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**ADDENDUM AND REVISED TREATABILITY
STUDY WORK PLAN FOR OU #4**

12-02-91

**USEPA/DOE-F
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LETTER**

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

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REPLY TO THE ATTENTION OF:

Mr. Jack R. Craig
United States Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239-8705

HRE-8J

RE: Addendum and Revised
Treatability Study Work Plan
for OU #4

Dear Mr. Craig:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the revised Treatability Study Work Plan for Operable Unit (OU) #4 and the Addendum to the OU #4 Treatability Study Work Plan. Also on November 21, 1991 and November 26, 1991 U.S. EPA and the United States Department of Energy (U.S. DOE) held conference calls to discuss the comments.

Since U.S. DOE has satisfactorily responded to U.S. EPA's written comments, and as a result of U.S. DOE's conference call responses, U.S. EPA hereby approves the Work Plan pending incorporation of the attached comments.

Please contact me at (312/FTS) 886-0992 if you have any questions.

Sincerely,

James A. Saric
Remedial Project Manager

Enclosure

cc: Graham Mitchell, OEPA-SWDO
Pat Whitfield, U.S. DOE-HDQ

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action
response
to t-0040
(3508)

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ATTACHMENT A

The following is a summary of comments that were either partially addressed by the response or for which U.S. EPA disagrees with the response. These comments, which are referenced by the original comment number, must be further addressed in order for U.S. EPA to approve the final issue of the treatability study work plan. Comments EPA made on the original draft of the work plan appear in bold print.

1. General Comment: The revised work plan still has not addressed the performance of toxicity characteristic leaching procedure (TCLP) on untreated waste samples. The revised work plan does not incorporate these analyses as requested by EPA, and the response to comments document does not provide any reasoning or explanation of this omission. The revised work plan must include the TCLP extraction and analysis of untreated waste samples.

2. General comment no. 1d: **TCLP is proposed to be performed on the treated waste mixtures only and is not proposed for the untreated samples. The efficiency and quantifiable effectiveness a mixture to fix heavy meatal constituents cannot be exactly determined without measuring TCLP before and after treatment. It should be noted that after treatment, TCLP measurements must be corrected for the dilution of additives.**

Sections 4.0 and 8.0 of the work plan should be revised to include TCLP analysis of untreated waste samples. The text should specify the number of TCLP analysis to be performed. The text should also address the comparability of untreated waste samples taken and the samples proposed for the treatability tests.

3. General comment no. 3: The test plan does not clearly identify the constituents of concern that will be used to measure the success of the testing at each phase of the treatability testing. For example, if during preliminary screening of stabilization formulations, a particular test

mixture shows the best fixation for lead but the worst for thorium, what criteria will be used to screen the formulations for the next phase?

The text in section 4.0 should be revised to reflect the explanation provided in the response document. At present, the work plan establishes a minimum unconfined compressive strength (UCS) of 300 pounds per square inch (psi) as the preliminary Phase-Stage 1 screening criteria. The text in sections 3.0 and 4.0 should clearly explain that "the professional judgment of the investigator" will ultimately determine which formulations best meet stabilization performance criteria.

4. General comment no. 4: A description of the waste characteristics from all three silos should be presented in section 1.0 of the work plan. This description should be a short summary of the chemical and physical properties of the wastes in each silo.

The response of no action is unacceptable. The introductory sections of the work plan should summarize the relevant chemical and physical characteristics of wastes from each silo, preferably in tabular form, in section 1.0. Chemicals of concern for both the remedial action and the treatability testing should be provided. The historical description of OU4, including the summaries of radionuclide concentrations, is inadequate to support the test design. A discussion of the affects of particle size distribution, heterogeneity, or results of chemical, physical, or radiological analysis may have on the treatability study should be included.

5. Specific comment 2; page 6, section 1.3.1, line 14-18: This paragraph appears to conflict with the statement made in section 2.1, page 1, lines 28 and 29. The paragraph cited or other appropriate text should clearly state that while in situ vitrification is not considered feasible, vitrification treatability studies are proposed to address the ex situ alternatives.

The text was not revised as specified in the response action.

6. Specific comment 3; page 11, section 1.3.4, lines 23 and 24: Provide a brief justification for selection of the additives proposed in the stabilization. For example, Type II portland cement is designed to be used in the presence of moderate sulfate levels. The test plan should describe how the selection of additives relates to the expected characteristics of the wastes and constituents of concern.

The response to this comment is generally acceptable, but the response action is not. The text in section 1.0 should be revised to justify the selection of additives as provided in the response.

The response states that "moderate" levels of sulfate may be present. Without a summary of waste characteristics, as requested in general comment 4, the term "moderate" is meaningless. The text should provide a definition of moderate or reference an expected sulfate concentration range. The response should also discuss Type V cement (sulfate resisting) as well as why it has not been selected as a potential reagent.

7. Specific comment 7; page 1 and 2, section 2.1: Alternatives 3 through 5 are not described. If these alternatives have been previously eliminated, provide a brief explanation of the rationale for their elimination.

The response is acceptable; however, the response action is not. The comment was made to improve the work plan, not because EPA does not know the answer. The response should be incorporated into section 2.0.

