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**REVIEW OF FERNALD'S ENVIRONMENTAL MONITORING PROGRAM
(AS REQUIRED BY THE AGREEMENT IN PRINCIPLE)**

03/03/95

OEPA
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REVIEW

DOE-FN



State of Ohio Environmental Protection Agency

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MAR 03 1995

George V. Voinovich
Governor

March 3, 1995

RE: REVIEW OF FERNALD'S
ENVIRONMENTAL
MONITORING PROGRAM

Mr. Wally Quaider
Fernald Area Office
P.O. Box 538705
Cincinnati, Ohio 45253-8705

Dear Mr. Quaider:

Please find enclosed a draft copy of Ohio EPA's review of the Fernald Environmental Monitoring Program as prepared by the Office of Federal Facilities Oversight consistent with the Agreement in Principle. If you have any comments on this document, please provide them to this office no later than March 22, 1995.

If you have any questions, please contact Donna Bohannon at 513-285-6453 or me.

Sincerely,

Thomas A. Schneider
Fernald Project Manager
Office of Federal Facilities Oversight

cc: w/att Kathy Nickel, DOE
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**This Review Conducted By the
Ohio Environmental Protection Agency
Office of Federal Facilities Oversight
Under the
Agreement In Principle
Grant # DE-FGO5-940R22206**

**Initial Review of the
Fernald Environmental Monitoring Program
March 1995**

Assistance Provided By:

**Ohio Environmental Protection Agency:
Division of Emergency and Remedial Response
Division of Surface Water
Division of Drinking and Ground Waters**

**Ohio Department of Health:
Contaminated Sites Group**

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ACRONYMS AND ABBREVIATIONS

AIP	Agreement In Principle
ASTM	American Society for Testing and Materials
CGMP	Comprehensive Groundwater Monitoring Program
CRU	CERCLA RCRA Unit
Cs-137	Cesium 137
DESAQM	Department of Environmental Services-Air Quality Management
DOE	Department of Energy
DOE/FN	Department of Energy/Fernald
D&D	Decontamination and Decommissioning
EMP	Environmental Monitoring Program
EM-RM	Environmental Monitoring-Radiological Monitoring
EP-REM	Environmental Procedure-Radiological Environmental Monitoring
FERMCO	Fernald Environmental Restoration Management Corporation
FMPC	Feed Materials Production Center
FRESH	Fernald Residents for Environmental Safety & Health
GMR	Great Miami River
KPA	Kinetic Phosphorescence Analysis
NPDES	National Pollution Discharge Elimination System
NRC	Nuclear Regulatory Commission
OAC	Ohio Administrative Code
ODH	Ohio Department of Health
OEPA	Ohio Environmental Protection Agency
OFFO	Office of Federal Facilities Oversight
OU5RI	Operable Unit 5 Remedial Investigation
PAH	Polynuclear Aromatic Hydrocarbon
Ra 226/228	Radium 226 and Radium 228
REM	Radiological Environmental Monitoring
RI	Remedial Investigation
SER	Site Environmental Report
SOP	Standard Operating Procedure
Sr-90	Strontium-90
SSOD	Storm Sewer Outfall Ditch
SWOAPCA	Southwest Ohio Air Pollution Control Agency
SWRB	Storm Water Retention Basin
Tc-99	Technetium-99
TEDE	Total Effective Dose Equivalent
TLD	Thermoluminescent Dosimeter
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

INTRODUCTION

This Ohio Environmental Protection Agency (OEPA) Report is the first annual review of the Fernald Environmental Monitoring Program (EMP). It is done to fulfill in part OEPA and Ohio Department of Health (ODH) obligations under the Department of Energy (DOE) / State of Ohio Agreement in Principle (AIP).

OEPA has a long standing regulatory oversight role at the Fernald facility. Such oversight has not previously been extended to the EMP activities at Fernald. One goal of the AIP is to extend agency oversight and review to the EMP activities carried out by and for DOE at Fernald. Results of this new oversight will be periodically reported to DOE, Fernald Environmental Remediation Management Company (FERMCO), and the public.

This report does not constitute a complete and comprehensive review of the entire Fernald Environmental Monitoring Program. It should not be viewed as an approval of those issues which are not specifically addressed. Attempts will be made throughout the report to clearly identify aspects of the EMP which have not been reviewed by OEPA to date. The report is intended to be the first in a series of successively more thorough and in depth EMP reviews accomplished by OEPA in cooperation with the ODH. The goal of these reviews is to improve the EMP at Fernald by helping DOE better focus their resources and by pointing out areas where the EMP can or should be modified. Any question regarding the contents of this report may be referred to:

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As shown in the Table of Contents, this review starts with a *General Findings* section which is intended to include review results that do not correspond to just one media or to any of the other specific categories of this review. The media specific sections of the report follow and they reflect the division of the media sampled by FERMCO into five categories. These review categories were chosen because they roughly parallel the way that sampling data are reported in the DOE Site Environmental Report (SER) so related media with similar sampling approaches were grouped. *Groundwater* is residential well sampling. *Air Monitoring* incorporates all types of air sampling currently done on and off the facility except for the stack monitoring currently required by permits. *Soil and Grass* includes the sampling of both media at the same locations. It does not include the soil sampling that occurs with the produce sampling because that soil data is not reported by the facility in the same way as the 'undisturbed' soils collected with grass. *Surface Water and Sediment* were grouped because of their obvious relationship to one another.

Finally, *Foodstuffs* include produce, milk, fish, and meat sampling. The last two sections of the report are a dose calculation review accomplished by the ODH and a report of public concerns about the EMP.

The media reviews were completed by evaluating the sampling currently done, as explained in the Fernald Environmental Monitoring Plan (PL-1002, 31 May 94) and the procedures prescribed for the EMP activities contained in the Radiological Environmental Monitoring Procedure Manual (REM, 15 June 94). Additional DOE, EPA, and other documents used in this review are listed in the *References* section towards the end of this document.

In general, the sampling locations and parameters were compared to the known extent of contamination for each media. To do this the Operable Unit 5 Remedial Investigation Report (OU5RI) was used where appropriate. Additionally, Standard Operating Procedures (SOPs) were reviewed and compared against common professional practices and reviewed for completeness, consistency, and clarity. Finally, for each media, the analysis and interpretation of data were examined. This included an evaluation of how data are presented in the SER each year and what conclusions are drawn based on the data.

The dose calculation review involved comparison of the methods used to arrive at the annual dose estimate contained in the SER to regulatory and industry methods, and an independent computation of the estimated doses for 1993 to evaluate the dose calculated in the 1993 SER.

Information for the public concerns section was acquired in a couple of different ways. The first was through review of public comment cards returned to FERMCO by area residents who received copies of the SER. The second included two public meetings held in January and February of 1995 by Ohio EPA where local citizens were asked to present their thoughts and concerns about the Environmental Monitoring Program.

GENERAL COMMENTS

The Ohio EPA findings contained in this section reflect the fact that all comments do not easily fit into one of the media categories described in the introduction to this report. Overall the Environmental Monitoring Program at Fernald is a good program appropriate to the conditions that exist at the site. The pathways that may carry contaminants to the public and workers have been identified and the media sampled are chosen so that the risks to residents and staff can be monitored over time. If at some point the risks become excessive, or new releases occur, the EMP should help FERMCO and DOE address the situation. In many instances the sampling regimen carried out for the EMP goes beyond what might be considered a minimum acceptable level. This is frequently in response to the concerns of the community and it demonstrates the commitment of FERMCO and DOE to meet the needs of the stakeholders.

Analytical methods

When OEPA started this review process, analytical methods were on the list of items for review this year. For a variety of reasons, including not receiving all methods from FERMCO, this task has not been completed. The only method that was reviewed for this report is the Kinetic Phosphorescence Analysis (KPA) method as it is used for the surface water and well water sampled for the EMP. All other methods will be reviewed as they become available to OEPA.

While KPA is not an EPA approved analytical method for total uranium in water, it is widely used and generally accepted as an appropriate and reliable method. Based on conversations with USEPA laboratory staff it is likely that KPA will become an accepted method in the future. There is a problem, however, with the way in which the FERMCO laboratory executes KPA.

OEPA became aware of the problem when the results of the July and August split sampling were returned from the laboratories and showed significant differences compared to FERMCO's results. Subsequent contacts with OEPA quality assurance staff, USEPA lab staff, and FERMCO lab and environmental monitoring staff resulted in concerns with the FERMCO labs execution of the KPA method.

