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**OU 4 PILOT PLANT TREATABILITY STUDY WORK PLAN**

**04/11/96**

**USEPA**

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**COMMENTS**



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5  
77 WEST JACKSON BOULEVARD  
CHICAGO, IL 60604-3590

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FILE: \_\_\_\_\_  
LIBRARY REPLY TO THE ATTENTION OF:

APR 11 1996

Mr. Johnny W. Reising  
United States Department of Energy  
Feed Materials Production Center  
P.O. Box 398705  
Cincinnati, Ohio 45239-8705

SRF-5J

RE: OU 4 Pilot Plant  
Treatability Study  
Work Plan

Dear Mr. Reising:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the United States Department of Energy's (U.S. DOE) Operable Unit (OU) 4 Pilot Plant phase I, treatability study work plan. Phase I uses BentoGrout and surrogate materials to complete four campaigns to perform system operability testing and readiness reviews of the vitrification processing equipment.

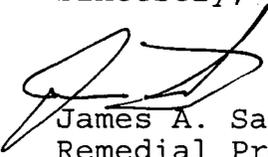
Although the work plan presents U.S. DOE's approach to the phase I treatability study it does not present detailed information in several areas and requires further clarification.

Therefore, U.S. EPA hereby disapproves the work plan pending incorporation of adequate responses to comments (RTC) to the work plan. U.S. DOE must submit a revised work plan and RTC document within thirty (30) days receipt of this letter.

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Please contact me at (312) 886-0992 if you have any questions regarding this matter.

Sincerely,



James A. Saric  
Remedial Project Manager  
Federal Facilities Section  
SFD Remedial Response Branch #2

Enclosure

cc: Tom Schneider, OEPA-SWDO  
Jack Baublitz, U.S. DOE-HDQ  
John Bradburne, FERMCO  
Charles Little, FERMCO  
Terry Hagen, FERMCO  
Michael Yates, FERMCO



## Specific Comments

Commenting Organization: U.S. EPA  
 Section #: 1.3.1 Page #: 1-6 Commentor: Saric  
 Line #: 7  
 Original Specific Comment #: 1  
 Comment: The text states that "when identified in the test plan, Silo 3 material will be mixed with K-65 material at a predetermined ratio, then vitrified." The text should be revised to clarify whether it is referring to "Operable Unit 4, Vitrification Pilot Plant Phase I Test Plan" or some other test plan.

Commenting Organization: U.S. EPA  
 Section #: NA Page #: 1-7 Commentor: Saric  
 Figure 1-1  
 Original Specific Comment #: 2  
 Comment: This figure presents the estimated schedule for VITPP Phase I and II activities. However, construction of the VITPP is not shown as a Phase I activity. Figure 1-1 should be revised to indicate the start date and duration of this activity.

Commenting Organization: U.S. EPA  
 Section #: NA Page #: 2-2 Commentor: Saric  
 Figure 2-1  
 Original Specific Comment #: 3  
 Comment: Figure 2-1 is a plan view of the VITPP layout and shows a cross-hatched area marked as "OPEN PROCESS AREA." Because the vitrification unit and ancillary equipment are to be housed in a pre-engineered, metal building, the purpose of the open process area is not clear. Figure 2-1 should clearly indicate the purpose of the open process area.

Commenting Organization: U.S. EPA  
 Section #: 2.2 Page #: 2-4 Commentor: Saric  
 Line #: 9 and 10  
 Original Specific Comment #: 4  
 Comment: The text states that "lead and barium in the K-65 material has [sic] the potential to undergo phase separation, and/or crystallization, or precipitate in the melter." However, the text does not clearly state how the VITPP testing program would address this situation. Although subsequent sections discuss foam prevention measures such as reducing the waste feed rate to the vitrification unit and reducing the vitrification unit's temperature, no discussion is provided of how metal separation, crystallization, or precipitation would be handled. One possible solution would be to install a discharge tap at the bottom of the vitrification unit for use in removing the metal slag. The work plan should be revised to discuss how the VITPP testing program will address the metal separation issue.

Commenting Organization: U.S. EPA  
 Section # 2.2 Page #: 2-8  
 Original Specific Comment #: 5  
 Comment: The text refers to the "film cooler" as one of the sources of off-gas from the VITPP. However, the film cooler's location and description are not provided in Figure 2-2, VITPP Process Flow Diagram - Phase I, or in Table 5-1, VITPP - Phase I Equipment List. The work plan should be revised to provide the location and description of the film cooler in this section.

