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MAY 23 1997

DOE-0980-97

Mr. James A. Saric, Remedial Project Director
U.S. Environmental Protection Agency
Region V-SRF-5J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Mr. Michael Murphy, Health Physicist
Air and Radiation Division
U.S. Environmental Protection Agency
Region V-AE-17J
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

Dear Mr. Saric and Mr. Murphy:

APPLICATION FOR APPROVAL TO USE ENVIRONMENTAL MEASUREMENTS TO DEMONSTRATE COMPLIANCE WITH THE NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS SUBPART H

The mandated method of determining compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 61, Subpart H, is by calculating an effective dose equivalent to members of the public using approved sampling methods and computer models. This calculated dose is compared with the standard of 10 mrem to determine the compliance status of the facility.

In the past, the principal sources of radionuclide emissions to the atmosphere from the Fernald site have been processed stacks, vents, and other point sources. Now that the mission of the site has changed to remedial action, the primary sources of radionuclide releases will be fugitive in nature. The U.S. Environmental Protection Agency (U.S. EPA) has expressed concern that the computer modeling-based demonstration for NESHAP compliance may not adequately assess the dose contribution from the fugitive sources. Therefore, per discussions with the U.S. EPA and Ohio Environmental Protection Agency (OEPA), the Fernald Environmental Management Project (FEMP) proposes to utilize environmental measurements to determine compliance with the NESHAPs standard. This will provide a more representative assessment of the potential dose received by the maximally exposed individual. The FEMP has agreed to implement a monitoring program as

an alternative method to demonstrate compliance with the NESHAP standard using environmental measurements as described in 40 CFR 60.93(5). These monitors will be located near the maximally exposed individuals, if permission is received from that individual to place the monitor on his/her property.

This letter constitutes an application for approval as detailed in 40 CFR 60.93(5)(vi). The enclosure addresses each of the criteria for Environmental Measurement Compliance programs as described in 40 CFR 61.93 (b)(5) and the basic requirements issued by the U.S. EPA for NESHAP Subpart H environmental measurements at the FEMP. Additional information may be found in the Integrated Environmental Monitoring Plan (IEMP) which will serve as the controlling document for this monitoring program.

If you or your staff have any questions concerning the contents and implementation of the proposed air monitoring plans, please contact Kathleen Nickel at (513) 648-3166.

Sincerely,

Johnny Reising

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Nickel

Enclosure: As Stated

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CRITERIA FOR ALTERNATE AIR MONITORING PROGRAM COMPLIANCE

CRITERION (I): ***The air at the point of measurement shall be continuously sampled for collection of radionuclides.***

A network of continuously operating high volume air monitors will be used for the collection of radionuclides. The monitors sample air at approximately one m^3/minute using a 0.5 micron filter. The monitors contain a flow rate chart recorder and hour-meter which provide a record of the monitor's operation over the sampling period. Monitoring stations will be routinely checked to ensure normal operation.

Monitoring locations have been selected based on wind rose sectors and potential receptor locations. In sectors where potential receptors are located near the facility fence line, monitors have been sited at the fence line on the FEMP property. In sectors where potential receptor locations are distant from the facility, every effort will be made to place monitors at or near selected off-property receptor locations. Monitors will not be sited at every potential receptor location. Rather, to the greatest extent possible, monitors were sited to provide coverage to groupings of receptors off-property (see map provided). Since the point of compliance under NESHAP Subpart H is at the receptor locations, if agreement cannot be reached with private property owners for placement of off-property monitors, further discussions between EPA, OEPA and DOE will be necessary to determine an alternate approach or locations for demonstrating compliance.

CRITERION (ii): ***Those radionuclides released from the facility, which are the major contributors to the effective dose equivalent, must be collected and measured as part of the environmental measurement program.***

Frequency of Analysis

The air monitoring program consists of the following sampling and analytical regimes.

- Biweekly samples will be collected from each air monitoring station and analyzed at ASL B by the on-site laboratory for the following parameters.