For this review, OEPA compared the KPA methods used by different laboratories and noted that unlike all other laboratories using this procedure, FERMCO doesn't stress obtaining a clear sample for analysis or agitating the sample prior to analysis. This is a substantial flaw because water samples are likely to contain some amount of particulate matter and without digestion of these particulates and/or agitation prior to analysis, it is impossible to assure that the analytical results will actually be representative of the analyte in the entire sample. At Fernald this error will lead to data showing lower levels of uranium in the water than are actually present.

For split sampling to be of any value, the method and procedures used by both parties need to be consistent. OEPA cannot commit to the use of the KPA procedure as it is carried out

by FERMCO. Therefore, FERMCO's execution of the KPA method for water samples is unacceptable and measures need to be taken to correct it. OEPA recommends that one of the two following options be implemented as soon as possible to eliminate this error from the monitoring program. One option is for both DOE and OEPA's contract labs to use the approved USEPA method for total uranium in drinking water (Method # 908.0) when analyzing groundwater and surface water samples. Use of Method # 908.0 would, however, require a higher detection limit. The second option is to continue using the KPA method and incorporate the appropriate changes into the procedure. Then both OEPA's and FERMCO's laboratories will be analyzing the samples with exactly the same process. Appendix I of this report contains changes that may be incorporated into FERMCO's procedure in order to correct the current deficiency.

Environmental Monitoring Program Documentation

As mentioned above, OEPA finds that the EMP at Fernald is in general terms a good program that is accomplishing its primary objectives. But like any program there is room for significant improvement in certain areas. One such area is the program documentation.

Thorough and accurate documentation of program activities is important for a couple of reasons. For one, a well documented program allows for understanding of why each element of the program is necessary to the success of the entire program. This becomes important when resources to carry out the program are cut and certain elements of the program must be cut back or eliminated. It is also important when staff turnover is substantial because thorough documentation helps new staff determine why the program works in a particular way. Without clear documentation new staff may be in the counter-productive position of re-inventing the program instead of just modifying it.

From reviewing the Environmental Monitoring Plan and supporting documents it is clear that the EMP documentation is not always consistent and that the justifications and criteria used for many of the EMP activities have not been written into the monitoring plan. Many of the comments in the five media reviews reflect concerns with justifications, inconsistencies, and lack of clarity in the Environmental Monitoring Plan or other EMP support documents. Increased attention to completeness and consistency will enable FERMCO and DOE to better modify the EMP due to budget cuts and changing priorities.

Another concern related to the documentation is the fact that the Environmental Monitoring Plan does not appear to be followed at times. While periodic minor deviations are to be expected with this type of sampling program, there are a couple of cases where the deviations appear to be significant and prolonged.

Specifically, the milk sampling requires two indicator locations according to the Environmental Monitoring Plan, but only one indicator is taken. Why two indicators are required is unclear, but the plan needs to explain the reason that only one is taken. It is certainly plausible that FERMCO and DOE have been unable to gain access agreements needed to sample a second indicator location. If this is the case it needs to be documented. Additionally, beef

sampling is supposed to happen at least annually according to the Environmental Monitoring Plan. It has happened only twice in five years.

The Environmental Monitoring Plan requires that, "Significant changes to the Program must be approved by DOE/FN and incorporated in the EMP before they can be implemented." This requirement appears to be breached by the deviations cited above. Efforts should be made to adhere to the plan and to promptly update the program documentation when appropriate.

Field Procedures

Through split sampling efforts carried out with FERMCO staff, OEPA have noticed that the field procedures are not always executed in the same way by the sampling technicians. This may introduce an undesirable variability into the sampling results and is therefore a concern. In addition to the required training for the sampling technicians, OEPA recommends that field audits be carried out as a requirement of the Environmental Monitoring Plan. This will improve the consistency of the EMP sampling, and the reliability of the sample results.

Site Environmental Report

The SER regularly uses a conversion of $.6757 \mu\text{g/L} = \text{picocurie/L}$. This conversion factor is presented in the Conversion Table "For Natural Uranium in Water" on page ix of the SER and is also apparent in Figure 40 on page 106. Such direct conversions of mass to activity are difficult due to the different half-lives of the various isotopes and it is certainly reasonable to provide some rough conversion factor in the SER.

The conversion factor for natural uranium in water that is used by USEPA in the development of the Maximum Contaminant Level for uranium and Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings is $20 \mu\text{g/L} = 30 \text{ picocurie/L}$. It is obvious that these conversion factors not only are significantly different, they run counter to one another. If the FERMCO conversion factor is established to meet site specific monitoring results it should be identified as such. Otherwise an explanation of the difference should be included in all future versions of the SER.

In the SER a wide variety of data are presented to the public each year. To help everyone interpret the results more easily, OEPA recommends the addition of a table in Appendix 1 of the SER that shows background values of the EMP's parameters. The table should provide a quick reference that can be used to compare sampling results to regional background levels and will compliment the regulatory standards that are currently in some of the tables.

GROUNDWATER

Program Description

Fernald conducts a groundwater monitoring program which includes the routine sampling of 490 private and DOE owned wells. All groundwater sampling done at Fernald is split into two major programs; the Comprehensive Groundwater Monitoring Program (CGMP), which covers all site owned wells (454 wells in 1993), and the Radiological Environmental Monitoring (REM) program, which covers the sampling of privately owned wells (36 wells in 1993). As a regulatory function, Ohio EPA previously reviewed and concurred with the Fernald CGMP as described on page 97 of the 1993 Fernald SER. Therefore, the CGMP was not reviewed during the preparation of the following comments. The comments below pertain to the Fernald REM program and related planning and procedural documents.

Review Activities

There were five measures by which Ohio EPA evaluated the Fernald Environmental Monitoring Program and the 1993 SER. These included Fernald's choice of sampling locations, parameters, field procedures, and data interpretation. The REM was compared against these four measures and against objectives contained in the Environmental Surveillance Sampling Design objectives contained in section 5.4 of the Fernald Environmental Monitoring Plan dated 5-31-93. In addition, site operating procedures for the REM that are related to the site groundwater review were critiqued.

Review Findings

Fernald's sampling locations and parameters were evaluated to determine their appropriateness in meeting the objectives of the Environmental Monitoring Program and were also compared to the most comprehensive site-wide data available, the OU5RI. The environmental monitoring sampling locations and analytical parameters appear to be adequate based on the most current site information.

It is, however, important to note that neither DOE nor FERMCO have clearly established criteria governing selection and deletion of private well locations for sampling. OEPA views this as a deficiency because in times of limited resources it is important to make systematic decisions regarding the value of sampling locations. Without established evaluative criteria such decisions are more likely to be haphazard. Well defined decision making criteria need to be in place. It is clear that non routine private well sampling is done at the request of well owners. It is not clear when those wells sampled by request will be brought into the routine sampling. It is also not clear when the value of continued sampling at a given well is reevaluated. Fernald should consider an annual evaluation of private well sampling locations to help ensure the maximum effectiveness of their sampling program.

The largest concern with the groundwater sampling is FERMCO's procedure for the kinetic phosphorescence method (KPA) used to analyze the samples. While KPA is not a USEPA approved method, it is a generally accepted method for determining total uranium in a

sample. The specific problem with the way in which FERMCO carries out this method for water samples is explained in detail in the General Comments section of this report.

OEPA staff noted during field activities that FERMCO field personnel do not consistently use latex gloves when collecting groundwater samples from private wells. It is recommended that latex gloves be worn to reduce the possibility of cross-contamination of the samples.

The following includes specific comments on the SER.

On page 114 of the 1993 SER, vinyl chloride is described as being associated with gasoline. This statement implies that vinyl chloride is found in gasoline. OEPA finds this statement misleading because vinyl chloride is not found in gasoline or other petroleum distillates. It is most commonly associated with the degradation of chlorinated volatile organic compounds (VOCs) and as production material in the plastics industry. This text should be revised in future SERs.

The uranium plume on page 106 of the SER does not match the extent of the South Plume as depicted in the OU5RI Plates. The information in the Plates is correct and is the fullest characterization of the nature and extent of groundwater contamination. Future presentations of plume boundaries must reflect the findings of the OU5RI with appropriate modifications for subsequent migration and remediation.

SURFACE WATER AND SEDIMENT

Program Description

FERMCO monitors effluents for radioactive and non-radioactive pollutants. FERMCO has identified eleven basic sources of liquid effluent (ref:SER 1993, p82). Monitoring is conducted in accordance with the applicable requirements of DOE Orders and other federal, state, and local standards (ref: EMP, PL-1002, rev. 1, section 2.1). FERMCO's monitoring program objectives are to assess the impact of liquid releases on members of the general public and the environment, and to be capable of verifying and/or determining compliance with applicable environmental statutes, regulations, and standards. Monitoring activities shall provide the data necessary to characterize releases, determine performance of equipment, establish trends, support environmental management decisions, and demonstrate compliance with legal and regulatory requirements set forth in applicable environmental statutes, regulations, and standards. The program shall also be capable of detecting and quantifying unplanned releases.

