

2001



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

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Ohio Emergency Management Agency

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ACRONYMS

A1PIII	Area 1 Phase III
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRG	Cost Recovery Grant
DOE	Department of Energy
FCAB	Fernald Citizens Advisory Board
FRL	Final Remediation Level
IEMP	Integrated Environmental Monitoring Plan
ITRC	Interstate Technology & Regulatory Cooperation Workgroup
NESHAP	National Emission Standard for Hazardous Air Pollutants
NRD	Natural Resources Damages
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
TSP	Total Suspended Particulates
U.S. EPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria
WPRAP	Waste Pit Remedial Action Project



June 2001 photo courtesy of DOE Fernald Site Photography #7476-437.

1.0 INTRODUCTION

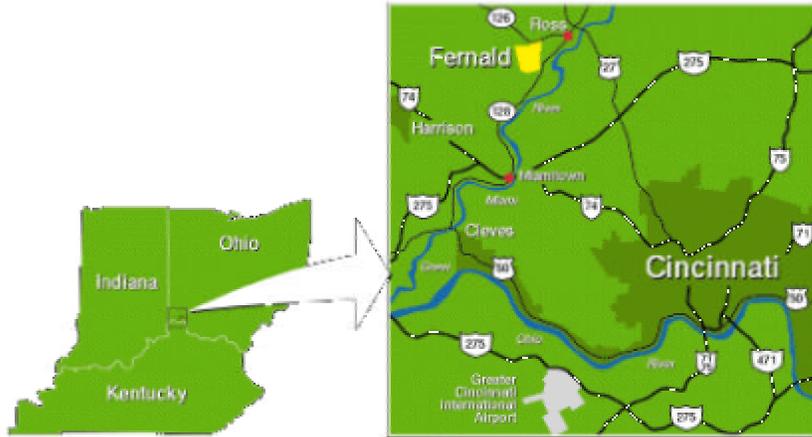
The purpose of this report is to document the State of Ohio's oversight activities at the United States Department of Energy's (DOE) Fernald Environmental Management Project. The report is written by the Ohio Environmental Protection Agency (Ohio EPA) to provide interested parties a single source of information regarding Ohio's regulatory, environmental monitoring, public outreach, and planning activities at Fernald during calendar year 2001.

As Fernald acknowledged its 50th anniversary, Fluor Fernald saw major changes in their management structure, the silos contractors were released from their contracts, excavation in the southern waste units was completed, and cell 1 of the disposal facility was completed and capped. This report will highlight remediation and regulatory oversight at Fernald in 2001.

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 DOE Fernald site.

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 made. 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 (U.S. EPA) 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 might 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 grant. 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 federal facilities program is enhancement of 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.

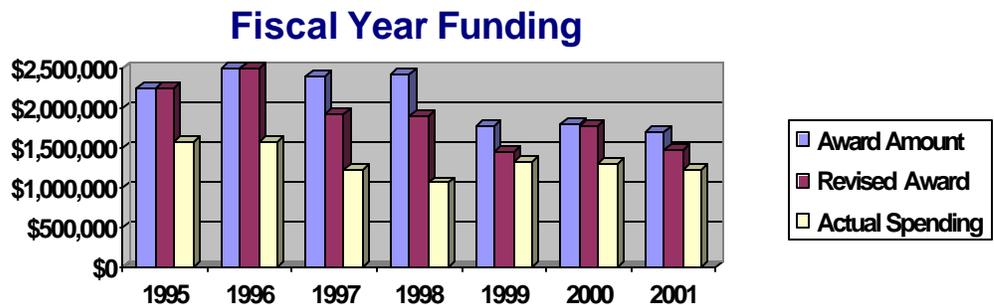


Figure 1

INTRODUCTION

The distribution of expenditures for fiscal year 2001 is provided in the following figure. 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

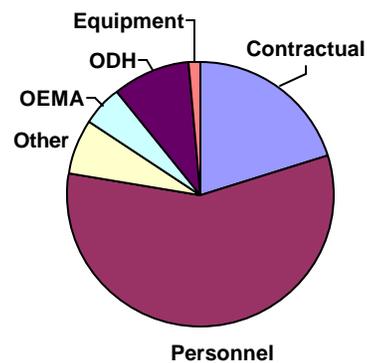


Figure 2 Money is distributed across various program areas.

2.0 ACTIVITIES AND ACCOMPLISHMENTS

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 continued to work diligently in 2001 to keep up with Fernald's accelerated cleanup schedule. Cell 1 of the on-site disposal facility (OSDF) was capped as cells 2 and 3 moved toward completion. A major milestone was reached in the southern waste units as excavation of contaminated soil was completed. Staff from Ohio EPA's Office of Federal Facilities Oversight (OFFO) observed these and other accomplishments during

numerous field visits. Ohio EPA technical staff reviewed and granted State approval on numerous documents. Restoration efforts were advanced through Ohio EPA's role as a Natural Resource Trustee, as well as through our efforts to involve school children in native plantings at Fernald. OFFO staff participated in public meetings that kept the community informed of progress at Fernald. Ohio continued to work with DOE on several national level issues and to maintain emergency planning operations. Ohio's activities and accomplishments for 2001 are further explained in the following sections.



Cell 1 of the OSDF was capped during 2001. In August, Ohio EPA staff observe as the gravel drainage layer is dumped onto the geotextile cushion. The bulldozer in the background will spread the gravel to one foot thick.

ACTIVITIES AND ACCOMPLISHMENTS

2.1 REGULATORY OVERSIGHT

The site first began remedial investigation activities as part of a 1986 Federal Facility Compliance Agreement between U.S. EPA 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 1989 listing on the National Priorities List, a CERCLA Consent Agreement was signed by U.S. EPA and DOE in 1990. Although separate agreements requiring cleanup exist, Ohio EPA and U.S. EPA work together on all aspects of the project to ensure efficiency.

As part of Ohio's oversight role at the Fernald site, more than 200 technical documents were reviewed and commented on and/or approved in 2001. Most of these documents related directly to the on-going 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 146 site visits or inspections. The inspections focused on OSDF cell cap construction and waste placement, storm water management, fugitive dust control, waste pit operations, silo 3 treatment facility construction, and other on-site activities.

Large-scale remediation continued in 2001. Cell 1 was capped, and waste placement continued in cells 2 and 3. The treatment facility for the remediation of the waste pits was operational, and waste loading operations and shipping continued throughout the year. Excavation of the southern waste units was completed.

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

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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.

Waste pit excavations continued throughout the year in pit 1 (85 percent complete), pit 2 (25 percent complete), and pit 3 (50 percent complete). During 2001, a total of 19 unit trains went to Envirocare in Utah for disposal of 125,000 tons of waste, exceeding the goal of 112,000 tons. New estimates indicate that approximately 125,000 cubic yards of additional soils will need to be excavated, dried, and shipped. Additional costs and a prolonged schedule are possible as a result of these new estimates.

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

In 2001, Ohio EPA staff observed OSDF progress during their 82 inspections of the disposal facility. By early summer, the enhanced permanent leachate collection



By October, the cell 1 cap was almost complete. Various layers of the cap are evident from bottom to top: the clay components, the black geotextile cushion, the gravel drainage layer, three foot of riprap (partially obscured by choke stone), and topped with a partial layer of soil.

ACTIVITIES AND ACCOMPLISHMENTS

system construction and pressure testing were completed. The new system will allow the independent measurement of leachate from each cell of the OSDF. Considerable attention was placed on the construction of the cell 1 cap during 2001. Observations made during field visits and the review of analytical data allowed Ohio EPA to recommend changes to the liner contracts for cells 4 and 5.

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. Plant's 5 and 6 were demolished in 2001. Plant 6 represents the sixth of 10 major structures demolished since the site's mission changed to environmental remediation in the early 1990s. The building was demolished more than two months ahead of schedule and within budget. Of more than 250 structures identified for demolition, 100 have been completed since 1994.

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 residues, and one has never been used. To reinforce the 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.

Construction of components for silos 1 and 2 advanced waste retrieval continued in 2001. During 2001, however, the silos project continued to be slowed by technical, schedule, and contractor issues. In 2000, Rocky Mountain Remedial Services determined they were unable to fulfill their obligation as specified and was released from their contract. In 2001, the same circumstances resulted in Foster-Wheeler being released from their remediation contract as well.

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These contractor issues have caused significant delays in the silos remediation process. This will most likely result in Record of Decision modifications and possibly new treatment and disposal options for the silos material. DOE will explore these new options in 2002.

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

Contaminated soils are being excavated with disposal of those soils meeting the waste acceptance criteria in the OSDF. In 2001 the soils project included excavation, certification and restoration. Excavation began in late 2001 in the former maintenance building in the production area, while excavation was completed and certification sampling began in the southern waste units.



Above, soil in the former maintenance area within the former production area was excavated at the end of 2001. Left, 400,000 cubic yards of impacted material was excavated from the 26-acre southern waste units; the majority of the soil went to the OSDF.

Certification of areas attaining the final remediation levels (FRL) was started in 1998. Sampling, analysis and statistical testing occurred for both remediated areas as well as several areas not requiring remediation. Approximately 11 percent of the site was certified during 2001, for a total of 52 percent certified as meeting final cleanup levels for soils.

Aquifer Restoration and Waste Water Project (formerly OU5): The Fernald site is located over the Great Miami aquifer, which is designated a sole source

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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 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.

In August, a public hearing was held before finalizing the Explanation of Significant Differences for the OU5 Record of Decision. To coincide with newly established maximum contaminant level under U.S. EPA's Safe Drinking Water Act, Fernald changed the final remediation level for uranium in drinking water as well as the discharge limit for uranium to the Great Miami River from 20 to 30 parts per billion (ppb or µg/L).

In 2001, approximately 1.5 billion gallons of ground water were extracted from the Great Miami aquifer and 626 pounds of uranium removed. More than 2 billion gallons of water were treated at the advanced wastewater treatment plant in 2001.

Resource Conservation and Recovery Act (RCRA): Ohio EPA Division of Hazardous Waste Management continued with oversight of the facility's hazardous waste and mixed waste container management, and the facility's Site Treatment Plan. The amount of hazardous and mixed waste stored on site continues to decline.

The facility submitted a Revision to the Site Treatment Plan in December 2001. The revision consists of proposals for changes to milestone dates affecting the completion of required treatment of some hazardous and mixed waste stored on-site. The revision is scheduled for public notice and comment.

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Ohio EPA's hazardous waste and federal facilities staff assisted in a complaint investigation in February. The complaint alleged non-compliance with management standards of leaking containers. The facility maintains a container inspection program designed to identify and repair or over-pack leaking containers. Ohio EPA's investigation concluded that management practices for container leaks were mostly adequate; however, there were a few instances where leaking containers were not over-packed in a timely manner. Subsequently, Ohio EPA issued the facility a notice of violation.

U.S. EPA and Ohio EPA conducted RCRA hazardous waste facility inspections in January and December. No violations were documented as a result of the joint inspections.

ACTIVITIES AND ACCOMPLISHMENTS

2.2 RESTORATION

Ohio EPA is the designated Fernald Natural Resource Trustee for the State of Ohio. Other Trustees for the Fernald site include DOE and the Department of



In this restoration project the combination of water and woody debris cover in this Area 1 Phase III post-remediation vernal pool provide habitat for amphibians and macroinvertebrates.