8. Specific comment 18; page 7, section 3.3, line 24 and 25: The work plan should clarify whether the proposed performance goals are total concentrations or leachable concentrations and should provide a justification for these levels.

The response refers to a table in section 3.0 but does not give the table number. It is assumed that the table is Table 1 on pages 2 and 3 of section 3.0. It is unclear why the limits (per DOE Order 5400.5) for Th-230 and Th-232 (5 picocuries/gram) do not appear in this table as implied in the response.

9. Specific comment 26; page 3, section 4.2, line 6-9: Additional physical characterization, such as viscosity measurements, should be considered.

TCLP analysis on the raw waste composites should be added to the chemical characterization. The text should provide a justification for the selection of the chemical parameters in Table 4-2.

Specific analytical procedures should also be referenced in Table 4-2.

Sample analysis of the stabilization additives, especially Portland cement and fly ash, should be performed as part of the treatability studies. Both additives contain some quantity of heavy metal constituents. Alternatively a reagent mix blank samples can be prepared by using pure quartz sand in place of the waste materials. The sand should also be tested to confirm that it is free of any contamination.

Waste viscosity can be a significant factor when determining the feasibility of stabilization as a treatment method. Apparently, some consideration has already been given to the physical nature of the silo wastes with regard to the feasibility of mixing reagents with the waste; otherwise treatability testing of stabilization processes would not be considered.

Response to the second paragraph of specific comment 26 is inadequate. The work plan must include a methodology for comparing TCLP results against untreated sample results.

The work plan should further specify how to conduct TCLP analysis on a blank reagent mixture. The text should be revised to include a blank TCLP analysis of reagents from both Group I and Group II experiments to cover variation in fly ash origin.

10. **Specific comment 28; page 10, section 4.3.2, line 27-31: The text should justify the selection of the bentonite-silo material mixture ratios.**

The response provided is acceptable, but the response action is not. An explanation of bentonite-silo material mixture ratios should be added to the text of section 4.1.2 to justify the testing methods chosen.

COMMENTS ON THE
OU 4 TREATABILITY STUDY WORK PLAN ADDENDUM

Comments on Proposed Revisions to the Existing OU 4 Treatability
Study Work Plan

1. General comment: The addendum to the treatability study work plan should provide additional information concerning the objectives of the radon leach test and the use of the resulting data.
2. Proposed item no. 4: The proposed revision states that the radon leach test will be performed if the combined Ra-226 and Ra-228 levels in treated residue samples are below 15 picocuries per gram (pCi/g). The limit of 5 pCi/g specified for the first 15 centimeters of soil after remedial action should also be addressed [40 CFR 192.12(a)(1)].
3. Proposed item no. 4: The addendum should specify what action will be taken if the combined Ra-226 and Ra-228 levels in the insoluble residue are above the 15 pCi/g limit.
4. Proposed items no. 5 and 6: The addendum should specify what actions, if any, will be taken based on the results of the radon leach tests.

Comments on Proposed Measurement of Radon Leaching in Water

5. Section 2.1.1: The addendum should specify how the amount of radon in the leachate will be "back-calculated" to the amount of radon leached from the stabilized mass during the leaching period. The text should include the complete set of equations to be used and the assumptions to be made.

6. Section 2.5.6: The addendum should specify the precautions that will be taken to ensure that the radon in the leachate will not escape the container during the 30-day period. In addition, the addendum should specify the type of container and seal that will be used.
7. Section 2.5.9: The addendum does not provide sufficient detail concerning the sample collection protocol. The addendum should provide information more specific than "rapidly remove enough leachate to conduct the liquid scintillation test." The addendum should specify how the sample will be removed, what precautions will be taken to ensure that radon does not escape during sample collection, and the amount of sample to be collected.
8. Section 2.5.10: The addendum does not provide sufficient information on how the liquid scintillation test will be performed. The following matters should be addressed in the addendum:

- Scintillation (or collection) vial and cap type
- Cocktail type
- Preparation of the sample
- Temperature control
- Instrument parameters

The addendum should also address the following considerations:

- Absorption of radon into plastic vials
- Absorption of radon into septa
- Effect of headspace
- Effect of air bubbles in the sample

9. Section 2.5.11: The addendum should provide additional information concerning equations to be used and assumptions to be made in calculating the amount of radon in the liquid scintillation sample.

1. Item 4., 2 sentences added to Section 4.2.1.3: 

This states that radon emission and radon leach tests will be performed if the combined Ra-226 and Ra-228 levels are below the limit of 15 pCi/g. The leach tests should be performed when the levels are above the 15 pCi/g limit. The addendum needs to explain why tests are required when below the limit of 15 pCi?

2. Section 2.1.1, Proposed Measurement of Radon Leaching In Water:

Due to the short half-life of radon, it is recommended that a 7 day leachate measurement be taken in addition to the 30 days leaching measurement. If maximum leaching occurs early in the 30 day procedure, most of the radon will have decayed off.

3. Section 2.2, Interference

It is stated here no known interferences, but what if the leachate contains radium? A measurement for radium should be included.

4. Section 2.5.5, Operation

Enough water should be added to eliminate the vapor space, rather than minimize the vapor space. The vapor space will allow for partitioning of dissolved radon and result in losses.