Review Activities

As a requirement of the AIP, OFFO staff reviewed the SER for 1993, EMP, and the REM. The sections pertaining to surface water sampling that were reviewed include Chapter Five of the SER; Section 2.0 of the EMP; and EM-RM-003, EP-REM-003, EP-REM-005, and EP-REM-009 of the REM. Review of the sampling locations, choice of parameters, analytical methods, field procedures, and analysis and interpretation of data were performed with regard to program objectives and approved procedures. Sampling location, parameter, and analytical method requirements from NPDES permits and stormwater permit applications, which are reviewed as part of the OEPA regulatory function, were not reviewed as part of this report.

Review Findings-Surface Water

Twelve surface water locations are currently sampled by FERMCO (Figure 32, SER). OEPA recommends adding a monitoring location downstream of the confluence of Paddy's Run and the Great Miami River in close proximity to the point of thorough mixing. Paddy's Run has the potential for carrying significant releases from Fernald into the Great Miami River (GMR). Station W4, the only station currently located downstream from the confluence of Paddy's Run and the GMR, is 9.3 km downstream. This relatively long distance may diminish any influences from Paddy's Run. It also allows the potential for other influences (e.g. non-point source influences from agriculture, the golf course, the airport; illegal dumping activities, etc.) to affect monitoring parameters.

Surface water samples should be taken at the storm sewer outfall ditch (SSOD), Paddy's Run, and the northeast drainage basin (e.g. at SWS-013 in figure 4-15 of the Operable Unit 5 Remedial Investigation Report) during storm events (SWS-013 could be sampled periodically rather than at each storm event). Sampling of the SSOD and Paddy's Run are particularly important during storm events which cause the Storm Water Retention Basins (SWRB) to overflow. When sampling radionuclides during storm events, stormwater sampling protocols should follow those in the NPDES Storm Water Sampling Guidance Document (USEPA 833-B-

92-001, July 1992). First flush and composite event sampling should be performed.

Surface water and sediment samples should be taken from the pond at Camp Ross Trails in the northeast drainage basin periodically, at least in five year increments and possibly more often pending the results of future sampling.

How the number of background samples for sediment and surface water derived needs to be explained better in the EMP documentation.

Reference is made in FERMCO's REM to wearing a life preserver "when in or near deep water" without defining "deep" water. This should be defined. For safety, two people should be present to conduct field sampling activities.

OEPA has observed FERMCO field personnel taking pH, conductivity, and temperature from the same surface water sample sent to the laboratory for analysis. This procedure is contrary to the procedure in EP-REM-009, 6.4.3-6.4.4.

OEPA has observed FERMCO personnel filling sample bottles without rinsing them with stream water first contrary to EP-REM-009, 6.4.3(C), and using pH, and conductivity probes without rinsing the probes with deionized water contrary to EP-REM-004, 6.2.22, 6.2.23. OEPA recommends taking field measurements (pH, conductivity, dissolved oxygen) directly in the stream rather than from the sample container.

Changes that were made to the NPDES permit were listed in the SER but the rationale for those changes were not explained. There were also no explanations given for those few exceedances of the NPDES limits. Any changes from previous years reporting or unusual values such as exceedances of limits should be explained in the SER.

Table 11 in the SER lists total curies for the radionuclides rather than picocuries as the other amounts are expressed. This makes direct comparison difficult, particularly since the picocurie is one trillionth of the curie.

Listing previous years results for comparison is desirable. This was done in the 1992 SER in Table 11. This addition makes it much easier to evaluate trends over time.

Table 11 does not include radionuclides discharged to the Great Miami River through uncontrolled stormwater runoff. The SER states that high and variable values were detected in the vicinity of W-10 and attributes the variability to varying precipitation and flow rates. As recommended above, sampling should take place during storm events (both first flush and event composites) to better understand the releases of radionuclides from the site during these events. Section 1.0 of EM-RM-003 should include evaluating effects of uncontrolled runoff. Expression of the amounts released should be made in total picocuries as well as picocuries per liter.

Although total alpha/beta activity is monitored on a more frequent basis than the isotopic radionuclides, results of those analyses do not appear in the SER. It is not clear why these results are not presented in the SER. This needs to be explained.

Statements in the SER indicate that significant inputs of uranium into Paddy's Run may be occurring during storm events (e.g. "High average values from W10-US, W10, W10-DS are due to a few very high weekly results", Figure 33). Reasons and potential sources for these high results should be given.

Data in Figure 33 in the SER should include station W10-DD or an explanation as to why it is not included.

Composite and grab samples should be labeled as such.

Review Findings-Sediment

Sediment samples were not analyzed for fission products whereas surface water samples were. Fission products were found in the surface water samples. Explanation should be given as to why sediments were not analyzed for fission products.

The upper three sediment stations on the GMR appear to be background stations but are not characterized as such in the SER or EM-RM-003. Only the four upstream Paddy's Run stations appear to be listed as background stations (BKGD 1-4). The criteria for selection of the background sample locations should be better documented.

Sediment samples should be taken from the stream and not from above the water line as indicated in EM-RM-003. Taking them above the water line as described allows the opportunity for airborne material to contaminate the sample and may not allow the sampler to obtain recently deposited sediments. It is also recommended that splitting of sediment samples occur as outlined for water samples in EM-RM-003 6.3.3 (i.e. fill each container partially in steps).

Sediment samples are currently collected twice each year. Once in the spring and once in the fall. Due to the flow patterns in the streams sampled by FERMCO, OEPA recommends reduction of this sampling to once per year in the fall, between late September and early November. That is the time of year when the Great Miami River and Paddy's Run will typically have the largest quantity of sediment. The scouring action of storm runoff in the spring and late fall tends to wash out the sediment leaving no real sediment to sample. Therefore, sampling during the spring is of little value when analyzing contamination in sediment.

The Environmental Monitoring Plan should explain how the 100 meter interval sediment sampling in the storm sewer outfall ditch (SSOD) was determined. Additionally, the rationale for not having any cross-sectional sampling in the SSOD should be explained in EM-RM-003, page 1, attachment C.

AIR MONITORING

Program Description

Fernald conducts a continuous air monitoring program which includes the monitoring of suspended uranium, radon and other radioactive and non-radioactive matter. Air pollutants that are monitored are dispersed into the atmosphere by two primary methods: point source (through stacks on site) and by fugitive dispersion (large areas in which wind can lift and redeposit pollutants).

Since most of the point sources on the site have been shut down as a result of the shifting emphasis from production to remediation, most of Fernald's efforts have been on the monitoring of fugitive emissions. The site, in 1993, operated 20 high-volume air monitoring stations. This number includes both on-site and off-site monitoring locations. Filters from these sites are collected weekly and analyzed for uranium. Fernald also retains portions of each weekly sample to run annual composite samples for other radionuclides.

Radon is monitored in and adjacent to the site by the use of alpha-track etch detectors and alpha-scintillation detectors. Alpha-track detectors are collected and analyzed every three months. The alpha-scintillation detectors, however, record radon levels every hour. These detectors are located at three fence-line air monitoring locations as well as around the K-65 silos and in the headspace within the silos.

Review Activities

The review of Fernald's air monitoring program is part of an overall effort by Ohio EPA/OFFO to review Fernald's 1993 Environmental Monitoring Program. This review, a requirement of the AIP, includes commentary on several documents including the 1993 SER, the REM, and Fernald's Site Environmental Monitoring Plan.

The review of these documents was accomplished by comparing available information to four measures proposed by Ohio EPA. These measures included Fernald's choice of sampling locations, parameters, field procedures, and data interpretation. These measures will also be compared to the OUSRI, which is Fernald's most comprehensive site-wide data available.

The sections pertaining to air monitoring that were reviewed include Chapter 5 and Chapter 8 of the Site Environmental Report; EP-REM-001, EP-REM-002 and EP-REM-011 of the REM, and Sections 11.2, 11.3, 11.4.1, 11.4.2, 11.4.2.1, 11.4.2.2, 5.6.1 3, and 8.4 of the Site Environmental Monitoring Plan. Due to the number of documents discovered in this review, OFFO was unable to include all available documents in the 1993 review. These documents may be included in future evaluations. Specific sections not reviewed include EM-RM-004, Section 6.7.2, EP-REM-002, Sections 1-8, EP-REM-01, Section 6.2, EM-RM-014 and EP-REM-001, Section 6.1.5 of the REM.