Commentor: Saric  
 Line #: 12

Commenting Organization: U.S. EPA  
 Section #: 2.2 Page #: 2-9  
 Original Specific Comment #: 6  
 Comment: The text discusses routinely monitored off-gas parameters but fails to include acidic gases. Because a caustic scrubber is shown in Figure 2-2, VITPP Process Flow Diagram - Phase I, apparently for treating acidic gases, the work plan should be revised to include routine monitoring of acidic gases. Monitoring this parameter will reveal whether the caustic scrubber is operating properly.

Commentor: Saric  
 Line #: 1 through 4

Commenting Organization: U.S. EPA  
 Section #: 2.4 Page #: 2-11  
 Original Specific Comment #: 7  
 Comment: This section discusses systems operability testing (SOT). However, Figure 1-1, Forecast Schedule, does not show this VITPP Phase I activity. If SOT is the same as the Phase I readiness assessment shown in Figure 1-1, then either the text or the figure should be revised for consistency. Otherwise, SOT should be included in Figure 1-1.

Commentor: Saric  
 Lines #: NA

Commenting Organization: U.S. EPA  
 Section #: 3-2 Page #: 3-2  
 Original Specific Comment #: 8  
 Comment: This table presents performance objectives for key VITPP test equipment. However, several listed objectives are inadequate. For example, the performance objective for the caustic scrubber is to achieve a sulfur oxide (SO<sub>x</sub>) removal efficiency greater than or equal to (≥) 99 percent. However, the primary acid used in plant operations is nitric acid, which will produce nitric oxide (NO<sub>x</sub>). Hydrofluoric acid may also be present. Therefore, the performance objective for the scrubber should be restated as a percent removal efficiency for total acidic gases or a similar parameter.

Commentor: Saric  
 Table 3-1

In addition, the performance objective for the desiccant tower is to achieve a relative humidity less than or equal to (≤) 15 percent. However, because relative humidity is associated with a specific temperature or dew point, the

relative humidity should be correlated with a specific temperature. Also, the desiccant tower's performance should be discussed with the other off-gas system components in Section 3.2.6.

Lastly, with regard to the high-efficiency particulate air (HEPA) filter, the "M" should be replaced with the word "micron."

Commenting Organization: U.S. EPA  
 Section #: 3.2.6 Page #: 3-5  
 Original Specific Comment #: 9

Commentor: Saric  
 Item 4

Comment: This item discusses the VITPP off-gas system performance objective for the scrubber. The performance objective for the scrubber should be revised to address all acidic gases formed during testing in the VITPP, not merely SO<sub>x</sub>.

Commenting Organization: U.S. EPA  
 Section #: 3.3 Page #: 3-8  
 Original Specific Comment #: 10

Commentor: Saric  
 Line #: All

Comment: This section discusses general VITPP startup and operational objectives and parameters as well as DQOs. However, the discussion of objectives and DQOs for the VITPP wastewater, off-gas, and glass product requires additional detail and clarification. For example, although the purpose of wastewater sampling is to meet "the FEMP NPDES requirements," those requirements are not listed, and it is not clear what specific cleanup levels must be achieved. Similarly, the glass product and off-gas will be sampled and analyzed for total metals and other parameters to "support disposal of [these] waste stream[s]." However, the levels of total metals and other parameters that must be achieved for disposal are not provided. The work plan should be revised to include specific cleanup criteria for each required parameter.

In addition, DQOs are presented in terms of Fernald Environmental Management Project (FEMP)-specific analytical support levels (ASL), which are cited in other documents. Because the ASLs are not readily available for review, it is not clear whether they are appropriate as used for VITPP sampling and analysis. A correlation table should be provided for FEMP-specific ASLs and U.S. Environmental Protection Agency (U.S. EPA) DQO levels; moreover, this table should present the rationale for selecting specific ASLs.