Interior represented by the U.S. Fish & Wildlife Service. Trustees act as guardians for public natural resources impacted by the Fernald site. One goal is to integrate natural resource

restoration into the ongoing CERCLA remediation at the site. Another goal of the trustees is to have the restoration activities lead to settlement of the State of Ohio's Natural Resource Damages (NRD) claim against DOE. Over 800 acres of the site will undergo natural resource restoration to include native grasslands, riparian buffers, forests and wetlands.

In 2001, the trustees worked toward resolution of NRD claims and settlement of the State of Ohio's lawsuit. A memorandum of understanding was finalized and signed by the trustees. In addition, trustees focused on refining methods for better restoration monitoring which would allow for the use of adaptive management in the construction and maintenance of restoration projects.

Restoration Projects

Ecological restoration projects during 2001 included revegetation in Area 1 Phase III (A1PIII) and replacement planting in A8PII and A1PI. Subarea 1 of the borrow pit received initial restoration grading. Soil amendment and seeding will occur in 2002. Invasive plant control continued in A1PIII and A1PI. See the Restoration Areas Map in Appendix A for locations of all restoration projects.

The A1PIII restoration included post-remediation grading and revegetation. Concrete debris and other wastes were excavated and removed from the heavily wooded area. The project resulted in a number of vernal pools that control erosion. Future plans include relocating Ambystomid salamanders to establish a local breeding population.

The A1PI wetland mitigation project focused on maintenance and some replacement planting of woody and herbaceous vegetation. Invasive species (such as *Phragmites australis*) were controlled. Macroinvertebrate and amphibian communities continued to thrive with significant populations of Blanchard's cricket frog. This species appears to be declining in other parts of Ohio. Fish were introduced into the wetlands as a food source for fish-eating waterfowl, including the hooded merganser that had successfully nested in the area. The fish species were selected based on species normally found in this Ohio habitat that would not eat or impact amphibian populations. Two minnow species were introduced, fat heads and golden shiners. Wood ducks, hooded mergansers, geese and mallards all successfully hatched clutches of chicks.

The A8PII restoration project area includes various forest types, savanna, ponds and a vernal pool. Activities included replacement planting and maintenance such as mowing. The ponds and vernal pool supported diverse amphibian and macroinvertebrate communities. A young snapping turtle was captured and released in the vernal pool. Coopers hawk, kingfishers and mallards were all observed in the area. Marbled salamander larvae and fairy shrimp were

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relocated to the ponds and vernal pool. Subsequent monitoring of the pools showed the translocated organisms were surviving.

Seeding and grading in the Carolina area restoration project showed initial success. Four small ponds were created as the result of remediation excavations. Native plant seeding in the fall of 2000 resulted in good germination and growth. A number of forbs successfully flowered and produced seed in their first year. Ohio EPA placed donor wetland muck into the ponds. The muck provides a source of macroinvertebrates, plant seeds and roots. The process continues to demonstrate the value of jump-starting these new constructions with donor muck.

Restoration Research and Monitoring

During 2001, the trustees initiated a functional monitoring program. The functional monitoring program is aimed at habitat types and their relative



This cricket frog was one of five species of Anurans (frogs/toads) identified in the Area 1 Phase I wetland during a September tour.

success trajectory based on data from baseline, restored and reference areas. Monitoring in 2001 focused on baseline sites that document the pre-restoration condition.

Surveys were conducted to monitor for butterflies and skippers, breeding birds, vegetation and amphibians and macroinvertebrates.

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Ohio EPA monitored amphibian and macroinvertebrate communities within baseline, reference and restored areas. Sampling was conducted using a technique developed by Ohio EPA, which uses 10 funnel traps to collect samples. The baseline site only had one species of amphibian (fowler's toad), while restored areas had up to three species and a total of five different species (bullfrog, green frog, cricket frog, chorus frog, American toad).

Ohio EPA continued monitoring a permanent butterfly/skipper transect in A1PI wetland and initiated monitoring of a transect within a baseline pasture area in A8PIII. The transect data in the wetland supports observations of more native vegetation, including forbs, as the overall number of

butterflies observed in 2001 increased 100 percent over the 2000 observations.

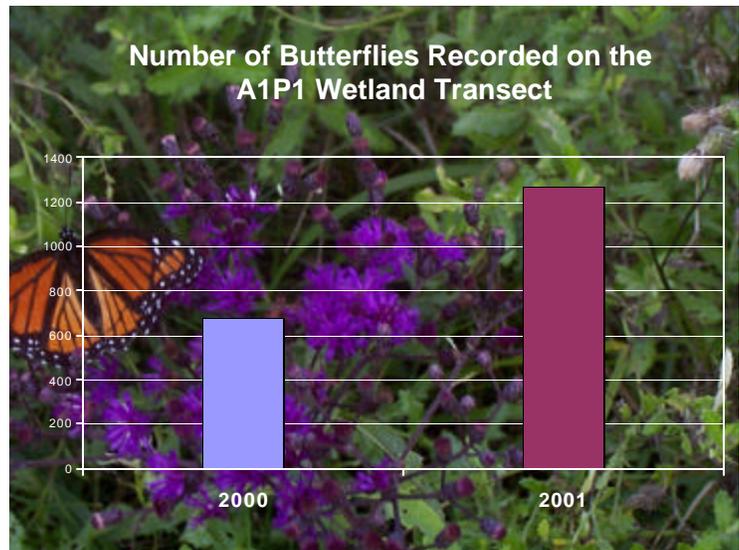


Figure 3 More butterflies were observed in the wetland transect in 2001.

One research project Ohio EPA is conducting is aimed at optimizing the vegetation used on the OSDF cap. The research plots were installed on the footprint of the former soil pile 3. Parameters evaluated include cover crops (ReGreen and annual rye), soil amendments and pelletized soil inoculum. All plots were seeded with upland prairie grass and flower mixture using a seed drill. Plots were measured for vegetative percent cover and seeding success. Monitoring started in late 2000 and continued through 2001 with the addition of locations within the former active flyash pile footprint. The seeding selected for use on the OSDF cover is a mixture of native grasses and flowers. Monitoring will continue in these areas and be extended to the OSDF in 2002.

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2.3 PUBLIC OUTREACH

As the Fernald site recognized its 50th anniversary, Ohio EPA's public outreach program continued to enhance site remediation efforts. OFFO's outreach

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.

In 2001, OFFO staff got dirty with elementary schools to educate them on using native plants to beautify their school grounds and for restoration at Fernald.

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 enables better cleanup decisions. OFFO's public outreach program supplements our monitoring and oversight activities by fostering early public involvement in important environmental decisions.

In 2001, OFFO participated in several site tours, including a June tour with Senator Voinovich. The CERCLA public input process was put to the test as Fernald underwent a record of decision change in the OU5 ground water explanation of significant differences (see page 24). OFFO participated in DOE's first complex-wide Top to Bottom Review Stakeholder Survey, a process familiar to DOE sites in Ohio. The following pages highlight public involvement at Fernald in 2001.

Meetings

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

- Fernald Residents for Environmental Safety and Health
- Fernald Citizens Advisory Board
- FCAB Stewardship committee
- Fernald Living History Project
- Site Technology Coord. Group

In 2001, the Fernald Citizens Advisory Board (FCAB) stewardship committee and full board each met monthly, with the exception of August, September and December. Ohio EPA staff continue to regularly participate in all FCAB activities, in ex-officio capacities. The group spent time in 2001 on funding, future use and long-term stewardship discussions. The FCAB launched its independent Web site, www.fernaldcab.org in June. The new site allows additional space to present detailed information about the FCAB's history, recommendations, meeting minutes, upcoming activities and special topics of interest such as waste transportation and the "Future of Fernald" process. Three new members joined the FCAB in 2001, including the first student member.

The National Center for Environmental Health and the Centers for Disease Control and Prevention disbanded the Fernald Health Effects Subcommittee in August 2001. Subsequently, several community members formed the Fernald Community Health Effects Committee to promote a greater understanding and public awareness of the potential health effects of living near or being employed at Fernald. OFFO does not plan on participating in regular meetings of the group because their issues are more directly related to the mission of ODH.

Ohio EPA continued to participate 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

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a part of their environmental history. University of Cincinnati, working with the living history group, continued efforts to implement the \$50,000 grant received in 1999 from the Ohio Environmental Education Fund. This project, Linking Community with Environment, will include a summer workshop in June 2002 for area 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 federal facilities. An additional 25 video interviews of Fernald community members were completed with the grant money. In 2001, OFFO continued to maintain an e-mail list server and Web pages for the Living History Project.

For the third consecutive year, Ohio EPA hosted outreach events teaching



Above, Ohio EPA staff removed overgrown shrubs and weeds from the courtyard in the winter and spring. Right, Eastmont students got a chance to get outside in April to transplant a variety of native seedlings.



Far right, media representatives from Dayton Public Schools and Channel 2 watched as Eastmont Elementary students worked with Ohio EPA in May to plant native seedlings in their courtyard.



school children about using native plants for the restoration effort at Fernald. In February, staff went to Ross and Crosby Middle Schools and Eastmont Elementary to teach students about the wetland restoration effort at Fernald

and help the children plant their own seeds.

The students tended the seedlings throughout

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the spring. In May, Ohio EPA staff helped the children from Fernald area schools plant the seedlings at Fernald. The children from Ohio EPA's Adopt-A-School, Eastmont Elementary, planted the seedlings at their school in an effort to revitalize an unused courtyard. In June, OFFO also provided wildflower seedlings and helped plant at Fernald's "Take Your Kid to Work Day." More than 400 plants of almost 30 different species of grasses and forbs were planted with the help of kids in 2001.

In addition to these Fernald-specific groups, Ohio EPA staff also participated in numerous DOE national groups including the Interstate Technology & Regulatory Cooperation (ITRC), the State and Tribal Government Working Group, National Governor's Association Federal Facilities Task Force, Environmental Council of States, the Association of State and Territorial Solid Waste Management Officials and the Environmental Management Advisory Board.

Publications

- *2000 Annual Report to the Public on the Fernald Environmental Management Project*, June
- *Native Grass and Flowers as Vegetative Cover on the OSDF*, article prepared by Tom Schneider for the July "FRESH" newsletter
- *Comparison of Hyporheic Organisms in Two Intermittent Streams to Assess a Local Disturbance*, a manuscript prepared by Joe Bartoszek on the hyporheic study at Fernald, was published in the December issue of the "Journal of Freshwater Ecology"

Fact Sheets

- Quarterly environmental monitoring results fact sheets

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Presentations

- *Native Wildflowers and Grasses* presented to Ross, Crosby and Eastmont students, February
- Native Restoration information presented to the Miamisburg Mound Community Re-use Initiative, March
- *The Importance of Public Involvement at Fernald*, panel presentation at the Central States Communication Association meeting, April
- *Stewardship & Technology: Challenges for Future Management of Radiologically Contaminated Sites*, presented at National Forum, in Utah, April
- *Stewardship & Technology: Challenges for Future Management of Radioactively Contaminated Sites*, presented at the Long Term Monitoring Sensors/Analytical Methods Workshop in Orlando, June
- *Long-Term Stewardship Consequences of Remedy Decisions*, presented at the Long-term Stewardship Conference in Grand Junction, Colorado, August
- OFFO and Surface Water staff presented information on Agency programs to graduate students from Miami University, August
- *Cooperative Monitoring Program: A Key to Achieving Success*, presented at the International Conference for the Society for Ecological Restoration in Niagara Falls, Ontario, October
- *Donor Soils in Wetland Mitigation: Effects of Soil Microbiology and Vegetative Community*, presented at the International Conference for the Society for Ecological Restoration in Niagara Falls, Ontario, October
- *Stewardship and Technology: Keys to Long-term Success*, presented at the ITRC Long Term Stewardship workshop in Long Beach, November
- Fernald presentations to graduate students at Miami University, April, June and November
- 15 South Pole presentations, January through 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 2001 major areas of the Web site were updated with Java enhancements to improve speed and accessibility of information. Ohio EPA provided extensive online information for the restoration effort, waste pit activities and other research and remediation projects.