Review Findings

The sampling locations as described in the SER were evaluated to determine if they are in an area which will allow for optimum monitoring. Fernald's air monitoring stations sample for different parameters and are scattered throughout the area, both on and off-site. The sampling locations of the air high volume particulate monitoring stations appear to be adequate. The majority of these monitoring stations are located along the fenceline and along the production area, and they are north and northeast of the site. This appears to be the prime location as they are located in the prevailing wind direction.

Fernald also monitors for radon utilizing alpha-track etch detectors at 27 locations, including both on-site, fenceline and background stations. The cups are spaced along the perimeter of the site as well as the K-65 silos, which constitute the main source of radon emissions at Fernald. The concentration of monitors, especially around the silo area, appear to be adequate.

Fifteen alpha-scintillation detectors are operated along and within the site boundary. Four monitors are placed around the K-65 silos. Although radon has a short half-life, OEPA suggests placing additional detectors in the prevailing wind direction. An expansion of this continuous monitoring program would be beneficial, as this detection method gives real-time results. Additional real-time monitoring will also be needed during vitrification of the K-65 silo material. It would be advantageous to begin this monitoring as soon as possible in order to have a background in which to compare the operating data. Information needs to be provided that includes how often readings from the alpha-scintillation detectors are monitored and if audible alarms are used in case of elevated radon levels. One benefit of this equipment is the ability to read results soon after the sample is collected. Without trained personnel to monitor radon levels, the real-time aspect is lost.

Direct radiation, in the form of X-rays and gamma rays are monitored through the use of thermoluminescent dosimeters (TLD's) located at 25 on-site and 4 background locations. Similar to the other alpha detectors, most of the detectors are located along the fenceline, with the largest concentration near the K-65 silos. These locations are adequate, however, it would be advantageous to place additional detectors to provide even spacing of the monitors. As the TLD's are collected every three months, they and the radon cups cannot be used to provide immediate data, thus the need for increased continuous radon monitoring through alpha scintillation detectors.

One area of concern regarding the utilization of mechanical air monitoring devices (alpha-scintillation detectors and high-volume air samplers) is the exposure to extreme cold during winter months. Is the air monitoring equipment subject to freeze-up in the winter? If so, please describe precautions that are taken to keep this from occurring. In view of the future schedule for building demolition, continuous monitoring is crucial.

Non-radiological monitoring is also conducted at Fernald. Sulfur dioxide, nitrogen

oxides and carbon monoxide are monitored at the boiler plant per federal Clear Air Act regulations. As part of permit requirements, required stack tests and opacity monitoring are conducted.

Asbestos monitoring is not mentioned in the SER. Fernald should have a comprehensive program in place that addresses the monitoring and control of airborne asbestos. With upcoming remediation activities taking place, the monitoring and control of asbestos becomes crucial.

Monitoring parameters for both radioactive and non-radioactive air pollutants are dependant upon the type of monitoring performed and the equipment used. At each particulate air monitoring station, filters are analyzed for total uranium. A portion of each sample is retained in order to prepare an annual composite sample which is analyzed for isotopic uranium, neptunium, plutonium, and thorium. Fernald needs to supply sufficient justification for monitoring neptunium and plutonium. OEPA does not feel that these are radionuclides of concern. In addition, please explain why samples are not analyzed for radium. As mentioned in previous sections, Fernald needs to implement a monitoring plan for asbestos and should provide the parameter for this constituent in this section. Other parameters appear to be adequate, but may need to be changed to analyze for certain constituents more frequently once remediation activities begin.

Direct radiation monitoring also appears to be adequate, analyzing for radium, thorium and their decay products. Once again, parameters and sampling frequencies may need to be altered once remediation activities take place.

Non-radiological monitoring at the site includes the monitoring of sulfur dioxide, nitrogen oxides and carbon monoxide that are emitted from the boiler plant. These parameters are governed by the Clean Air Act under the authority of USEPA, delegated to Ohio EPA. Because of USEPA's authority, the non-radiological monitoring parameters are deemed appropriate.

The following includes specific comments on the SER.

1. Page 67: The text states that air monitoring for stacks is accomplished by stack sampling. More detail would be helpful by describing how stacks are sampled and which stacks undergo this process.
2. Page 135: Are the second quarter lower-than-average radon concentrations noted in Figure 51 due to quality assurance problems as noted in the text? Please give an explanation why the readings were significantly lower than the remaining three quarters.

The following comments are from Fernald's Site Environmental Monitoring Plan.

1. Page 3-6, CRU 1: Waste Pits 1, 2 and 3 are described as having negligible wind erosion

due to a vegetative cover. However, the next sentence states that there are sections of the pits that are not covered by vegetation. Please clarify these sentences including the status of the vegetative cover and in the case of a lack of cover, how wind erosion is prevented.

2. Page 3-7: The text states that CRU 3, 4, and 5 have low or no fugitive emissions. OEPA is concerned this may not be the case once remediation starts. We believe efforts need to be undertaken now to design the EMP around remediation activities.
3. Page 3-21: Provide an update regarding the proposal to compare the measured concentrations to standards provided in the NESHAP appendixes. Has this proposal been accepted?
4. Page 5-27: Update the section on the split sampling between Fernald and ODH. Ohio EPA OFFO has taken over split sampling responsibilities from ODH.

The following comments are from the REM.

1. EP-REM-001, Section 6.4.8: The procedure states, "if a filter to be installed in the high volume pump is damaged, the REM field supervisor is to be notified." If this will result in downtime of the monitoring station, would it not be possible to always carry an extra filter in case one is damaged or inspect the replacement filters before field activities? All efforts should be made to keep downtime to a minimum.
2. EP-REM-001, Attachment A: Several of the maps at the end of EP-REM-001 list an air monitoring station at SWOAPCA (Southwest Ohio Air Pollution Control Agency). SWOAPCA should be changed to DESAQM (Department of Environmental Services - Air Quality Management).
3. EM-RM-004, Section 6.4.2: The REM Manager should be notified if an increase or decrease of 150% or more is noticed from last week's results. Please provide a basis for the selection of the 150% decision point.
4. EP-REM-011, Section 6.3.2: Step G in this section describes sealing the detectors in a Mylar sleeve and sealing with tape. It is not clear if custody tape is used or not. If not, custody tape should be used to seal all samples.

Although the preceding review of the Site Environmental Report is for the 1993 monitoring year, there will be activity in the coming years that will greatly effect the air monitoring program. Calendar year 1994 saw the demolition of Plant 7, the first in a number of planned demolitions at Fernald. These demolition activities, in addition to other remediation actions, have the potential to generate and resuspend particulates. Fernald will need to be aware of these upcoming projects and should be developing plans to monitor and control particulate emissions. At a minimum, additional air monitoring stations should be installed in addition to a

periodic review of the locations of current stations. Fernald should also pursue the investigation of real-time monitoring for uranium and how this technology, when available, will be implemented.

SOIL AND GRASS

Program Description

Fernald conducts annual soil and grass sampling at approximately 30 locations as a part of the Environmental Monitoring Program. The main purpose of this sampling is to identify trends in the levels of uranium found in the surface soils on and around Fernald. No sampling is currently performed for non-radiological contaminants. Several of the sampling points are located at the air monitoring stations on and around Fernald and the other locations are off-site. Surface soil samples are collected at two depths, 0-2 inches and 2-4 inches where recent deposition of the target analytes would be evident. Composite grass samples are collected around each soil sampling location at the same time that the soil is collected. Both soil and grass samples are analyzed for total uranium.

Review Activities

There were five measures by which OEPA/OFFO evaluated the Fernald Environmental Monitoring Program and the 1993 SER. These included choice of sampling locations, parameters, field procedures, and data interpretation. Soil and grass sampling activities were compared against these four measures and against objectives contained in the Fernald Environmental Monitoring Plan (EMP) dated 5-31-93. In addition, SOPs in the REM that are related to the site soil and grass sampling review were critiqued. The OU5RI was used to compare the known extent of contamination to locations and parameters of the monitoring program.

In order to complete this review in a timely fashion, the soil review was limited in a couple of ways. The radiological contaminant sampling review was limited to the near surface soils that area residents or site workers may most easily come in contact. This also includes review and activities in the OU5RI as well. Additionally, non-radiological contaminants were given an initial review. Future OEPA/OFFO review of the Environmental Monitoring Program may include examination of radiological soil contamination at greater depths and will involve more extensive review of off-site non-radiological contamination.

Review Findings

When the sampling locations were compared against the data gathered for the OU5RI, the EMP sampling locations appeared to appropriately delineate the area known to contain elevated levels of uranium in the surface soil. More than adequate background soil and grass sampling locations also exist.

