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SILOS 1 AND 2 REMOVAL ACTION BENTONITE EFFECTIVENESS ENVIRONMENTAL MONITORING PLAN

1-27-92

DOE/EPA
DOE-745-92
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LETTER

R-008-106.1

Department of E
Fernald Environmental Management Project
P.O. Box 398705
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JAN 2 7 1992

DOE-745-92

Mr. James A. Saric, Remedial Project Director
U. S. Environmental Protection Agency
Region V - 5HR-12
230 South Dearborn Street
Chicago, Illinois 60604

Mr. Graham E. Mitchell, DOE Coordinator
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402-2086

Dear Mr. Saric and Mr. Mitchell:

Enclosed for your approval is the Silos 1 and 2 Removal Action Bentonite Effectiveness Environmental Monitoring Plan. In accordance with Section 34 of the Federal Facilities Agreement, the sampling and monitoring data will be included in the January CERCLA Consent Agreement Report. Your approval of the plan is requested by February 28, 1992.

If you have questions, please contact Randi Allen at FTS 774-6158 or (513) 738-6158.

Sincerely,

Jack R. Craig
Fernald Remedial Action
Project Manager

FO:Allen

Enclosure: As Stated

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cc w/enc.:

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2

Silos 1 and 2 Removal Action

Bentonite Effectiveness

Environmental Monitoring Plan

27 January, 1992

Continuous (i.e., real time) and integrated (i.e., passive) sampling for radon-222 is being performed as part of the routine environmental monitoring program at the Fernald Environmental Management Project (FEMP). The recent removal action involving application of a bentonite sealant layer to the K-65 silos is expected to produce a reduction in the quantity of radon-222 being emitted from the silos. Continuous measurements of radon-222 in the head space of the K-65 silos as well as results of real-time and integrated radon monitoring on- and off-site will be utilized with a Gaussian plume model computer program and site specific meteorological data to determine what contribution residual radon emissions from the K-65 silos make to the off-site background radon concentration.

One of the objectives of the environmental radon-222 monitoring and analysis at the FEMP is to determine whether radon-222 emitted from the K-65 silos following the bentonite sealant application has been reduced to a level such that its contribution to off-site background is less than 0.015 pCi/l at the location of the maximally exposed individual at a non-FEMP location. Data is being collected and analyzed to document compliance with this limit. Likewise, these periodic analyses will provide information relative to the integrity of the bentonite sealant since any significant increase in radon flux from the K-65 silos unrelated to changes in meteorological parameters would likely indicate a breach of the sealant barrier.

The flux of radon (pCi/M^2/sec) across the dome of the K-65 silos will be determined from continuous measurements of the radon concentration in the K-65 silo headspace and knowledge of the physical integrity of the dome structure. The dome contains cracks and penetrations which, realistically, permit radon to escape from the silo head space and diffuse in the open atmosphere. The equation which describes the radon flux across the dome structure is identical to that used to describe the radon flux from the ground. The equation is as follows:

$$j = \phi \times \varepsilon \times l$$

Where j is the radon flux (pCi/m^2/sec), ϕ is the radon production rate (pCi/m^3/sec), ε is the porosity of the dome (~ 0.5), and l is the diffusion length (~ 170 cm).

The Gaussian plume model computer code, ISC version #3.4, December 1988, is currently being used to calculate what contribution radon-222 emitted from the K-65 silos makes to the off-site background radon concentration. (An update to version 4 is being obtained.) Site-specific meteorological parameters and the radon-222 flux calculations are used as input to the ISC Gaussian plume model computer code to predict the radon concentration at any predetermined location relative to the K-65 silos as the source of radon-222.

Confirmation of the Gaussian plume model predictions will be made through evaluation of actual radon-222 monitoring data. Following the K-65 removal action, the contribution of radon-222 from the K-65 silo to off-site radon-222 background is expected to be very small and may not be measurable at the site boundary unless there is an unexpected release of radon due to a failure of the bentonite sealant. Because the off-site radon-222 background is approximately 0.5 pCi/l, it is not possible to confirm by measurements whether radon-222 emitted from the K-65 silos increases the off-site radon background in excess of 0.015 pCi/l. However, computer model calculations, which use as a source term the radon-222 concentration actually measured in the

headspace of the K-65 silos, will predict exactly how much of the offsite radon-222 background is due to radon-222 emissions from the K-65 silos.

Real-time radon-222 monitoring data, including measurement of radon-222 in the K-65 silo headspace, will be generated and recorded hourly. Permanent files of the hourly data are available on computer discs. Data from integrated radon measurements are available on a quarterly basis since samples are collected for a three month period. For a fixed location, variations in the radon concentration are due, primarily, to changes in meteorological parameters which impact the amount of mixing and dilution experienced by the radon-222 emitted from the K-65 silos. Likewise, periodic changes in radon-222 flux from the K-65 silos are due to diurnal changes in certain meteorological parameters, especially barometric pressure, wind speed, temperature and solar radiation.

Determination of the average weekly contribution to the off-site radon background concentration produced by the radon-222 flux from the K-65 silos will provide a technically sound, reliable evaluation of the efficacy of the removal action which will include the significance of important seasonal changes in climate but will minimize the uncertainty produced by the short-duration, diurnal variations. In addition to the weekly evaluation of data, monthly and quarterly evaluations will also be performed to provide documentation necessary for the regulatory agencies. Generating analyses results with a frequency greater than weekly is not recommended because the uncertainty in the predicted off-site radon concentration will increase due to the diurnal and other short-term temporal variations that appear in the measurements. Although the model is capable of generating daily or hourly values, such detail is not consistent with the objective of the removal action monitoring plan.

Evaluation of the predicted contribution to off-site radon background, using the ISC Gaussian plume model computer code with actual measurements of the radon flux from the K-65 silos and site-specific meteorological parameters, will be accomplished by comparing the model's predictions to the actual measured results of off-site radon background using both continuous and integrated samplers. This evaluation will be performed to determine compliance with the 0.015 pCi/l limit and to provide an independent assessment of the integrity of the bentonite sealant.

The Gaussian plume computer model will use hourly measurements of the radon concentration in the head space of the K-65 silos along with site-specific meteorological parameters to predict radon concentration at any location. Sets of data will be generated to produce a weekly average concentration for all off-site monitoring locations. Analysis of the average weekly predicted radon background concentration and the actual measured average values will be reported. This process combines results of the routine radon monitoring program at the FEMP with a standard method for Gaussian plume modeling to determine the contribution to environmental radon background from the K-65 silos and compares the predicted contribution to 0.015 pCi/l for compliance reporting. Although field monitoring techniques do not have the precision to detect a variation in the off-site background radon-222 concentration of 0.015 pCi/l, the computer model, which uses measurements of radon-222 in the K-65 silo dome headspace to predict the actual contribution to off-site radon-222 background, is adequately precise to calculate these values.