Java updates were made in 2001 to enhance the speed and ease of Ohio EPA's Fernald web site.

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.

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2.4 EMERGENCY PLANNING

The revision to the State Hazardous Materials Contingency Plan, including an update to the DOE Annex of the plan, was finished and approved. Ohio EMA continues to work with other state agencies on the implementation of the state's incident command system during emergencies, including incidents at DOE facilities. Ohio joined the Emergency Management Assistance Compact, which is an interstate mutual aid pact with 45 states and two territories. Ohio EMA continued to enter updated facility information into the state resource directory, the duty officer's handbook and into the CAMEO database.

Ohio EMA has worked with Fernald to gather information on shipments. This information was processed and disseminated to the county emergency management agencies. Ohio EMA continued to attend the cleanup status meetings and the cooperative planning and training meetings for Fernald.

Ohio EMA continued to prepare for site emergencies through training and upgrading the Ohio Emergency Operations Center. Ohio EMA personnel attended hazardous materials courses and seminars related to response and emergency planning. Ohio EMA taught an introductory CAMEO course in Columbus, which included county personnel. The course included training on air modeling and mapping.

Under the DOE grant provisions, Ohio EMA continued to provide funds to the Hamilton and Butler counties' Emergency Management Agencies for Fernald-specific issues. They used the funds for preparing hazards assessments, participating in emergency response organizations, conducting exercises and drills, digitizing site-specific information, participation in periodic communications checks and upgrading their emergency operations center.

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 2001, 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 2001. The reviews included three quarterly status reports, one annual report covering all monitoring activities, and an extranet data site available online. 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 2001. 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 2001. A discussion of sampling activities and results for each media is provided in Sections 3.1 through 3.5. 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.

3.1 PRIVATE WELLS

Ohio EPA continued to monitor three private wells in 2001 for total uranium. OFFO split sampled the wells quarterly with DOE/Fluor Fernald. The 2001 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. 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 U.S. EPA drinking water standard for total uranium was finalized in 2001 at 30 µg/L, a change from the long proposed limit of 20 µg/L. The ground water final remediation level for total uranium in the OU5 Record of Decision (December 15, 1995) was changed through an explanation of significant differences. 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 Ohio EPA detected from the three monitoring wells during 2001 was 99.2 µg/L found in well NKM-12. Well BOK-14 was consistently within background in 2001. Appendix B contains the private well sampling data.

OFFO has been split sampling the three wells with Fernald since 1994. These

Ohio EPA continues to see increased concentrations of uranium in NKM-12, probably a result of re-injection of ground water as part of the aquifer restoration project.

wells have historically shown some fluctuation in their total uranium concentrations. Increased concentrations have been noted in well NKM-12 since re-injection began in 1998. With Fernald's re-injection

and extraction system, treated water is reinjected, pushing the contaminated ground water past the private well and toward the extraction wells.

3.2 SURFACE WATER

Fifty-two surface water samples were taken in 2001, compared with 37 taken in 2000 and 36 taken in 1999. In addition to the 39 routine monitoring samples taken in 2001, samples were taken in April, July and November at the storm sewer outfall ditch (SSOD), and in July and November at the southern waste units storm water basin 2 (BSN2) and inactive flyash pile (IAF). Additional samples were taken at the effluent in support of the National Pollutant Discharge Elimination System inspection in June. Routine samples were analyzed for total uranium, radium-226 and radium-228.

The maps in Appendix A show all 2001 surface water sampling locations. Location codes reflect the river mile of the routine sampling locations.



Ohio EPA staff observe Fernald's storm water retention basins during an annual inspection in June 2001.

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 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 outfall from Fernald in the Great

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Miami River. Location GM21.4 is at the bridge in New Baltimore, approximately three miles downstream of the effluent.

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 µg/L, 38 pCi/L, and 47 pCi/L, respectively. No sample results exceeded the FRLs.

Paddys Run at the property line (PR1.8) was generally dry. The four routine samples taken at this location continued to demonstrate low levels of total uranium (2.6, 2.1, 5.4 and 3.0 µg/L).

PR1.8 TOTAL URANIUM

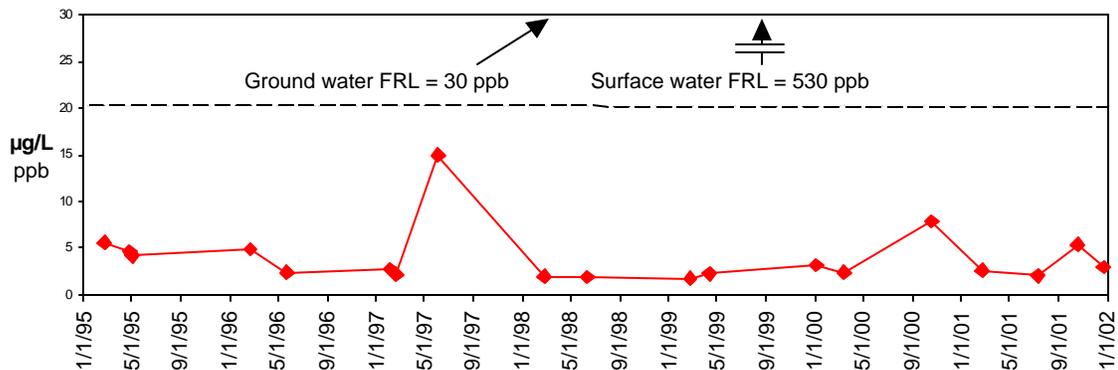


Figure 4 Surface water samples at PR1.8 have continued to demonstrate low levels of uranium.

Most radium-228 sample results have generally been less than 1 pCi/L for all samples taken during 2001. This follows several years of a slight upward trend in radium-228 results at all locations, apparently due to laboratory error. Review of Ohio EPA and DOE data along with discussions with the analytical laboratory helped to recognize and resolve this anomaly in 2001.

3.3 SEDIMENT

Sediment samples were taken at seven locations in 2001. A total of six sediment samples were analyzed in 2000, seven in 1999, nine in 1998, ten in 1997 and nine in 1996. Samples were analyzed for total uranium, radium-226 and isotopic thorium.

The maps in Appendix A show all 2001 sediment sampling locations. Most samples were co-located with surface water. Location PR7.2 had a gravel and cobble substrate and did not have sufficient sediment to sample. PR4.6 at the Morgan Ross Road bridge, the DOE/Fluor Fernald background station for Paddys Run, was sampled in place of PR7.2.

Final remediation levels for sediment at Fernald have been established for the following analytes per the OU5 Record of Decision (December 15, 1995): total uranium (210 µg/g); radium-226 (2.9 pCi/g); and thorium-228 (3.2 pCi/g), 230 (18,000 pCi/g), and 232 (1.6 pCi/g). No sediment sample had any analyte above the final remediation level. Results are summarized in Appendix D.

Total Uranium in Sediment

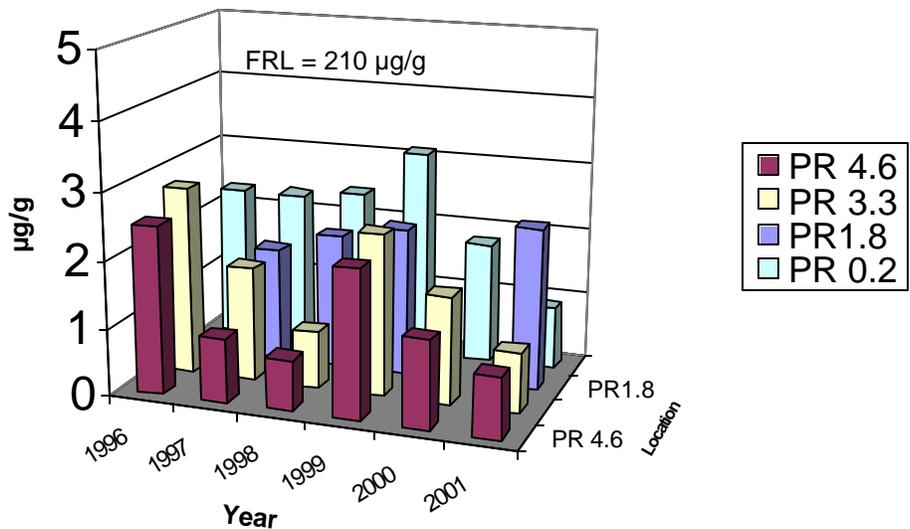


Figure 5 Total uranium levels in sediment in Paddys Run have remained far below the FRL of 210 micrograms per gram (µg/g). (Data for 1996 and 2000 were not available for PR1.8).

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3.4 SOIL

In 2001, soil sampling was conducted to evaluate compliance with the waste acceptance criteria prior to disposal in the OSDF. Ohio EPA collected soil samples from three stockpiles set up as staging areas for excavated soil in area 2 phase I of Fernald's southern waste units. See Appendices A and E for sampling locations and data results.

Soil samples were collected from three stockpiles in different areas of the



OFFO staff sampled southern waste units soil piles for WAC compliance.
the third was in the Carolina area (SWU-WAC-11).

southern waste units. The first stockpile was on the northwest corner (SWU-WAC-09), the second was along the north road toward the equipment wash facility (SWU-WAC-10), and

The contaminants of concern selected to characterize the soil piles for WAC compliance were uranium-238 and technetium-99. OFFO's contract lab agreed to provide less than 48-hour response time for the analysis of these samples. All results were within WAC limits and the stockpiles were taken to the OSDF for disposal.

Ohio EPA will continue to work with DOE and Fluor Fernald in 2002 toward monitoring site soil conditions and evaluate WAC characterization prior to disposal in the OSDF.

3.5 AIR

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 at Fernald. 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 in the air from Fernald activities. These samplers are strategically located to measure total uranium, total suspended

particulates (TSP) and other target radionuclides 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



OFFO staff collect bi-monthly samples from hi-vol monitors at Fernald.

specific activities, prevailing wind

direction, availability of utilities, locations of public interest and points where maximum concentrations may be measured. Projects specifically targeted include the Waste Pit Remedial Action Project (WPRAP) and the on-site disposal facility. Our off-site samplers are located in Crosby and Ross townships. The locations are shown on maps in Appendix A.