It is unclear from the EMP and from the SOPs what criteria were used to establish the sampling locations. Discussion of this issue with FERMCO staff indicate that American Society for Testing and Materials (ASTM) Standard C 998-90 was used to guide the selection of locations and procedures for soil and grass sampling. This is an appropriate mechanism for sampling design, but a reference to the standard must be included in either the EMP or SOPs to properly document the sampling program. This finding is supported by DOE requirements

contained in DOE Order 5400.1 Section 4 and further reflects the need for increased attention to the thorough documentation of Fernald's Environmental Monitoring Program.

The soil and grass sampling procedures indicate frequency and schedule for the collection of samples is left to the "discretion of E/S [Engineer/Scientist]". OEPA finds that this alone is an undesirable method for controlling the frequency and schedule. Recognizing that some discretion in any sampling regime is necessary, written criteria should be established and/or referenced to guide the selection of sampling locations and for setting appropriate time frames for sample collection.

As noted above, there is not an ongoing non-radiological soil sampling regimen at Fernald. Review of the OU5RI revealed that elevated levels of barium, beryllium, calcium, pesticides, VOCs, and polynuclear aromatic hydrocarbons (PAHs) have been identified at various locations outside of Fernald. While not all off-site contamination necessarily relates to past Fernald activities, some of the contaminants noted in the OU5RI are characteristic of the former Feed Materials Production Center (FMPC) operations. OEPA's initial review of the OU5RI information regarding non-radiological constituents, indicates that FERMCO should evaluate the need for off-site non-radiological monitoring. This will become even more important as the Decontamination and Decommissioning (D&D) and restoration activities pick up over the next several years.

The increase in activity will lead to greater opportunities for airborne transport of radiological and non-radiological contamination off-site and subsequent deposition on soil and grass around the Fernald site. In order for the soil and grass monitoring effort to operate in a way that properly identifies trends in contaminant levels off-site and meets many of the stated objectives of the environmental surveillance program, an expansion of the soil and grass parameters may be necessary. OEPA is available to work with DOE and stakeholders on the development of a revised program.

In reviewing the Soil, Grass, and Fertilizer sampling procedure (EP-REM-012) in the REM document lack clarity or sufficiency in several instances. While certainly not indicative of substantial deficiencies in the Environmental Monitoring Program, they do indicate the need for continued efforts to streamline and clarify certain aspects of the program documentation. Below are a few examples.

1. Section 6.1.1 of the procedure suggests that sampling technicians must be "properly trained", but fails to indicate what constitutes properly trained or where the training requirements might be explained in a separate procedure or document.
2. Section 6.7.8 reads, "Return bucket containing rinsate from equipment wash to field office for approved disposal." The instruction is not clear. Is the rinsate or the bucket being disposed? Is the technician responsible for this or does it fall to someone else under another procedure? If the technician must dispose of the waste, then an

appropriate disposal method should be indicated or referenced in this SOP.

3. Section 6.2.3 does not provide the rationale behind the collection of fertilizer samples. Nor does the Environmental Monitoring Plan (PL-1002). While it makes sense to check fertilizer for possible uranium content, the rationale behind this decision is not provided within the EMP documentation. The EMP and supporting documentation are expected to fully provide the justifications for all activities carried out under the Environmental Monitoring Program.

The following comment is from the SER.

1. In the presentation of the soil and grass data to the public it is desirable to add a map with soil uranium concentrations in pCi/g. This can be done much like the groundwater plume displayed on page 106. The map of sampling locations can be used, with the addition of contour lines for contamination zones. Because data gathered in the soil and grass sampling is used for analysis of trends, members of the public could then compare the sampling results to the known extent of contamination and make their own judgements about the contaminant levels.

FOODSTUFFS

Program Description

Fernald monitors local produce, milk, fish and meat for radioactive contaminants. These programs include the collection of produce and fish samples annually, milk samples monthly, and beef samples collected every three years.

Produce is collected from the local farmers, gardens, and fruit and vegetable stands. The areas sampled are those most likely to show elevated concentrations of uranium due to airborne deposition or irrigation with ground or surface water which may contain uranium from past Fernald operations. Produce locations are selected based on availability during the fall before harvest time. A variety of produce is collected from above and below ground including cabbage, sweet corn, soybeans, tomatoes, lettuce, beets, green beans, and apples. Soil samples are collected in the same area as produce to compare uranium concentrations between the two media. If the produce was fertilized, an attempt is made to get a fertilizer sample for analysis.

The milk program includes analysis of samples monthly for uranium. Samples are collected at a local dairy and from a background location in Indiana. Once a year, between May and July, the milk samples are analyzed for additional radioactive contaminants. These include isotopic thorium, isotopic uranium, radium-226 & 228, strontium-90, and several other radionuclides.

The fish sampling program consists of an annual electrofishing event along the Great Miami River during August or September. The sampling is conducted by the University of Cincinnati with assistance from FERMCO personnel. The fish are collected at three locations. These include one upstream point at the bridge below Route 127, midstream at the effluent discharge point, and downstream at the outfall of Paddys Run into the GMR. Fish samples that are likely to be eaten by humans are analyzed for total uranium to detect an estimated dose. Other fish are sampled to detect possible bioaccumulation of uranium.

The beef sampling program consists of obtaining samples once every three years. A beef indicator and control sample were collected in 1991 and 1994. The indicator sample is taken from an animal fed and watered from locations down gradient of Fernald. The control sample is collected from a location outside Fernald's influence, approximately 25 miles away. The beef samples are analyzed for isotopic uranium, isotopic thorium, radium-226 & 228, strontium-90, and technetium-99. A gamma scan for Cs-137 is conducted and used as a target parameter.

Review Activities

OEPA/OFFO evaluated Fernald's produce, milk, fish, and meat monitoring programs. Produce, milk, fish, and meat sampling activities were compared against objectives contained in the Fernald EMP and against five other measures. These include Fernald's choice of sampling locations, parameters, analytical methods, field procedures, and data interpretation. In addition, the SOPs in the REM were critiqued.

Review Findings-Produce

The produce sampling locations from the EMP were compared against the locations and data gathered in the OU5RI. The RI sampling points were selected based on Fernald's stack emission depositional pattern. However, the criteria used to establish the produce sampling locations in the EMP are unclear. If an ASTM or other method for the selection of sampling locations and procedures for produce is used, it is not referenced in the Environmental Monitoring Program documentation. The only apparent criteria is the desire to obtain samples of a few key crops regularly grown in the area each year.

The following are comments pertaining to the EMP.

1. Section 5.0 includes basic information on the environmental surveillance activities in the Environmental Monitoring Program. The text of the plan that covers the produce sampling indicates that, "Based on the annual dose to members of the public (Table 5-2), a minimum of five produce samples shall be collected locally within 15 km of the Fernald site." Table 5-2 lists the annual approximate dose level from produce as 0.0 mrem, and the corresponding minimum number of samples as zero. This same inconsistency between the text and Table 5-2 also exists for milk, fish, and meat. The basis for the numbers in the table is not clear and the justification for the numbers in the text is unfortunately not stated clearly enough to explain the discrepancies. This kind of inconsistency in the documentation needs to be corrected in future drafts of the Environmental Monitoring Plan. This is an example of the type of confusion in the program documentation that lead to the general finding in Section 2 of this report.

Section EP-REM-006 of the REM, the SOPs raise a few minor concerns on completeness of the produce sampling.

1. Section 6.3 is unclear. There needs to be more detail on the procedures of sample preparation.
2. Sections 6.4 and 6.5.3: (a) The actual sampling techniques for collecting produce, soil, and fertilizer samples are unclear. Procedures should be outlined in these sections. The reference to EP-REM-012 is appropriate since the same techniques are used. But, it is only implied that the soil sample is being collected along with produce.

(b) No explanation is provided about whether or why a fertilizer sample is being collected with the produce and soil or if it is taken from the same location. The rationale behind collecting these media from the same location simultaneously should be provided, if not in the SOP, then in the Environmental Monitoring Plan.
3. Attachment A: This attachment provides sampling points on a map for collecting crop

and produce samples. Clarify how these locations were initially selected. Was distance from the facility a factor, location in the 'footprint', or public concerns the driver to selection?

Review Findings-Milk

One concern with the milk sampling is that milk is analyzed for isotopic uranium when other media are analyzed for total uranium. The EMP documentation should contain the rationale for this distinction.

As noted above, there is a discrepancy in the number of required sample locations in Chapter 5 of the Environmental Monitoring Plan. The text calls for a minimum of three locations (2 indicator, 1 background). Table 5-2 lists zero as the minimum required number of samples. Furthermore, chapter 11 of the plan notes that one indicator and one background sample are actually collected.