TABLE 1 BIWEEKLY ANALYSIS REGIME

ANALYTE	METHOD	HAMDC (pCi/m^3)
Total Uranium	Laser Phosphorescence	3E-05
TSP	Gravimetric	.001g/Filter

- Quarterly composite samples will be prepared from the biweekly samples for each monitor. The composite samples will be analyzed at ASL D by an off-site laboratory for the following radionuclides of concern. The basis for the frequency of analysis and selection of radionuclides is provided below:

QUARTERLY ANALYSIS REGIME

ANALYTE	METHOD	HAMDC (pCi/m^3)	HAMDC AS PERCENT OF APPENDIX E, TABLE 2 VALUES
U^{238}	Alpha Spec.	9E-05	1.1
U^{234}	Alpha Spec.	9E-05	1.3
$U^{235/6}$	Alpha Spec.	9E-05	1.2
Th^{228}	Alpha Spec.	7E-06	0.2
Th^{230}	Alpha Spec.	7E-06	0.2
Th^{232}	Alpha Spec.	7E-06	1.1
Ra^{226}	Gamma Spec.	2E-04	6.1

HAMDC = Highest Allowable Minimum Detectable Concentration as specified in the CERCLA Quality Assurance Project Plan (SCQ) or as specified in analytical contracts with off-site laboratories. The HAMDCs required by the FEMP provide adequate sensitivity to detect below 10% of the corresponding NESHAP standard for each radionuclide of interest.

Quarterly analysis of composite samples is performed in order to meet the following needs of the air monitoring program:

- Sufficient air sample volumes to detect the (very) low concentrations of contaminants in the air.
- Periodic confirmation that contaminant concentrations are below the levels which would cause a dose of 10 mrem/year.

At low concentrations, large volumes of air must be sampled in order to readily detect and distinguish the presence of a contaminant from both the background and blank concentrations. Since filter loading limits the volume of air that can be sampled with a single filter, composite sampling is used to create a sample which represents a large volume of air.

Periodic (quarterly) measurements provide a means to check the concentrations of contaminants several times during the year. Activities or work practices will be adjusted if quarterly measurements indicate that the 10 mrem/year limit might be exceeded.

Analytical Regime

The isotopes selected for quarterly analysis represent the major contributors to dose based on the following considerations:

1. Radionuclides which are stored in large quantities at the FEMP and which will be handled or processed during the remediation effort (uranium, Th-232, Th-230, Ra-226).

2. Radionuclides which have been the major contributors to dose based on environmental and stack filter measurements (uranium).

3. Radionuclides, which due to their concentration in waste and contaminated soil, will be the major contributors to dose if the waste or soil is released in the form of fugitive dust (uranium, Th-228, Th-230).

The large quantities of uranium and thorium compounds stored at the FEMP combined with the potential for release during the remediation effort are the basis for including them as major contributors to dose. The waste products from the chemical processes used to produce uranium metal at the FEMP, contain comparatively high levels of Th-230 and Ra-226. These wastes were either stored in the K-65 silos (with the intent of recovering the Ra-226) or disposed of in the waste pits. The high concentration of Th-230 in the waste pit material is documented in the Operable Unit 1 RI. The K-65 silos contents and the high levels of Ra-226 and Th-230 are characterized in the Operable Unit 4 RI. The inclusion of Ra-226 and Th-230 as major contributors is based, in part, on the quantity of wastes which contain high levels of these radionuclides.

Stack filter measurements during production and environmental measurements during both production and the pre-remediation period at the FEMP confirm that uranium is the major contributor to air inhalation dose. Thus, these measurements provide additional justification for its inclusion as a major contributor as well as the target analyte for biweekly sampling.