Commenting Organization: U.S. EPA  
Section #: 4.0 Page #: 4-1  
Original General Comment #: 11

Commentor: Saric  
Line #: All

Comment: This section discusses the proposed use of surrogate materials for the VITPP testing. However, the work plan does not present any information on the composition of the waste so that the suitability of the proposed surrogates can be evaluated. For example, the experimental design for Phase I proposes using barium as a substitute for radium. Although using barium seems reasonable, lack of information on constituent concentrations in the waste and on quantitative formulas for the surrogate materials prevents adequate evaluation of the proposed surrogates. The materials used for testing in Phase I should be at least as corrosive and should have melting temperatures as high as the actual waste. The work plan should be revised to compare all key constituent concentrations measured in the waste with constituent concentrations in the surrogate materials.

Commenting Organization: U.S. EPA  
Section #: 5.2 Page #: 5-4  
Original Specific Comment #: 12

Commentor: Saric  
Table 5-2

Comment: This table presents chemical formulas for surrogate feed constituents. The chemical formula listed for "BentoGrout<sup>®</sup>" is the formula for silicon dioxide ( $\text{SiO}_2$ ). The BentoGrout<sup>®</sup> formula should be reviewed and corrected to be similar to the formula for betonite ( $\text{Al}_2\text{O}_3 \cdot 4\text{SiO}_2 \cdot n\text{H}_2\text{O}$ ).

Commenting Organization: U.S. EPA  
Section #: 6.2 Page #: 6-2  
Original Specific Comment #: 13

Commentor: Saric  
Line #: NA

Comment: This section discusses startup and operational sampling and analysis. Comparison of this summary of the planned sampling and analysis with the performance objectives in Table 3-1 indicates that the sampling and analysis are inadequate. Additional samples and analyses will be needed to confirm the performance of the quench tower (for example, temperature will need to be monitored), scrubber (acid gas removal efficiency), and desiccant tower (water removal efficiency). Even if such parameters will be monitored continuously, several confirmatory samples will be needed to verify the precision and accuracy of the monitoring instrumentation. The work plan should be revised to address this issue, as well as address calibration standards for monitoring devices.

Commenting Organization: U.S. EPA  
Section #: 6.3 Page #: 6-4 through 6-12  
Original Specific Comment #: 14

Commentor: Saric  
Table 6-1

Comment: This table outlines the proposed sampling and analysis program for VITPP Phase I testing. However, additional

information is needed to evaluate the adequacy of the program. The following additional information should be provided:

- For each analytical parameter, the specific analytical method to be used, cleanup goal, target reporting limit, and QA objectives (precision and accuracy)
- A definition and discussion of the expected degree of data completeness, representativeness, and comparability
- For each analytical parameter, the number of test samples to be collected daily and for each campaign, number of quality control (QC) samples (for example, blanks) to be collected daily and for each campaign, and the total number of samples (including QC samples) to be collected daily and for each campaign. This information will provide a uniform basis for evaluating the adequacy of the proposed sampling program.

This table was also compared to the more detailed sampling and analysis presentation in the "Project Specific Plan for Operable Unit 4, Vitrification Pilot Plant Phase I Process Sampling," Fernald Environmental Restoration Management Corporation, 1995 (FERMCO 1995), and numerous discrepancies were found. Examples of these discrepancies are provided below.

- Tests have been added or deleted for sampling ports S3, S4, S5, S6, S7, S14, S16, and S17. For some added tests, such as those for sulfate and nitrate, the necessary sample containers, preservatives, holding times, analytical methods, and other details can be determined from listings for other sampling ports. However, these details are missing for some critical tests, such as particle size distribution for samples from sampling ports S3, S5, S14, and S16.
- Sampling port S21 on the surge tank has been deleted
- Several terms used in this table are misleading. For example, the table indicates that samples collected at sampling ports S1, S12, and S17 will be analyzed for total metals. However, FERMCO 1995 states that the samples collected from these ports will be analyzed only for barium and lead; which is adequate for determining whether the sampled waste stream is hazardous but inadequate for characterizing the waste. Also, according to this table, the bulk density test will be used for samples from sampling port S10 to determine the specific gravity of the glass product,

while the specific gravity test will be used to determine the bulk density of the glass product in shipping drums.

The discrepancies between this table and other relevant documents, including FERMCO 1995, should be corrected.

In addition, use of several additional sample analyses would better characterize the VITPP's performance. For example, additional samples should be collected from sampling port S6 and analyzed for acidity and alkalinity to better monitor removal of acid gases. Furthermore, although the radon monitor will not be used until Phase II, it should be tested during Phase I. The work plan should be revised to address these issues.