When OEPA asked FERMC0 about the requirement for three locations (Chapter 5 text), no one currently on staff could explain exactly how that number of samples was ever established. It is apparent, however, that three samples are not collected. Without knowing how the initial requirement was established it is impossible to determine if the shift from three to two meets the requirements once established for the program. Current staff must rely on their best judgement, or some other method to determine an appropriate number of sampling locations. This again highlights the need to properly document the logic of EMP activities in the Environmental Monitoring Plan and the SOPs. Without thorough documentation the activities of the program may appear to be arbitrary and even wasteful over time.

Review Findings-Fish and Meat

With regard to the fish sampling, OEPA finds that there is disagreement between the number of sampling locations as described in the Environmental Monitoring Plan and the SOPs. Additionally, the SOP (EP-REM-05) is insufficient in terms of its explanation of the techniques used for the fish capture and preparation of samples.

Fish sampling station number two has been deleted for the 1993 SER with no explanation given. Changes from one year to the next such as this should be explained in the SER.

The current fish sampling station at RM19 (at the confluence of Paddy's Run and the GMR) may not include fish influenced by Paddy's Run. The fish from station RM19 may easily move upstream out of the influence of any outfall from Paddy's Run. Rather than the RM19 station, a fish sampling station further downstream from the confluence of Paddy's Run (in close proximity to the point of thorough mixing) and a fish sampling station from Paddy's Run itself in the vicinity of station W8 or as far upstream as practical are recommended. Changing the stations as recommended would increase the likelihood of sampled fish being under any influence from Paddy's Run.

There is no indication as to whether whole fish or fish fillets were used for the fish monitoring for uranium. Both parameters have value. The latter will be more indicative of human exposure to edible portions of fish consumed whereas the former is valuable to determine dose to aquatic organisms. Fillets should be taken from those fish normally consumed as food fish and whole fish should be used for all other analyses. The SER should indicate whether whole fish or fillets were used for analysis.

OEPA review of the meat sampling was minimal because the documentation contained in the Environmental Monitoring Program is not currently followed and hasn't been for the past three years. This despite the fact that on page 1-13 of the EMP indicates that, "Significant changes to the Program must be approved by DOE/FN and incorporated in the EMP before they can be implemented." No alternative documentation was received and therefore it appears that the plan is simply not being executed in this instance. OEPA, like DOE, expects that the plan presented as the driver of the EMP activities should be followed, and when changes become appropriate they should be made as quickly as possible and documented.

DOSE CALCULATION REVIEW

The Site Environmental Report presents a summary and some interpretation of the data gathered at the site each calendar year in the Environmental Monitoring Program. A major part of this presentation is the dose estimated radiation dose attributable to the site. As part of this review the method for calculating the estimated dose and the numerical calculations presented in the 1993 SER were evaluated. The Ohio Department of Health (ODH) conducted this portion of the Environmental Monitoring Program review.

Review Findings

Review of the method used to calculate annual total effective dose equivalent (TEDE) at Fernald identified no deficiencies. FERMCO uses industry standards that are accepted by the Nuclear Regulatory Commission (NRC) and USEPA to compute the TEDE. The further review of the actual calculations found no difference between the TEDE calculated by ODH and that presented in the 1993 SER. ODH believes that the dose information presented in the SER accurately reflects the situation around the facility.

PUBLIC CONCERNS

The final category for evaluation is a critical component for the success of the entire Environmental Monitoring Program (EMP) at Fernald. Public health and safety are the ultimate reasons for environmental restoration efforts and hearing the concerns of the public are a necessary element in the cleanup process. The evaluation of public concerns and opinions about the EMP prove that in general, the public is satisfied with environmental monitoring at Fernald, and in particular they are impressed with the Site Environmental Report.

Public opinion of Fernald's EMP was evaluated using two approaches. First, OFFO looked at the Reader Information Cards that were returned to the FERMC (Fernald Environmental Restoration Management Company) environmental monitoring team by SER readers. These 25 responses indicated general support for the 1993 SER. The second method of evaluation involved direct feedback from the community by holding two public meetings. The meetings proved to be beneficial by evoking discussion and receiving comments from the public about the EMP. Both of these evaluation methods will be expanded on further in the following paragraphs.

Response Cards

Reader Information Cards from the SER were received from about 25 community members, employees, contractors and students. All of the responses were generally favorable to the SER and in particular to the Executive Summary. The response cards did not provide public comments on the EMP, rather a few of them offered more specific comments on the SER. The majority of these more specific comments were about the format of the document.

The comment cards were not very helpful for our evaluation because they did not assess the EMP as a whole, rather they were specific to the SER document itself. In order to get a more complete public perspective for our evaluation, OFFO sponsored two public meetings early in 1995 to raise discussion on the EMP.

Public Meetings

In order to generate public discussion and facilitate a critical look at the EMP by the community, OFFO sponsored two public meetings. These meetings were intended to provide an open and candid forum to hear the questions and concerns the community has about environmental monitoring.

On Wednesday, January 11, 1995 at 6:30 p.m. a public meeting with members of Fernald Residents for Environmental Safety and Health (FRESH) and the Fernald Citizens Task Force (Site Specific Advisory Board) was held at Venice Presbyterian Church in Ross, Ohio. A second meeting was held on Wednesday, February 15, 1995 at 7:00 p.m. at Crosby Elementary for environmentally monitored property owners. Separate meetings were held in order to more fully address the concerns of the two different interest groups. Unfortunately, due to low attendance, the second meeting did not bring the response as had been anticipated.

At these meetings OFFO staff explained the drivers of the environmental monitoring evaluation process. First, the origins and funding of OFFO's environmental monitoring team were explained. Then the actual evaluation process was described with the sections of the report highlighted. Next OFFO's current split sampling program was discussed with an explanation of sampling locations, media, and parameters. Finally, OFFO's plans for further environmental monitoring and the expected Sampling Plan were explained.

This open discussion between the community and the regulators proved to be a very effective method to evaluate public concerns about environmental monitoring at Fernald. Comments critical of the EMP as well as generally positive comments of general on the EMP and the SER were received. Additionally, some very constructive suggestions about the expansion of OFFO's environmental monitoring program were received.

SUMMARY OF COMMENTS FROM PUBLIC MEETINGS

In general, the public indicated an overall approval of the 1993 SER and the EMP at Fernald. There was an overriding concern that the EMP at Fernald adapt to monitoring demands posed by the change to the Remedial Design/Remedial Action phase of cleanup. More specific comments and discussion are included in these areas: sampling locations, media, parameters and public notification of results.

Sampling Locations -- There was considerable concern that ground water contamination was moving to the east and that this be monitored. They also requested that Ohio EPA/OFFO sample the wells in the area of the effluent line to ensure that the line is not leaking into the GMR.

There were concerns that ground water was being monitored far enough south to account for the entire plume. It was requested that some of the residential wells that are abandoned due to the public water supply be retained as monitoring wells so new wells don't have to be drilled.

Media -- The change from dairy to beef farming at Knollman's farm was discussed at length and there were concerns over the associated samples. The monitored media during project specific sampling was an issue of concern.

Parameters -- There was a suggestion that Fernald's EMP sample for Mound's contaminants since they are upstream.

Public Notification -- The public was concerned about requirements for public notification of contamination. OFFO agreed to report split sampling results to the public through a quarterly fact sheet (at FRESH meetings and/or via the mail). (See Appendix II for a sample fact sheet.)

A specific list of questions and concerns summarized above is provided as Appendix III.

APPENDIX I

Determination of Uranium in Water by KPA (Kinetic Phosphorescence Analysis)

1. Scope and Application

- 1.1 This method covers the measurement of total uranium in a water sample by kinetic phosphorescence analysis;
- 1.2 Recommended pretreatment processes, the MDL, and the recommended equipment to be used to achieve the MDL.

2. Summary of the Method

- 2.1 Samples are acidified and allowed to equilibrate at least 16 hours, after which time samples are examined for particulate. If it is believed the sample could contain interferents i.e., organic compounds, chloride, etc., pretreatment and/or stringent digestion techniques could be required before analysis.

With a clear, particulate-free sample, agitate the sample and collect a (1) ml aliquot, add 1.5 ml "uraplex", then analyze in the KPA.

3. Sample Preservation and Handling

- 3.1 A determination should be made upon sample receipt whether or not the sample has been preserved. If not, preserve sample with concentrated nitric acid to a pH of <2, then allow sample to set for at least 16 hours.
- 3.2 Thoroughly shake the sample. If sample is believed to be free of interferents and contains no visible particulate, pretreatment may not be necessary.
- 3.3 If sample is believed to contain interferents and/or particulate, stringent digestion techniques (addition of H₂O₂, wet-ashing¹, evaporating¹ the sample) should be performed until a clear sample is obtainable. If particulate are still present, the appropriate pretreatment will be necessary i.e., centrifuging² and/or filtering²).

