550
contact: Mike Donnelly, acting
designated federal official

Fernald Citizens Advisory Board
P.O. Box 544
Ross, OH 45061
(513) 648-6478
contact: Jim Bierer, Chair

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

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 Living History Project
c/o Steve Depoe
5360 Desertgold Drive
Cincinnati, OH 45247
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