Based on planned activities and the radiological characteristics of materials (soil and waste) to be processed, uranium is expected to be the major contributor to the air pathway dose during the near term (1997 and 1998). However, DOE recognizes that as the remediation progresses, new sources of emissions may change the mix of major contributors. The potential to change the list of major contributors exists through the excavation of the waste pits and, to a lesser extent, the removal and handling of the silo's contents. The major contributors from these sources were estimated by calculating the radionuclides relative contributions to dose assuming resuspension of the pit material in the form of fugitive dusts. Average concentrations of pit materials (Operable Unit 1 RI) were used to represent the radiological characteristics of the fugitive dusts. The radiological characteristics of the K-65 silos were not used since removal the silo contents is not expected to generate emissions in the form of fugitive dusts. The expected major contributors to dose during pit excavation are shown in the following table.

TABLE 2

PERCENTAGE CONTRIBUTION TO INHALATION DOSE ASSUMING RESUSPENSION OF WASTE PIT MATERIAL

RADIONUCLIDE	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6
Cs-137	0	0	0	0	0.2	0
Np-237	0	0	0	0	3.4	0
Pu-238	0	0	0	0	0.1	0
Pu-239/240	0	0	0	0	0.3	0.1
Ra-226	1.1	4.8	2.9	0.3	3.4	0
Ra-228	0.2	1.1	1.2	0.4	0.5	0.2
Ru-106	0	0	0	0	0	0
Sr-90	0	2.0	0	0.1	0	0
Tc-99	0	0	0.1	0	1.2	0
Th-228	5.2	6.1	2.8	7.4	0.7	0
Th-230	47.1	40.0	77.3	9.8	66.6	0.2

RADIONUCLIDE	Pit 1	Pit 2	Pit 3	Pit 4	Pit 5	Pit 6
Th-232	16.2	9.1	8.4	9.5	2.5	0
U-234	5.1	14.3	2.6	9.1	10	8.8
U-235/6	0.7	6.6	.2	1.6	0.4	1.7
U-238	24.4	16.1	4.6	61.7	10.7	88.9

Th-228 was added to the list of major contributors based on its greater than 5 percent contribution from Pits 1, 2, and 4. Based on process knowledge, small quantities of transuranics (e.g. Np-237 and Pu-239/240) and fission products (Sr-90, Tc-99, Ru-106, and Cs-137) shown in the above table were introduced into the waste pits from recycled material and not from irradiated fuel. These radionuclides have been well characterized in the FEMP wastes and will not be major contributors to air inhalation dose.

DOE proposes to monitor the changing mix of contributors by comparing the quarterly composite results to the NESHAP Appendix E, Table 2 values. If the fractions of the measured concentration to the corresponding NESHAP limit indicates a contaminant other than uranium is contributing the largest percentage of dose, then DOE will propose changes to the IEMP air monitoring and analytical schedule in order to better monitor the mix of major contributors.

Consideration of Decay Chain Daughter Products

Uranium-238, thorium-232 and uranium-235 are initial radionuclides in the uranium, thorium and actinide decay chains, respectively. The decay chains and the half-lives of the daughter products are provided in the following table.

Note: Doses caused by radon-222 and its respective decay products formed after the radon is released from the facility are not included in the NESHAP dose limit of 10 mrem/year and will not be measured as part of the NESHAP Subpart H compliance demonstration. A description of the FEMP radon monitoring program is included in the Integrated Environmental Monitoring Plan.

TABLE 3

URANIUM, THORIUM AND ACTINIDE DECAY CHAINS

ISOTOPE	HALF-LIFE	ISOTOPE	HALF-LIFE	ISOTOPE	HALF-LIFE
U-238	4.5×10^9 years	Th-232	1.4×10^{10} years	U-235	7.1×10^8 years
Th-234	24 days	Ra-228	5.7 years	Th-231	25.64 hrs
Pa-234m	1.2 min.	Ac-228	6.13 hrs	Pa-231	3.25×10^4 years