NOTE: The digestate, from which an aliquot is collected for analysis, must be clear with no visible particulate.

¹ Reduces quenching, fluorescence

² Removes particulate

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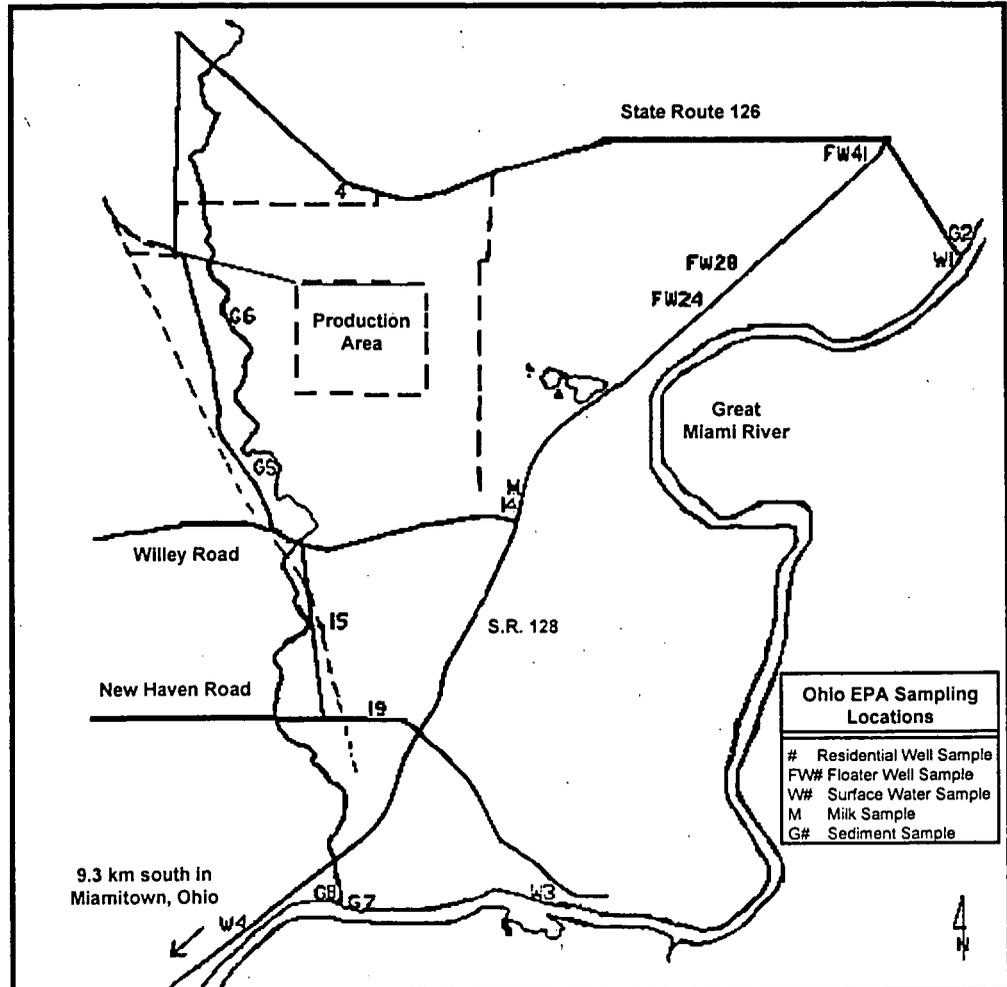
ENVIRONMENTAL MONITORING AT FERNALD

Background

The State of Ohio has conducted environmental monitoring at the U.S. Department of Energy's former nuclear production facility in Fernald, Ohio (referred to as FEMP) since 1987. The Ohio Environmental Protection Agency (EPA) assumed these responsibilities from the Ohio Department of Health in 1994.

Funding for this enhanced technical support is the result of an Agreement in Principle (AIP) between the State of Ohio and the U.S. Department of Energy (DOE). Ohio's objectives in this agreement are: 1) assuring the adequacy of Fernald's Environmental Monitoring Program; 2) emergency preparedness; and 3) public involvement and education. The Ohio EPA's Office of Federal Facilities Oversight (OFFO) in cooperation with the Ohio Department of Health is currently implementing this first objective.

* Words in italics are defined on the back page.



Sampling locations at the Fernald Environmental Management Project. Data for these locations is contained in the attached tables.

Evaluation of Fernald's EMP

As part of our obligation under the AIP, the Ohio EPA is leading an evaluation of the Environmental Monitoring Program (EMP) at Fernald. During this evaluation, OFFO will take a critical look at how environmental monitoring works at Fernald. The evaluation

will be documented in a yearly report which will be available to the public. Since this is not a one time evaluation, but rather an on-going effort, public comments on the EMP will be received throughout the year.

OFFO divided the EMP into separate categories for evaluation purposes. These areas include

private well water, surface water and sediment, soil and grass, air, foodstuffs (produce, milk, meat and fish), *dose calculation**, and public concerns. The *media* are evaluated based on sampling locations, *parameters*, analytical methods, field procedures, and analysis/ interpretation of data.

Ohio EPA Sampling

Since July of 1994 OFFO has conducted *split sampling* with Fernald on a monthly basis. One day each month samples are collected by both FEMP and OFFO. The two groups of samples are sent to different laboratories to ensure independent analysis and quality control. The

media that are split sampled include residential ground water wells, surface water, sediment and milk.

The Ohio EPA plans to expand our current sampling program at Fernald. This will include independent sampling (as opposed to split sampling).

The Next Step

The Ohio EPA environmental monitoring program at Fernald will continue to expand in 1995. Specifically, we will develop a Sampling Plan to define the scope and methods for our environmental monitoring program. The Sampling Plan will define and provide a justification for sampling

locations and procedures as well as analytical methods. The sampling plan will address both independent and split sampling.

Additionally in 1995 the evaluation of the Fernald Environmental Monitoring Program will be ongoing. OFFO will continue to evaluate changes in site conditions and respond to public concerns.

Definitions

Dose Calculation - The process of estimating the radiation absorbed.

Media - Specific environments—air, water, soil—which are the subject of regulatory concern and activities.

Parameter - The radiological or hazardous contaminant that is tested for in a sampling event (ie. total U, Ra-226).

pCi/L (picocuries per liter) - A unit of measurement for radioactivity. A picocurie is equivalent to the radioactivity present in one trillionth of one gram of pure radium.

ug/L (micrograms per liter) - A unit used to measure analytical results in concentrations which are equivalent to parts per billion (ppb).

Split Sample - Divide one sample in half from a single location. One half is collected by OFFO and the other half by Fernald Environmental Monitoring. The two samples are sent to different labs and the results are compared. This is a quality control check of the labs work.

Detection Limit (DL) - The detection limit is the lowest level of a chemical that can be distinguished from the normal "noise" of an analytical instrument or method.

The Ohio EPA will continue to evaluate the Environmental Monitoring Program at Fernald. We look forward to public input as this review process evolves. It is especially important to receive public feedback during the development of our independent sampling program.

If you have additional comments or questions we would like to hear from you. Please contact the Ohio EPA's Office of Federal Facilities Oversight at:

Ohio EPA
attn. Laura Hegge
401 East Fifth Street
Dayton, Ohio 45402-2911
1-800-686-8930

February 1995

**ENVIRONMENTAL
MONITORING AT FERNALD****GROUND WATER/RESIDENTIAL WELLS
SAMPLING RESULTS FOR TOTAL URANIUM (ug/L)**

	4	14	15	19	Floater (FW#)
SEPTEMBER	1.38	1.89	177.00	<0.10	0.57 (FW24)
OCTOBER	1.23	1.78	144.00	<0.10	0.38 (FW28)
NOVEMBER	1.20	2.00	179.00	<0.10	0.43 (FW41)

**SURFACE WATER
SAMPLING RESULTS**

MONTH/LOCATION	TOTAL U (ug/L)	Radium-226 (pCi/L)	Radium-228 (pCi/L)
SEPTEMBER	W1	1.47	<1.00
	W3	1.47	<1.00
	W4	1.00	<1.00
OCTOBER	W1	1.74	<1.00
	W3	1.78	<1.00
	W4	1.93	<1.00

**MILK
SAMPLING RESULTS**

MONTH/LOCATION	U-234 (pCi/L)	U-235 (pCi/L)	U-238 (pCi/L)
SEPTEMBER M	0.0249	<0.0268	<0.0239

¹ The proposed US EPA standard for uranium in drinking water 20 ug/L.² The proposed US EPA standard for radium-226 in drinking water is 20 pCi/L.³ The proposed US EPA standard for radium-228 in drinking water is 20 pCi/L.