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Ohio EPA compares on-site concentrations with off-site location concentrations and the concentrations listed in the National Emission Standard for Hazardous Air Pollutants (NESHAP) for radionuclides.

Waste Pit Remedial Action Project: Ohio EPA monitors total uranium, thorium isotopes, radium-226 and TSP concentrations in air at two sampling locations adjacent to the waste pits. These air samplers are located northeast and northwest of the waste pits (FNAPS01 and FNAPS04, respectively). Significant differences have been observed in 2001 between these samplers and our background sampler, located in Crosby Township. These locations indicate elevated concentrations of total uranium and thorium-230. Fernald will install a pugmill ventilation system in 2002 to reduce air emissions from WPRAP activities. All of the measured concentrations were less than NESHAP standards.

The 2001 average total uranium concentration measured at both waste pit

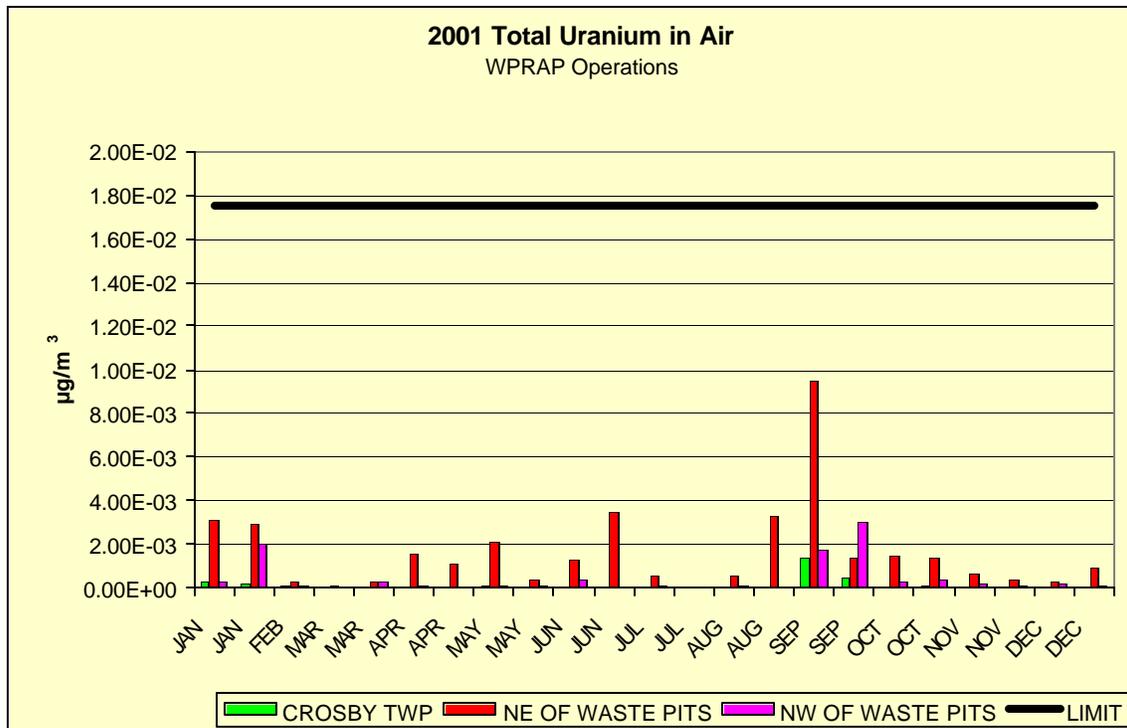


Figure 6 Elevated concentrations of uranium will likely continue during waste pits remediation.

locations appear to be increasing for the third consecutive year. Both locations had total uranium concentrations significantly greater than the concentrations measured off site. The concentrations were still less than a calculated NESHAP-based concentration for natural uranium in air ($1.75 \times 10^{-2} \mu\text{g}/\text{m}^3$). Elevated concentrations will likely continue throughout the remediation of this area. Ohio EPA will continue to monitor these locations to ensure that control measures are in place to keep emissions as low as reasonably achievable.

Isotopes of thorium (thorium-232, 230 and 223) are also analyzed at the waste pit locations. Thorium-230 concentrations were elevated at both WPRAP monitors compared to the concentrations measured at the background location. All of the thorium concentrations measured in 2001 were less than the NESHAP concentrations. As mentioned earlier, Fernald is taking steps to decrease emissions from the WPRAP, such as the pugmill ventilation system.

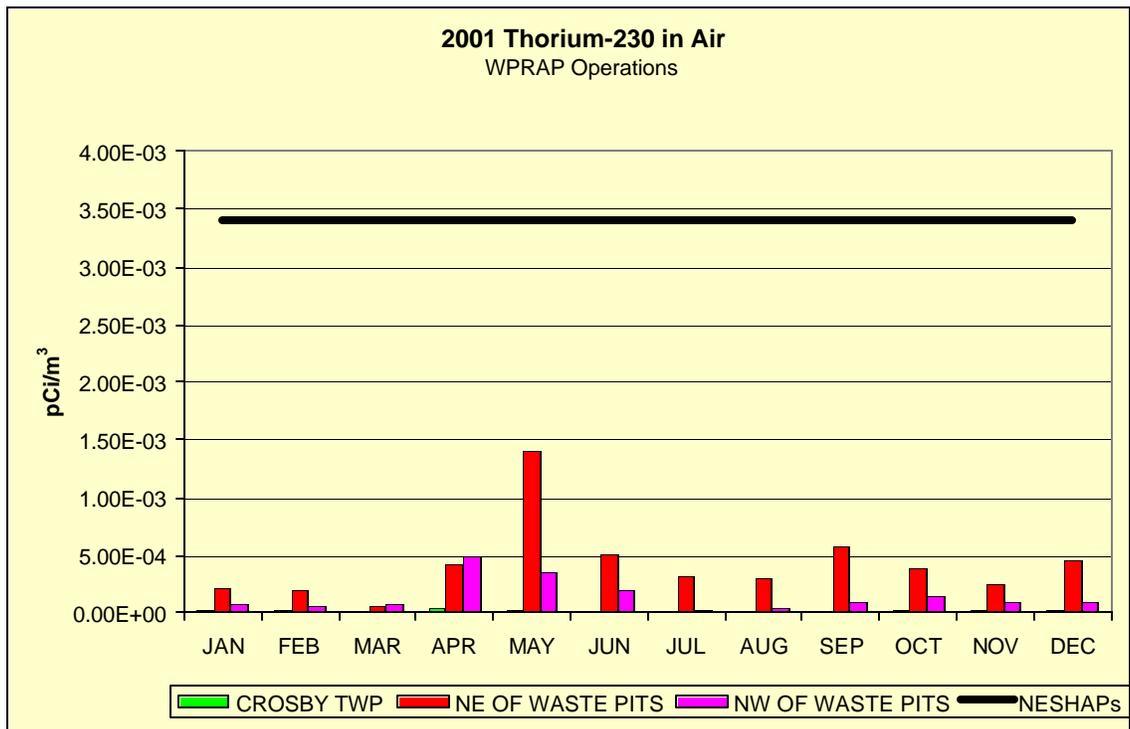


Figure 7 Elevated thorium at the waste pits is the result of remediation.

ENVIRONMENTAL MONITORING

Radium-226 concentrations in air are also measured at the waste pit monitors. The results were similar to the results measured during 2000 and were similar to the concentrations measured at the background location.

The 2001 average TSP concentration at both locations was nearly the same as 2000 and was similar to background concentrations. These concentrations may be attributed to the aggressive program in place at Fernald to minimize fugitive emissions using water as a dust suppressant.

Other Monitoring Locations: Ohio EPA operates two additional monitors on site, at the northeast fenceline (FNAPS02) and the met tower (FNAPS03A), as well as an additional off-site location in Ross Township (FNAPS05). Total uranium and total suspended particulate samples are collected from this location semi-monthly. A monthly composite sample for isotopes of thorium is also performed.

The 2001 total uranium concentrations are approximately the same as the concentrations measured in 2000 and significantly greater than the concentrations measured off site. Of these locations, the northeast fenceline monitor (FNAPS02) has the greatest concentrations, which can be attributed to waste placement in the OSDF. The other locations, with the exception of Ross (FNAPS05), continue to have elevated concentrations. These concentrations are to be expected as remediation activities continue on site. The measured concentrations remain well below the NESHAP standard. The total uranium results for the other sampling locations are shown in Figure 8.

The thorium concentrations measured at these locations were slightly elevated compared to the off-site locations, but all were significantly less than the NESHAPs standard.

The 2001 TSP concentrations for these locations remain essentially the same as 2000, and were similar to the concentrations measured off site.

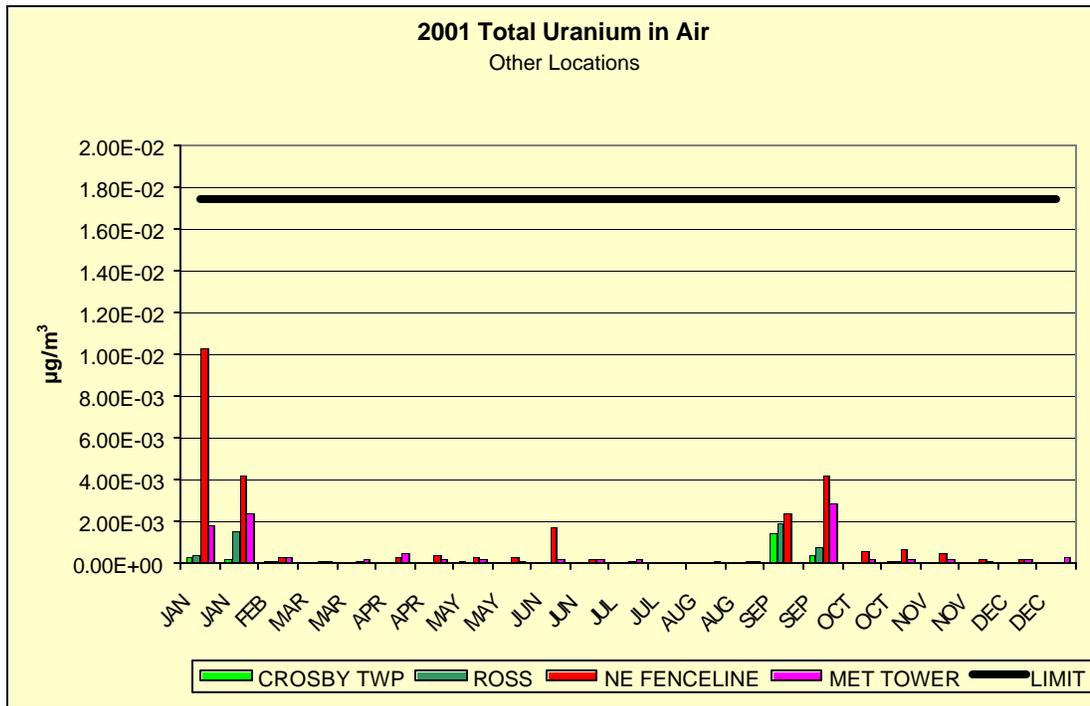


Figure 8 Elevated concentrations of uranium will likely continue during waste pits remediation.