ISOTOPE	HALF-LIFE	ISOTOPE	HALF-LIFE	ISOTOPE	HALF-LIFE
U-234	2.5×10^5 years	Th-228	1.9 years	Ac-227	21.6 years
Th-230	8.0×10^4 years	Ra-224	3.64 days	Th-227	18.2 days
Ra-226	1622 years	Rn-220	55 sec.	Fr-223	22 min.
Rn-222	3.8 days	Po-216	0.16 sec	Ra-223	11.4 days
Po-218	3.05 min.	Pb-212	10.6 hr	Rn-219	4.0 sec.
Pb-214	26.8 min.	Bi-212	60.5 min	Po-215	1.77×10^{-3} sec.
Bi-214	19.7 min.	Po-212	3.04×10^{-7} sec.	Pb-211	36.1 min.
Po-214	1.6×10^{-4} sec.	Pb-208	Stable	Bi-211	2.16 min.
Tl-210	1.3 min.			Tl-207	4.79 min.
Pb-210	22 years			Pb-207	Stable
Bi-210	5 days				
Po-210	138 days				
Pb-206	Stable				

The majority of uranium and thorium received and processed during the production era of the FEMP had been separated from its decay chain daughters prior to shipment to the FEMP. As a result, decay chain daughter products were not in equilibrium (the condition where the daughter concentration (in Ci/g) is equal to the parents concentration (in Ci/g)) with the parent concentrations in the bulk of the materials received on site for processing.

Radioactive decay laws govern the ingrowth of the daughters from the purified parent. Daughter product ingrowth is based on the length of time the parent bearing material has been stored on site. As a general rule, the daughter of a long-lived parent (e.g. U-238, Th-232, or U-235) grows into equilibrium with the parent in about 10 daughter half-lives. For example, using data from the above table, Th-234 would reach equilibrium with U-238 in about 240 days (10 x 24 days).

Considering the half-lives in the table above and the 40 year production history of the FEMP, a number of daughters can conservatively be considered to be present in equilibrium concentrations with their parents. These radionuclides (Th-234, Ra-228, Ac-228, Ra-224, and Th-231) will be considered to be in equilibrium with their parent concentrations measured in the quarterly composite. The equilibrium based concentration for these radionuclides will be compared to the corresponding 40 CFR 61 subpart H, Appendix E Table 2 value as described in *Criterion iv* (below). Other radionuclides (Protactinium-231

[Pa-231], Actinium-227 [Ac-227], and their decay products) have not had sufficient time to reach equilibrium with their parent. In fact, due to the 32,500 year half-life of Pa-231, none of the decay chain daughters have had time for significant ingrowth. Therefore, concentrations of decay chain daughters in the U-235 chain below Th-231 will be considered to be zero in the quarterly composite samples.

CRITERION (iii): ***Radionuclide concentrations which would cause an effective dose equivalent of 10% of the standard shall be readily detectable and distinguishable from background.***

As indicated in Table 3, the detection limits for the major contributors to dose are less than 10% of NESHAP Appendix E, Table 2 values and will therefore be readily detectable, if present. The analysis of samples from the two background monitors will provide the data to distinguish fenceline and potential receptor monitoring results from background.

CRITERION (iv): ***Net measured radionuclide concentrations shall be compared to the concentration levels in Table 2 of Appendix E to determine compliance with the standard. In the case of multiple radionuclides being released from the facility, compliance shall be demonstrated if the value for all radionuclides is less than the concentration level in Table 2, and the sum of the fractions that result when each measured concentration value is divided by the value in Table 2 for each radionuclide is less than 1.***

Average annual radionuclide concentrations at each monitoring location will be determined for each radionuclide by dividing the sum of the radionuclide mass values, obtained via quarterly laboratory analysis, by the total volume of air drawn through the filter. As described above, decay chain daughter products will be assumed to be in equilibrium with the measured parent concentration. Concentrations will be corrected for background to obtain the net measured concentration. The resulting net annual average concentrations will be divided by the corresponding 40 CFR 61 subpart H, Appendix E Table 2 values. The resulting fractions will be summed per monitoring location to demonstrate compliance. Compliance with the Subpart H standard will be documented in an annual compliance summary that will be submitted as part of the IEMP sponsored annual environmental report.