Commenting Organization: U.S. EPA  
 Section #: 6.4 through 6.11  
 Page #: 6-13 through 6-15  
 Original Specific Comment #: 15  
 Comment: These sections pertain to analytical methods; DQOs; ASLs; QA requirements; data reduction, verification, and quantification; performance and system audits; calculations of data quality indicators; corrective action; and QA reports to management. However, the work plan discusses these items in very general terms and often cites one of several QA plans for further details. These general discussions and citations of other documents impede review and evaluation of these sections. The relevant information in the QA plans cited should be summarized and presented in this work plan.

Commentor: Saric  
 Line #: NA

Commenting Organization: U.S. EPA  
 Section #: 7.0  
 Original Specific Comment #: 16  
 Comment: This section discusses data management for data and records generated during VITPP Phase I testing. However, this section frequently cites the sitewide QA plan and general project record management requirements. To make the work plan easier to review and evaluate, the relevant portions of the sitewide QA plan and record management requirements should be summarized in the work plan, and any forms should be included in an appendix.

Commentor: Saric  
 Page #: 7-1  
 Line #: NA

Commenting Organization: U.S. EPA  
 Section #: 8.0  
 Original Specific Comment #: 17  
 Comment: This section discusses data analysis and interpretation. However, this section does not provide specific procedures for data analysis and interpretation. Such procedures should be described in this section.

Commentor: Saric  
 Page #: 8-1  
 Line #: NA

In addition, this section states that data validation personnel will validate only ASL B plus data packages. Under this approach and based on the information presented in Section 3.3, only total and toxicity characteristic leaching procedure metals data would be validated. The work plan should also propose validating wastewater data for metals, pH, nitrates, and total suspended solids as well as off-gas data for total metals. Otherwise, the work plan should provide a rationale for not validating these data.

Commenting Organization: U.S. EPA  
 Section #: 9.0  
 Original Specific Comment #: 18

Commentor: Saric  
 Page #: 9-1  
 Line #: NA

Comment: This section discusses health and safety aspects of the VITPP testing program in two brief paragraphs. These paragraphs refer to project-specific plans in the construction subcontracts and to standard operating procedures that were unavailable during the review of this work plan. The basis for these project-specific procedures is the "Preliminary Safety Analysis Report (PSAR) for Operable Unit 4," Fernald Environmental Restoration Management Corporation, 1994. The PSAR focuses on radiation and hazardous material releases and on atypical events rather than routine operations. One routine operation in the VITPP testing program involves creating glass gems in the vitrification furnace. In ordinary glass making, the feed material is dry. However, in the VITPP testing program, the feed material is a slurry containing up to 50 percent water. The furnace and the off-gas system must be capable of handling the volume of water in the slurry at maximum feed rates, as well as any carbon dioxide and other gases that may form in the furnace. The work plan should be revised to address these and other routine health and safety issues related to the vitrification unit operation.

Commenting Organization: U.S. EPA  
 Section #: 10.1  
 Original Specific Comment #: 19

Commentor: Saric  
 Page #: 10-2  
 Line #: 6 through 27

Comment: This section lists waste streams that will be generated during the VITPP testing program. This list is incomplete. Missing wastes include building sump effluent, cooling tower blowdown, and used desiccant. This list should be revised to include all the waste streams.

Commenting Organization: U.S. EPA  
 Section #: 13.3  
 Original Specific Comment #: 20

Commentor: Saric  
 Page #: 13-3  
 Table 13-1

Comment: This table outlines the proposed organization of the VITPP testing final report. Section 2.0 of the final report, Conclusions and Recommendations, should include sections describing how this testing program relates to future work at Operable Unit 4 (OU4).

Commenting Organization: U.S. EPA

Commentor: Saric

Section #: Appendix B Page #: NA

Line #: NA

Original Specific Comment #: 21

Comment: This appendix lists applicable or relevant and appropriate requirements (ARAR) and criteria to be considered. Comparison of this list of ARARs and criteria to be considered with the list in Table B.1-3 of the record of decision revealed the following omission in the appendix: 40 Code of Federal Regulations 264, Subpart F, Releases from Solid Waste Management Units

This missing ARAR should be added to the appendix or the reason for excluding it should be provided.