Annual Composites: All of the samples from each of the six sampling locations are composited into a single sample for an annual composite sample. This method of analysis allows for detection of isotopes that may not have been detectable on a semi-monthly basis. The annual composites are analyzed for total uranium, isotopic uranium, isotopic thorium and radium-226. A gamma spectroscopy analysis is also performed to detect gamma-emitting isotopes.

The results for analytes of concern that were detectable are shown in Figure 9. Qualitatively, the results are consistent with the semi-monthly and monthly results. The radium-226 concentrations were indistinguishable from background. The sampler northeast of the waste pits (FNAPS01) had the highest concentrations for all isotopes. These elevated concentrations were expected and are explained in the *Waste Pit Remedial Action Project* section beginning on page 30. All of the on-site samplers had higher concentrations

ENVIRONMENTAL MONITORING

than the off-site samplers, but all concentrations were less than the NESHAP standards. All results can be seen in data tables in Appendix F.

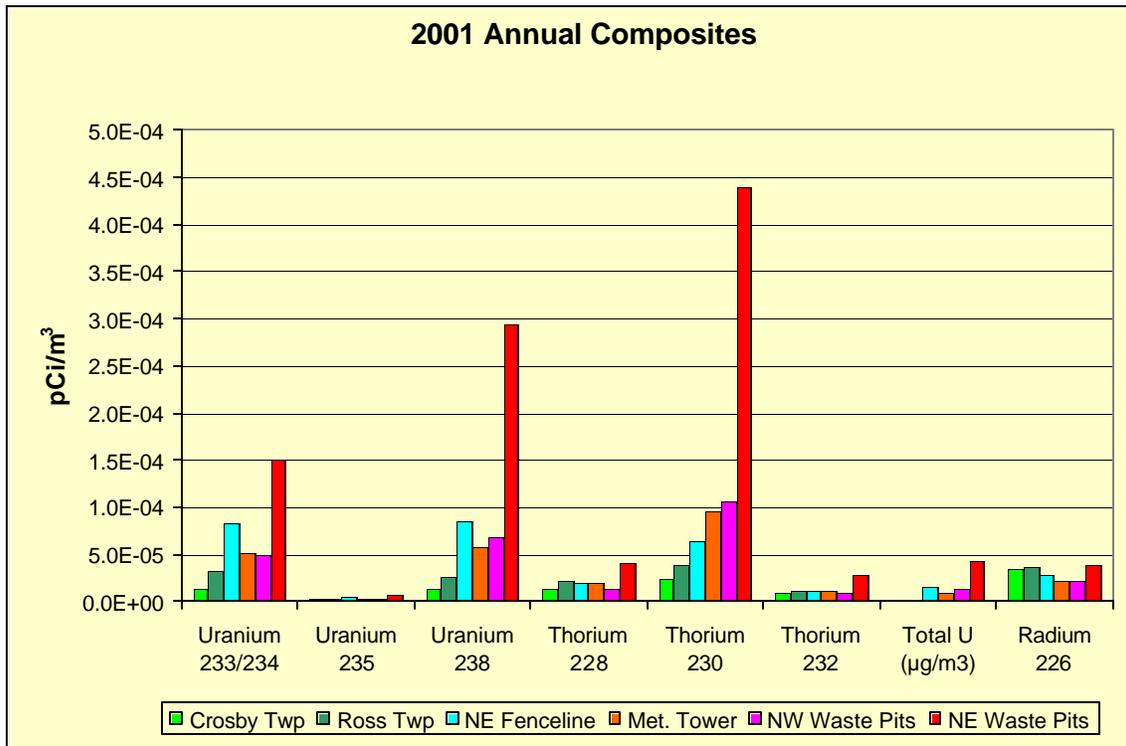


Figure 9 Analytes of concern are sampled using an annual composite.

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, and;
- FNRDN03, located approximately two miles west-southwest of Fernald in Crosby Township which serves as our background location.

The most recent hourly data is posted “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 all radon monitoring locations are shown in Appendix F. The data indicates that average monthly radon concentrations from the monitors located east of the silos (FNRDN02A) and the Paddys Run Road location (FNRDN01) range from 0.2 to 1.0 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 Figure 10.

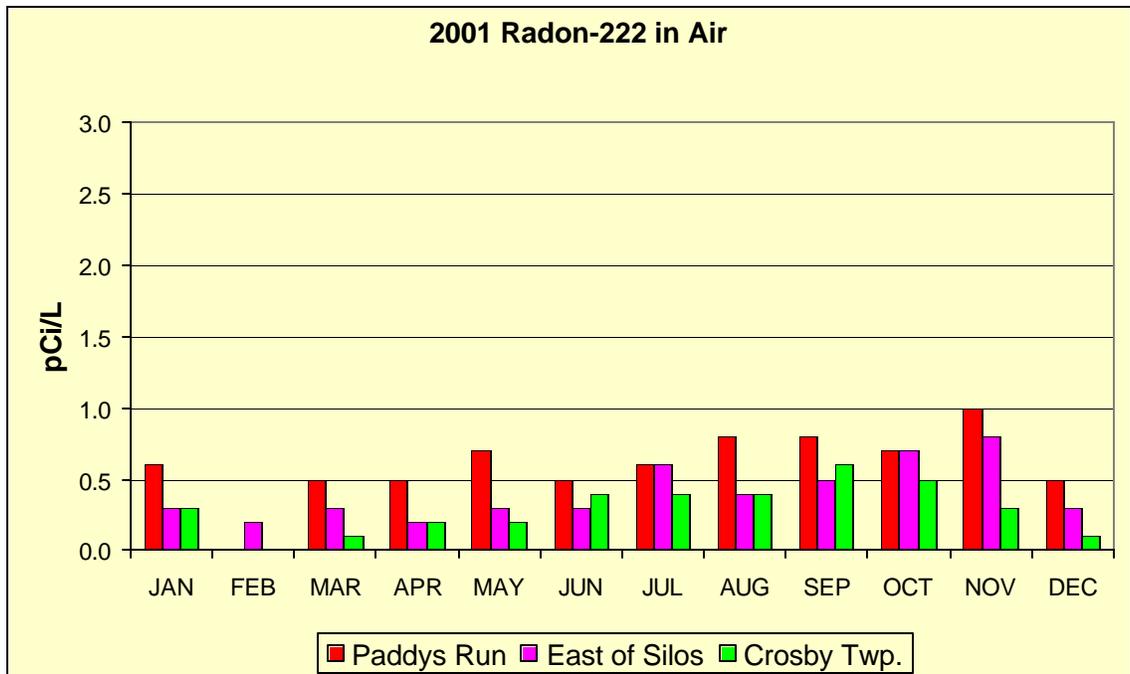


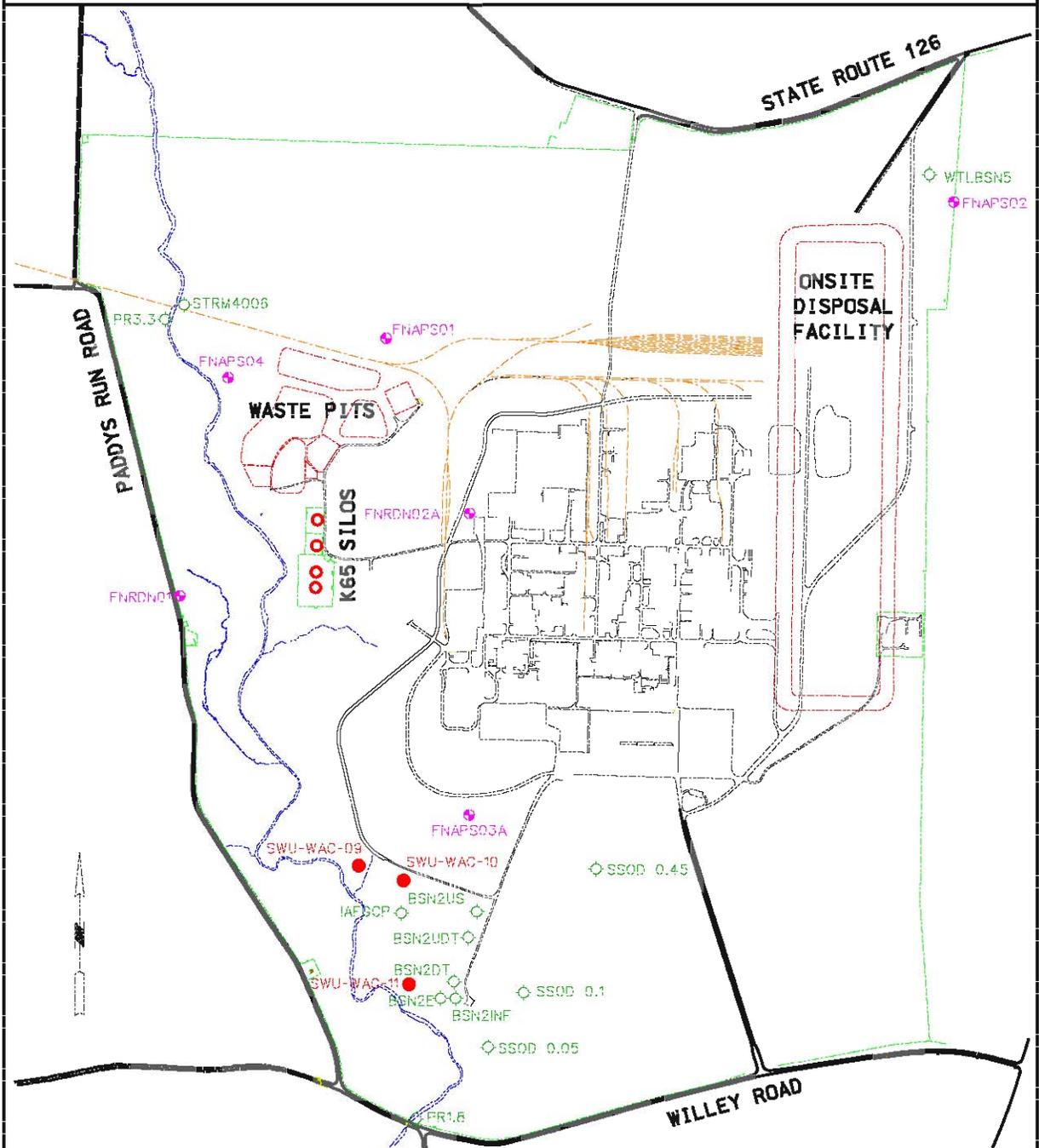
Figure 10 Average monthly radon concentrations are below the DOE limit of 3.0 pCi/L.

ENVIRONMENTAL MONITORING

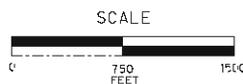
The monthly average concentrations measured east of the silos (FNRDN02A) and at Crosby Township (FNRDN03) are very comparable and statistically indistinguishable. The Paddy's Run Road location (FNRDN01) has a slightly higher average concentration than that measured at Crosby Township (FNRDN03) in 2001. The annual average concentration measured at Paddy's Run Road was 0.7 pCi/L as compared to 0.3 pCi/L measured at Crosby.