**SEDIMENT
SAMPLING RESULTS (NOVEMBER)**

PARAMETER	G2	G7	G8	G5	G6
Total Uranium (ug/g)	1.33	1.42	1.16	1.09	1.25
Radium-226 (pCi/g)	0.31	0.34	0.38	<0.25	0.53
Thorium-228 (pCi/g)	<0.10	0.11	0.10	<0.10	<0.10
Thorium-230 (pCi/g)	0.10	0.72	0.15	0.20	<0.10
Thorium-232 (pCi/g)	<0.10	<0.10	<0.10	<0.10	<0.10
Cesium-137 (pCi/g)	<0.10	<0.17	<0.15	<0.16	<0.12
Lead-212 (pCi/g)	NR*	NR	0.31	0.24	0.22
Lead-214 (pCi/g)	0.41	NR	0.36	NR	0.33
Potassium-40 (pCi/g)	7.41	NR	NR	9.37	6.13

* Not Reported — Lead and potassium were not requested for sediment analysis. They were only reported when detected.

BACKGROUND REFERENCE SHEET

Background refers to the naturally occurring amount of a material in the environment. The values listed below represent an approximate range. The values listed only represent those parameters that the Ohio EPA currently samples for. Background values for ground water, surface water, and sediment are taken from the Operable Unit 5 Remedial Investigation Report (October 1994). Background values for milk are taken from the 1993 Site Environmental Report (SER).

Ground Water/Residential Wells -

Background for Total Uranium in the Great Miami River is approximately 1.2 ug/L

Surface Water -

Background values for both the Great Miami River and Paddy's Run are approximately:

	<u>Great Miami River</u>	<u>Paddy's Run</u>
Total U	1.40 ug/L	1.10 ug/L
Radium-226	0.41 pCi/L	0.35 pCi/L
Radium-228	2.20 pCi/L	2.10 pCi/L

Milk -

The background value for milk is taken about 23 miles WSW of the Fernald site:

Uranium-234	0.0650 ± 0.0330 pCi/L
Uranium-235	-0.0035 ± 0.0076 pCi/L
Uranium-238	0.0670 ± 0.0330 pCi/L

Sediment -

Background for sediment in both the Great Miami River and Paddy's Run are approximately:

	<u>Great Miami River</u>	<u>Paddy's Run</u>
Total U	3.00 ug/g	3.00 ug/g
Radium-226	0.57 pCi/g	0.50 pCi/g
Thorium-228	not detected	not available
Thorium-230	0.72 pCi/g	"
Thorium-232	0.80 pCi/g	"
Cesium-137	not detected	"

APPENDIX III**COMMENTS FROM FRESH/TASK FORCE MEETING
JANUARY 11, 1995**

The group wanted to know ODH's role in environmental sampling. It was explained that ODH was analyzing Fernald's surface water samples and they were also assisting in the review of Fernald's Site Environmental Report.

An inquiry was made regarding OFFO's budget and how much of the budget was allocated to Fernald activities. OFFO was able to provide basic information, but did not know specifics for Fernald. This information will be provided. An additional comment was made requesting information regarding OEMA's budget including how their money was distributed. The group wanted to know how the head of OEMA is appointed. OFFO did not know this information.

The attendees wanted to know if Fernald was using an accepted analytical methodology or if they were using an unapproved analytical method. The question arose whether OEPA can require Fernald to use an acceptable method? FRESH was told that OEPA was serving in an advisory capacity without legal authority unless their methods have an effect upon a RI/FS, RD/RA, ROD, etc.

Concern was expressed regarding a proposed shooting range on Willey Rd. There are monitoring wells nearby which may present a health and safety concern when wells are monitored. The group wanted to know if the lead from ammunition could possibly make it's way into creeks.

Eastward contaminant transport was also a topic of concern. The group wanted to know if OEPA was monitoring this migration. It was explained that OFFO has split sampled Branch Hill Mobile Home Park.

There seemed to be confusion on the part of FRESH regarding OFFO's split sampling program. They were under the impression that OEPA had been split sampling with Fernald instead of ODH. OEPA was not sure how FRESH came to this conclusion, but informed them that OFFO had only been split sampling on a regular basis since July.

Several of those at the meeting would like to receive split sampling results. OEPA will provide quarterly sampling results. In addition, several would like Mound sampling results. These would be available to interested persons.

Concern was raised regarding notification of the public by Fernald if off-site private wells were found to be contaminated. Specifically, there was concern that contamination might be found, but the public not notified. It was explained that effected persons probably would be told and

those at the meeting were assured that if OEPA found anything that would warrant informing the public they would be informed.

Several of those at the meeting wanted to know if OEPA is looking for additional contaminants? It was explained that OFFO is including other parameters in addition to uranium in their sampling program. It was also asked if we were looking for any Mound contaminants since the facility was located upstream. However, since Mound was so far upstream, their contaminants would not be detectable at Fernald, but Mound sampling results were available for review.

It was respectfully asked if the OFFO staff was "smart enough" to catch a mistake in Fernald's Site Environmental Report. OFFO responded that each section was reviewed by staff that had experience in the area being reviewed. OFFO also used the expertise of those in other divisions and district offices when needed.

Several persons were concerned that we are not sampling far enough down Rt. 128 and wanted to know how far down Rt. 128 was being sampled. FERMCO showed where groundwater wells 39 and 40 were located, these wells being located furthest south. The group also wanted to know if cisterns were being sampled. They were not.

Several of those present would like to see increased sampling closer to the effluent line to detect possible leakage. The location of several homes in the area of the effluent line that may be used for sampling were discussed.

It was asked why Nieman Nursery is sampled? FERMCO explained that Nieman was located north of the site and provided a background and quality control site.

There was some confusion regarding the location of several of the sampling points, specifically W10 and W10US. FERMCO explained that these were two of three surface water sampling points at the confluence of Paddy's Run and Fernald's outfall line. The confluence was sampled upstream and downstream of the confluence and at the confluence itself for characterization purposes. The locations of GW15 and GW12 were also questioned. According to FERMCO, GW15 belonged to Delta Steel and GW12 was a well that belonged to a local resident.

The detection limit for uranium was also questioned. According to OFFO, the detection limit was 0.1 µg/L for total uranium.

Several residents expressed concern regarding future changes at Knollman's Farm. According to FERMCO, at the end of March, Knollman will convert from dairy cattle to beef cattle, therefore they would not be able to use them for milk sampling. FERMCO added that due to the public water system being installed, there would also be changes in the groundwater monitoring program.

The group wanted to know if beef sampling had been performed. FERMCO said that within the

past few weeks, Fernald had submitted samples from a cow purchased from Knollman's Farm (liver, bone, and kidney samples were taken.) It was also explained that since tissue sampling requires very sensitive sampling equipment, they were currently searching for a lab that could analyze at a very low detection limit. In addition, the possibility of urine sampling cows was discussed. ODH explained that urine sampling was easier than tissue sampling and that the bone surface was the critical organ.

Several of those attending would like descriptions of the different types of sampling that OFFO conducts and why different constituents are analyzed. This information would be provided as part of OEPA's sampling plan which will be developed.

Those attending wanted to know if sampling for ecosystems (vegetation, soil, grass, etc.) would increase once remediation started. FERMCO said that project-specific sampling would take place and that the results would be in the Site Environmental Report and public affairs would be informed. It was added that sampling emphasis should be on all pathways, not just air.

A comment was received that the 1993 Site Environmental Report "looks great."

A group member would like to see more east side sampling and wants to be notified quarterly of sampling results. Suggested notification at FRESH meetings. Water and air are media of most concern and OFFO should monitor DOE-owned wells (on-site wells?)

Another of the group suggested a 15-20 minute presentation of results at FRESH meetings. They emphasized that someone needs to be there to explain results. For this individual, air is media of greatest concern, depending on which direction you live.

Additional sampling on Buehl Road was requested. Groundwater wells 39 and 40 should be monitored at Paddy's Run and Paddy's Run Rd.

Emphasized sampling to the west to make sure plume hasn't shifted westward and to closely monitor Paddy's Run Road Site.

The analytical results from monitoring well 40 were requested. FERMCO said that the data was available to those interested.

Several of those at the meeting were concerned about monitoring further south and monitoring of abandoned wells. Would it be possible to open an abandoned well one time per year to get a sample or pay for a backflow meter for sampling? An earlier discussion was repeated regarding the use of backflow meters. Public water customers in Butler County can operate their well without a backflow meter. Hamilton County customers, however, will have to install a backflow meter or abandon their well. A backflow meter costs approximately \$400.

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