The average radon concentrations were all less than the 3.0 pCi/L limit in DOE Order 5400.5 and less than 0.5 pCi/L greater than background, the limit proposed in Draft 10 CFR 834.

2001 OHIO EPA ON-SITE SAMPLING LOCATIONS



PROJECTION: STATE PL. WE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 27
 Q:/FEMP/99RPT/ANNLRPT99.DGN



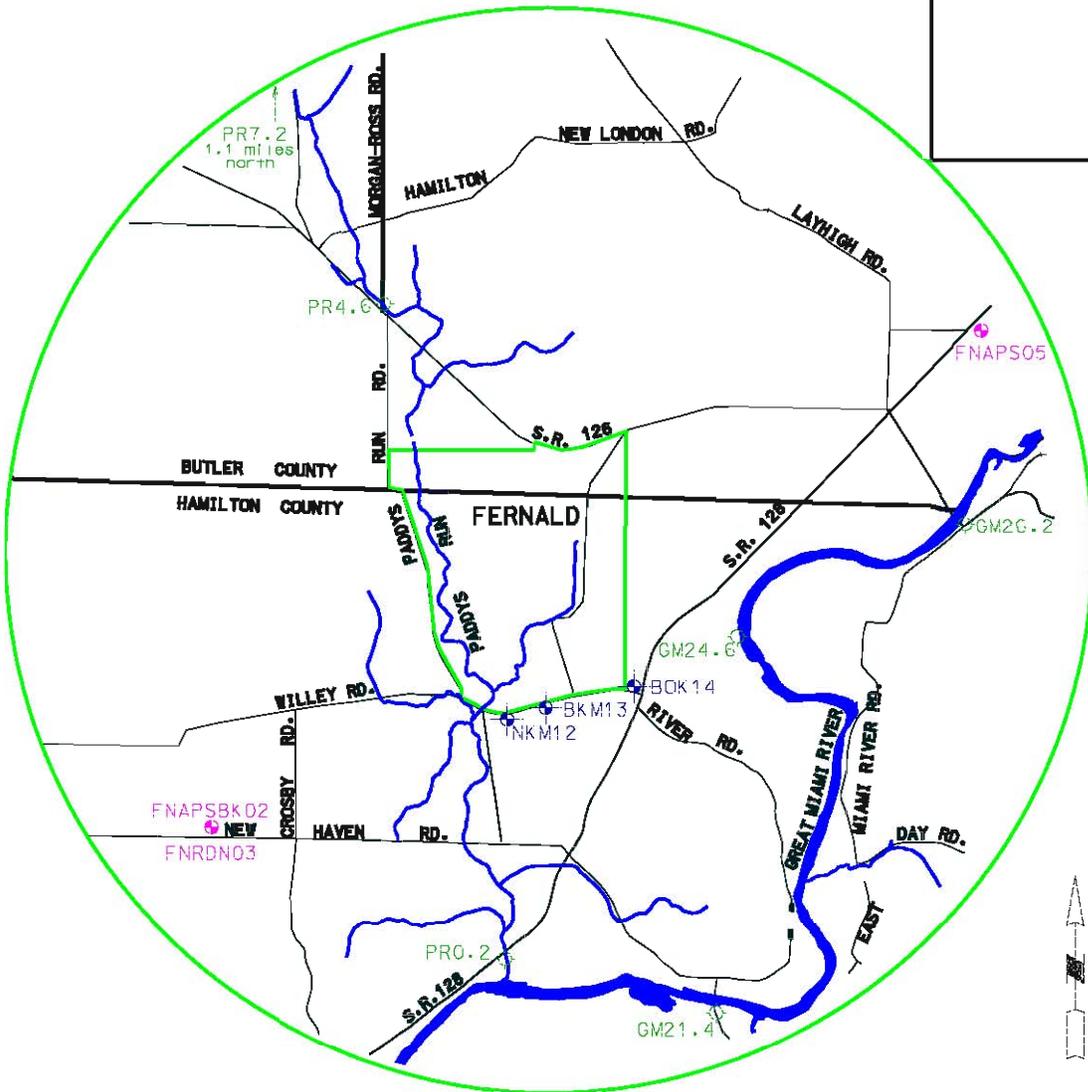
LEGEND	
	FERNALD FENCELINE
	PADDYS RUN AND TRIBUTARIES
	RAILROAD
	SURFACE WATER/SEDIMENT LOCATION
	AIR LOCATION
	SOIL LOCATION



OFFICE OF FEDERAL FACILITIES OVERSIGHT

2001 OHIO EPA OFF-SITE SAMPLING LOCATIONS

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PROJECTION: STATE PLANE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 27
 Q:/FEMP/99RPT/LANDUSE99.DGN

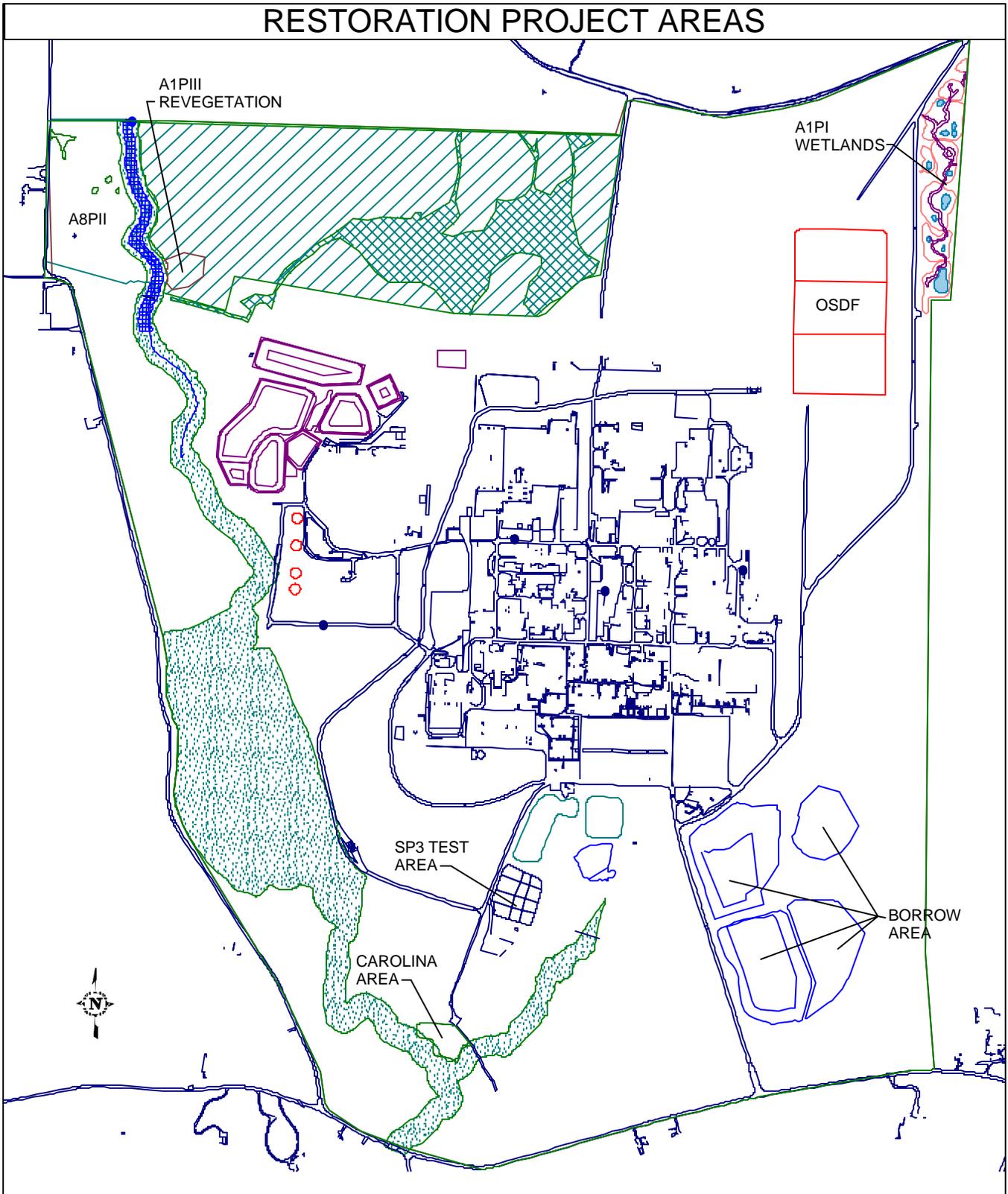


OFFICE OF FEDERAL FACILITIES OVERSIGHT

LEGEND

- COUNTY LINE
- FERNALD PROPERTY BOUNDARY
- ⊕ PRIVATE WELL
- ⊙ SURFACE WATER/FISH/SEDIMENT
- ⊕ AIR MONITOR

RESTORATION PROJECT AREAS



OFFICE OF FEDERAL FACILITIES OVERSIGHT

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SCALE



LEGEND

-  WETLANDS
-  NORTHERN WOODLOT
-  RIPARIAN CORRIDOR

PRIVATE WELLS			
LOCATION CODE	COLLECT DATE	OEPA TOTAL U µg/L	DOE TOTAL U µg/l
NKM12	1/30/2001	141	123
NKM12	4/25/2001	99.2	109
NKM12	7/25/2001	90.9	86.2
NKM12	10/30/2001	88.7	86.7
BMK13	1/30/2001	43.4	35.4
BMK13	4/25/2001	39.6	44.3
BMK13	7/25/2001	33.4	33.4
BMK13	10/30/2001	23.4	21.6
BOK14	1/30/2001	2.3	2.06
BOK14	4/25/2001	2.37	2.01
BOK14	7/25/2001	2.11	1.95
BOK14	10/30/2001	2.13	2.11

Note:

µg/l = micrograms per liter

Total Uranium Final Remediation Level = 20 µg/l for ground water

APPENDIX C

SURFACE WATER - Bi-monthly							
LOCATION CODE	COLLECT DATE	TOTAL U $\mu\text{g/L}$	TOTAL U +/- error	Ra-226 pCi/L	Ra-226 +/- error	Ra-228 pCi/L	Ra-228 +/- error
PR0.2	2/20/2001	2.09	0.21	<0.064		<0.56	
PR0.2	6/14/2001	1.18	0.12	<0.32		<1	
PR0.2	8/2/2001	0.257	0.028	<0.33		<0.9	
PR0.2	10/17/2001	4.95	0.5	<0.14		<1.2	
PR0.2	12/20/2001	3.01	0.3	<0.35		1.22	0.58
PR1.8	2/20/2001	2.58	0.26	0.1	0.038	<0.59	
PR1.8	7/9/2001	2.07	0.22	0.235	0.13	<2	
PR1.8	10/17/2001	5.37	0.54	0.177	0.1	<1.1	
PR1.8	12/20/2001	2.95	0.3	<0.29		<0.75	
PR3.3	2/20/2001	2.16	0.22	0.119	0.031	<0.61	
PR3.3	4/5/2001	2.58	0.58	<0.07		<1	
PR3.3	6/14/2001	1.43	0.15	<0.48		<0.72	
PR3.3	8/2/2001	1.27	0.14	<0.32		0.822	0.77
PR3.3	10/17/2001	1.52	0.15	<0.14		<1.1	
PR3.3	12/20/2001	1.85	0.19	<0.29		<0.75	
PR7.2	2/20/2001	1.42	0.15	0.092	0.038	<0.67	
PR7.2	4/5/2001	1.66	0.17	<0.055		<0.98	
PR7.2	6/14/2001	1.28	0.13	<0.35		<0.94	
PR7.2	8/2/2001	0.909	0.099	<0.37		<0.93	
PR7.2	10/17/2001	0.989	0.1	<0.085		<1	
PR7.2	12/20/2001	0.907	0.091	<0.44		0.992	0.54
GM21.4	2/20/2001	1.96	0.2	0.155	0.053	<0.61	
GM21.4	4/5/2001	2.18	0.24	0.172	0.05	<1.1	
GM21.4	6/14/2001	1.83	0.19	<0.31		0.917	0.92
GM21.4	8/2/2001	1.42	0.16	<0.43		<1.2	
GM21.4	10/17/2001	1.45	0.15	<0.22		<1.1	
GM21.4	12/20/2001	1.38	0.14	0.37	0.21	<0.82	
GM24.6	2/20/2001	2.13	0.22	0.201	0.07	<0.53	
GM24.6	4/5/2001	2.27	0.24	0.179	0.046	<0.97	
GM24.6	6/19/2001	1.91	0.2	<0.32		<0.98	
GM24.6	8/2/2001	1.75	0.19	<0.58		<1	
GM24.6	10/17/2001	1.58	0.16	0.177	0.098	<0.95	
GM24.6	12/27/2001	2.22	0.22	<0.43		<0.82	
GM26.2	2/20/2001	1.98	0.2	0.118	0.034	<0.56	
GM26.2	4/5/2001	2.12	0.22	0.164	0.043	<1.1	
GM26.2	6/14/2001	1.69	0.18	0.704	0.24	<0.84	
GM26.2	8/2/2001	1.24	0.14	<0.38		<0.93	
GM26.2	10/17/2001	1.47	0.15	0.209	0.088	<0.98	
GM26.2	12/20/2001	1.36	0.14	0.531	0.23	1.54	0.65

Notes:

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

pCi/L = picocuries per liter

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

Radium-226 Final Remediation Level = 38 pCi/L for surface water

Radium-228 Final Remediation Level = 47 pCi/L for surface water

SURFACE WATER - Other					
LOCATION CODE	COLLECT DATE	TOTAL U µg/L	TOTAL U +/- error	Ra-226 pCi/L	Ra-228 pCi/L
SSOD0.05	4/20/2001	17.8	1.8	NS	NS
SSOD0.1	4/20/2001	7.75	0.8	NS	NS
SSOD0.45	4/20/2001	34.6	3.5	NS	NS
BSN2E	7/9/2001	16.7	1.7	<0.2	<1.2
BSN2INF	7/9/2001	50.1	5.1	NS	NS
SSOD0.45	7/9/2001	14	1.4	<0.23	<1.4
WTLBSN5	7/9/2001	2.18	0.24	<0.44	<1.1
STRM4006	8/30/2001	15.5	1.6	NS	NS
BSN2DT	11/30/2001	27.1	2.7	NS	NS
BSN2UDT	11/30/2001	24.5	2.5	NS	NS
BSN2US	11/30/2001	25.5	2.6	NS	NS
IAFGCP	11/30/2001	23.7	2.4	NS	NS
SSOD0.1	11/30/2001	8.04	0.81	NS	NS

SURFACE WATER - Other			
LOCATION CODE	COLLECT DATE	Tc-99 pCi/L	Tc-99 +/-error
BSN2E	7/9/2001	11.8	5
BSN2INF	7/9/2001	<9.8	

Notes:

µg/L = micrograms per liter

pCi/L = picocuries per liter

NS = no sample or sample not analyzed for parameter

Total Uranium Final Remediation Level = 530 µg/L for surface water

Radium-226 Final Remediation Level = 38 pCi/L for surface water

Radium-228 Final Remediation Level = 47 pCi/L for surface water

Technetium-99 Final Remediation Level = 150 pCi/L for surface water

APPENDIX D

SEDIMENT						
LOCATION CODE	COLLECT DATE	LOCATION DESCRIPTION	Total U µg/g dry	Total U +/- error	Ra-226 pCi/g	Ra-226 +/- error
PR0.2	6/14/2001	Paddys Run/Route 128 Bridge	0.92	0.1	0.25	0.067
PR1.8	7/9/2001	Paddys Run/RR Bridge	2.4	0.26	0.56	0.18
PR3.3	6/14/2001	Paddys Run/Mile 4.6	0.89	0.1	0.34	0.11
PR4.6	6/14/2001	Paddys Run/Morgan Ross bridge	0.9	0.1	0.36	0.11
GM21.4	6/14/2001	New Baltimore Bridge	0.79	0.093	0.28	0.13
GM24.6	6/19/2001	Down Stream FEMP Effluent	2.4	0.25	0.75	0.14
GM26.2	6/19/2001	Venice Bridge - background	2	0.21	0.59	0.13

LOCATION CODE	COLLECT DATE	LOCATION DESCRIPTION	Th-228 pCi/g	Th-228 +/- error	Th-230 pCi/g	Th-230 +/- error	Th-232 pCi/g	Th-232 +/- error
PR0.2	6/14/2001	Paddys Run/Route 128 Bridge	0.28	0.052	0.53	0.078	0.24	0.048
PR1.8	7/9/2001	Paddys Run/RR Bridge	0.36	0.058	0.57	0.078	0.34	0.056
PR3.3	6/14/2001	Paddys Run/Mile 4.6	0.3	0.05	0.51	0.07	0.31	0.052
PR4.6	6/14/2001	Paddys Run/Morgan Ross bridge	0.34	0.054	0.52	0.074	0.35	0.058
GM21.4	6/14/2001	New Baltimore Bridge	0.36	0.06	0.6	0.086	0.35	0.062
GM24.6	6/19/2001	Down Stream FEMP Effluent	0.57	0.08	0.87	0.11	0.54	0.082
GM26.2	6/19/2001	Venice Bridge - background	0.58	0.08	0.8	0.1	0.44	0.07

Notes:

µg/g = micrograms per gram

pCi/g = picoCuries per gram

Final Remediation Level for Total Uranium = 210 µg/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

SOIL				
LOCATION CODE	COLLECT DATE	U-238* pCi/g	Tc-99 pCi/g	Tc-99 +/- error
SWU-WAC-09	6/26/2001	<0.16	<0.22	
SWU-WAC-10	6/26/2001	<0.16	<0.22	
SWU-WAC-11	6/26/2001	<0.16	0.23	0.13

Note:

pCi/g = picoCuries per gram

< = Less than the minimum detectable limit

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

* = U-238 is estimated using a quick turnaround gamma method using protactinium-234

APPENDIX F

AIR - Total Suspended Particulates							
START	STOP	FNAPS01 NE OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPS02 NE FENCELINE $\mu\text{g}/\text{m}^3$	FNAPS03A MET TOWER $\mu\text{g}/\text{m}^3$	FNAPS04 NW OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPSBK02 CROSBY $\mu\text{g}/\text{m}^3$	FNAPS05 ROSS $\mu\text{g}/\text{m}^3$
01/04/01	01/18/01	23.5	24.5	31.7	20.6	28.2	40.5
01/18/01	02/07/01	21.2	23.0	25.3	19.2	18.6	35.2
02/07/01	02/27/01	16.0	21.8	24.7	17.7	47.5	28.3
02/27/01	03/14/01	11.2	11.8	16.4	11.3	1.3	20.7
03/14/01	04/02/01	30.0	20.5	23.4	16.1	20.4	26.7
04/02/01	04/18/01	27.5	26.5	21.8	8.4	30.6	38.2
04/18/01	05/01/01	34.4	7.1	35.9	NS	31.5	46.8
05/01/01	05/17/01	6.9	41.9	43.9	32.8	52.3	47.8
05/17/01	05/31/01	27.7	41.9	22.3	27.1	24.6	13.9
05/31/01	06/19/01	30.9	ND	29.3	30.3	33.4	29.0
06/19/01	07/03/01	156.5	33.6	27.7	NS	29.4	44.4
07/03/01	07/17/01	ND	42.3	22.9	40.0	27.8	34.2
07/17/01	08/02/01	NS	NS	37.4	NS	54.3	NS
08/02/01	08/16/01	46.4	16.4	35.1	26.0	39.3	37.5
08/16/01	09/04/01	37.7	36.7	27.4	NS	28.7	25.1
09/04/01	09/18/01	37.7	35.1	30.3	35.9	28.5	195.9
09/18/01	10/04/01	28.2	31.5	NS	19.8	11.3	29.4
10/04/01	10/23/01	NS	35.0	25.7	18.1	25.1	NS
10/25/01	11/08/01	27.2	34.3	27.1	21.2	30.1	36.1
11/08/01	11/15/01	34.6	36.7	30.9	39.3	33.2	45.2
11/15/01	12/03/01	23.7	22.5	22.1	20.4	24.0	20.3
12/03/01	12/18/01	16.0	23.3	23.3	17.4	20.2	28.1
12/18/01	01/07/02	18.1	ND	18.5	16.2	21.4	ND

AIR - Total Uranium							
START	STOP	FNAPS01 NE OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPS02 NE FENCELINE $\mu\text{g}/\text{m}^3$	FNAPS03A MET TOWER $\mu\text{g}/\text{m}^3$	FNAPS04 NW OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPSBK02 CROSBY $\mu\text{g}/\text{m}^3$	FNAPS05 ROSS $\mu\text{g}/\text{m}^3$
01/04/01	01/18/01	3.09E-03	1.03E-02	1.83E-03	3.16E-04	2.76E-04	3.75E-04
01/18/01	02/07/01	2.91E-03	4.24E-03	2.37E-03	2.04E-03	2.20E-04	1.58E-03
02/07/01	02/27/01	2.99E-04	2.73E-04	2.65E-04	9.97E-05	7.99E-05	7.92E-05
02/27/01	03/14/01	1.26E-04	1.34E-04	1.32E-04	4.29E-05	4.08E-05	5.74E-05
03/14/01	04/02/01	2.79E-04	1.04E-04	1.96E-04	2.78E-04	3.39E-05	6.69E-05
04/02/01	04/18/01	1.54E-03	2.68E-04	4.51E-04	1.12E-04	2.68E-05	4.46E-05
04/18/01	05/01/01	1.14E-03	3.91E-04	2.23E-04	NS	6.16E-05	3.48E-05
05/01/01	05/17/01	2.13E-03	3.01E-04	1.62E-04	9.78E-05	8.60E-05	3.10E-05
05/17/01	05/31/01	3.45E-04	3.01E-04	1.24E-04	1.00E-04	2.84E-05	1.77E-05
05/31/01	06/19/01	1.29E-03	1.71E-03	1.78E-04	3.92E-04	4.84E-05	2.35E-05
06/19/01	07/03/01	3.48E-03	2.25E-04	1.77E-04	NS	4.45E-05	6.14E-05
07/03/01	07/17/01	5.25E-04	1.18E-04	1.88E-04	7.25E-05	1.94E-05	4.94E-05
07/17/01	08/02/01	NS	NS	1.71E-05	NS	2.27E-05	NS
08/02/01	08/16/01	6.00E-04	5.54E-05	1.13E-04	9.55E-05	3.85E-05	2.98E-05
08/16/01	09/04/01	3.32E-03	1.16E-04	1.21E-04	NS	2.41E-05	4.22E-05
09/04/01	09/18/01	9.49E-03	2.42E-03	NS	1.76E-03	1.40E-03	1.92E-03
09/18/01	10/04/01	1.43E-03	4.23E-03	2.88E-03	3.06E-03	4.37E-04	7.89E-04
10/04/01	10/23/01	1.45E-03	5.54E-04	2.11E-04	2.80E-04	1.84E-05	NS
10/25/01	11/08/01	1.42E-03	6.61E-04	1.84E-04	3.48E-04	7.73E-05	6.99E-05
11/08/01	11/15/01	6.91E-04	4.67E-04	1.61E-04	2.22E-04	3.58E-05	5.75E-05
11/15/01	12/03/01	3.74E-04	1.68E-04	1.01E-04	1.32E-04	1.14E-05	1.63E-05
12/03/01	12/18/01	3.18E-04	1.80E-04	1.98E-04	2.36E-04	2.17E-05	1.44E-05
12/18/01	01/07/02	9.44E-04	2.03E-05	2.58E-04	1.16E-04	1.86E-05	1.45E-05

Notes:

$\mu\text{g}/\text{m}^3$ = micro grams per cubic meter

ND: Indicates sparse, erroneous, or no data collected for this time period.

NS: Indicates "Not Sampled".

AIR - Thorium - 228						
MONTH	FNAPS01 NE OF WASTE PITS	FNAPS02 NE FENCELINE	FNAPS03A MET TOWER	FNAPS04 NW OF WASTE PITS	FNAPSBK02 CROSBY	FNAPS05 ROSS
2001	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
JAN	9.67E-06	1.22E-05	1.58E-05	5.89E-06	9.53E-06	NS
FEB	1.27E-05	1.50E-05	4.44E-05	7.08E-06	2.63E-05	1.73E-05
MAR	1.44E-05	9.80E-06	5.33E-06	<6.88E-06	<1.26E-05	8.72E-06
APR	3.44E-05	3.86E-05	2.95E-05	<3.37E-05	2.11E-05	2.06E-05
MAY	9.78E-05	2.98E-05	1.44E-05	2.87E-05	2.36E-05	2.21E-05
JUN	3.10E-05	<1.56E-05	<1.10E-05	<1.93E-05	7.30E-06	<9.92E-06
JUL	<1.79E-05	7.46E-06	9.70E-06	<8.62E-06	4.90E-06	<3.73E-05
AUG	2.86E-05	7.16E-06	1.01E-05	5.84E-06	4.23E-06	7.51E-06
SEP	2.95E-05	1.70E-05	1.77E-05	7.32E-06	6.09E-06	2.21E-05
OCT	2.77E-05	2.20E-05	1.16E-05	9.97E-06	1.11E-05	4.54E-06
NOV	2.26E-05	2.12E-05	1.25E-05	1.67E-05	1.83E-05	2.18E-05
DEC	1.64E-05	1.01E-05	1.43E-05	1.22E-05	5.57E-06	9.33E-07

AIR - Thorium - 230						
MONTH	FNAPS01 NE OF WASTE PITS	FNAPS02 NE FENCELINE	FNAPS03A MET TOWER	FNAPS04 NW OF WASTE PITS	FNAPSBK02 CROSBY	FNAPS05 ROSS
2001	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
JAN	2.10E-04	1.04E-04	2.89E-04	7.76E-05	2.58E-05	NS
FEB	1.93E-04	1.08E-04	1.78E-04	6.46E-05	<2.40E-05	8.21E-05
MAR	5.79E-05	1.70E-05	5.33E-06	6.76E-05	9.03E-06	1.79E-05
APR	4.31E-04	3.80E-05	7.18E-05	4.92E-04	4.01E-05	3.39E-05
MAY	1.40E-03	1.24E-04	5.18E-05	3.48E-04	3.19E-05	3.66E-05
JUN	5.02E-04	6.00E-05	4.97E-05	1.99E-04	1.69E-05	3.14E-05
JUL	3.21E-04	4.80E-05	4.47E-05	3.07E-05	1.36E-05	2.09E-05
AUG	3.02E-04	3.78E-05	4.30E-05	4.21E-05	1.62E-05	3.42E-05
SEP	5.70E-04	8.74E-05	1.04E-04	9.06E-05	1.79E-05	8.19E-05
OCT	3.90E-04	7.22E-05	5.77E-05	1.42E-04	1.81E-05	7.00E-05
NOV	2.54E-04	8.52E-05	3.23E-05	1.00E-04	2.51E-05	3.89E-05
DEC	4.53E-04	2.14E-05	2.16E-04	9.14E-05	2.13E-05	3.92E-06

AIR - Thorium - 232						
MONTH	FNAPS01 NE OF WASTE PITS	FNAPS02 NE FENCELINE	FNAPS03A MET TOWER	FNAPS04 NW OF WASTE PITS	FNAPSBK02 CROSBY	FNAPS05 ROSS
2001	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$	$\mu\text{g}/\text{m}^3$
JAN	8.74E-06	1.01E-05	1.70E-05	7.46E-06	6.75E-06	NS
FEB	6.54E-06	1.32E-05	9.87E-06	5.33E-06	<6.43E-05	9.80E-06
MAR	8.01E-06	5.52E-06	9.14E-06	6.37E-06	7.51E-06	9.42E-06
APR	3.88E-05	2.00E-05	2.68E-05	3.07E-05	2.73E-05	2.48E-05
MAY	1.02E-04	2.22E-05	1.41E-05	2.27E-05	2.27E-05	1.41E-05
JUN	3.08E-05	7.92E-07	<5.64E-06	1.70E-05	7.28E-06	9.12E-06
JUL	5.45E-06	7.46E-06	8.06E-06	<6.46E-06	4.58E-06	<1.27E-05
AUG	1.61E-05	6.76E-06	6.89E-06	<3.47E-06	4.25E-06	7.51E-06
SEP	3.85E-05	1.57E-05	1.41E-05	5.37E-06	6.09E-06	1.44E-05
OCT	2.30E-05	1.95E-05	1.01E-05	1.03E-05	7.52E-06	1.18E-05
NOV	1.94E-05	1.62E-05	1.27E-05	9.14E-06	9.32E-06	8.94E-06
DEC	8.33E-06	4.32E-06	1.02E-05	6.62E-06	3.53E-06	8.48E-07

Notes:

pCi/m³ = picocuries per cubic meter

ND: Indicates sparse, erroneous, or no data collected for this time period.

NS: Indicates "Not Sampled".

APPENDIX F

AIR - Radium - 226						
MONTH	FNAPS01 NE OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPS02 NE FENCELINE $\mu\text{g}/\text{m}^3$	FNAPS03A MET TOWER $\mu\text{g}/\text{m}^3$	FNAPS04 NW OF WASTE PITS $\mu\text{g}/\text{m}^3$	FNAPSBK02 CROSBY $\mu\text{g}/\text{m}^3$	FNAPS05 ROSS $\mu\text{g}/\text{m}^3$
2001						
JAN	<5.79E-06	1.53E-05	2.00E-05	1.33E-05	2.30E-05	NS
FEB	NS	NS	NS	NS	NS	NS
MAR	NS	NS	NS	NS	NS	NS
APR	NS	NS	NS	NS	NS	NS
MAY	NS	NS	NS	NS	NS	NS
JUN	NS	NS	NS	NS	NS	NS
JUL	8.61E-05	NS	NS	4.31E-05	2.94E-05	NS
AUG	<3.42E-05	NS	NS	4.33E-05	2.26E-05	NS
SEP	8.27E-05	NS	NS	8.85E-05	7.58E-05	NS
OCT	3.09E-05	NS	NS	5.71E-05	<1.62E-05	NS
NOV	7.73E-05	NS	NS	<2.37E-05	<1.63E-05	NS
DEC	2.44E-05	NS	NS	1.40E-05	<1.70E-05	NS

AIR - Annual Composites								
LOCATION	Total U $\mu\text{g}/\text{m}^3$	U-233/234 pCi/m3	U-235 pCi/m3	U-238 pCi/m3	Th-228 pCi/m3	Th-230 pCi/m3	Th-232 pCi/m3	Ra-226 pCi/m3
FNAPS01	4.4E-05	1.5E-04	6.5E-06	2.9E-04	4.1E-05	4.4E-04	2.8E-05	3.8E-05
FNAPS02	1.6E-05	8.3E-05	4.7E-06	8.6E-05	2.0E-05	6.3E-05	1.1E-05	<2.7E-05
FNAPS03	8.5E-06	5.1E-05	<3.5E-06	5.8E-05	1.9E-05	9.5E-05	1.2E-05	<2.2E-05
FNAPS04	1.3E-05	5.0E-05	<2.2E-06	6.9E-05	1.4E-05	1.1E-04	9.6E-06	<2.2E-05
FNAPSBK02	1.2E-06	1.5E-05	<3.6E-06	1.3E-05	1.4E-05	2.4E-05	9.5E-06	<3.4E-05
FNAPS05	1.6E-06	3.2E-05	<2.6E-06	2.6E-05	2.1E-05	3.8E-05	1.2E-05	3.6E-05

AIR - Radon									
MONTH 2001	FNRDN01 W OF SILOS			FNRDN02A E OF SILOS			FNRDN03 CROSBY TOWNSHIP		
	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX
	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L	pCi/L
JAN	0.6	1.0	4.6	0.3	0.8	2.5	0.3	0.7	1.4
FEB	ND	ND	ND	0.2	0.5	1.7	ND	ND	ND
MAR	0.5	0.9	1.9	0.3	0.7	1.8	0.1	0.9	4.1
APR	0.5	0.9	1.9	0.2	0.6	1.6	0.2	0.5	1.6
MAY	0.7	1.1	2.7	0.3	0.7	2.0	0.2	0.6	2.5
JUN	0.5	0.9	2.1	0.3	0.6	1.5	0.4	0.7	1.6
JUL	0.6	1.1	2.5	0.6	1.2	2.3	0.4	0.9	2.8
AUG	0.8	1.3	3.3	0.4	0.9	1.4	0.4	0.9	2.6
SEP	0.8	1.2	3.2	0.5	1.1	4.2	0.6	1.1	2.7
OCT	0.7	1.3	2.7	0.7	0.9	2.2	0.5	1.1	2.8
NOV	1.0	1.9	4.0	0.8	1.7	3.6	0.3	0.7	1.7
DEC	0.5	0.8	1.8	0.3	0.8	1.9	0.1	0.3	0.6

Notes:

pCi/m³ = picocuries per cubic meter

pCi/L = picocuries per liter

$\mu\text{g}/\text{m}^3$ = micro grams per cubic meter

ND: Indicates sparse, erroneous, or no data collected for this time period.

NS: Indicates "Not Sampled".

OTHER RESOURCES

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Delta Building
10995 Hamilton-Cleves Highway
Harrison, OH 45030
(513) 648-7496
diana.rayer@fernald.gov

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 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
(513) 556-4459
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