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DOCUMENT CHANGE REQUEST (DCR) FOR OPERABLE UNIT 4 TREATABILITY WORK PLAN FOR STABILIZATION AND CHEMICAL EXTRACTION

10-8-92

DOE/EPA

DOE-0069-93

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LETTER

[redacted]

Department of Energy
Fernald Environmental Management Project
P.O. Box 398705
Cincinnati, Ohio 45239-8705
(513) 738-6357

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OCT 0 8 1992
DOE-0069-93

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, Project Manager
Ohio Environmental Protection Agency
40 South Main Street
Dayton, Ohio 45402

Dear Mr. Saric and Mr. Mitchell:

DOCUMENT CHANGE REQUEST (DCR) FOR OPERABLE UNIT 4 TREATABILITY WORK PLAN FOR STABILIZATION AND CHEMICAL EXTRACTION

Enclosed for your information is the DCR which documents modifications to Section 4.2.2 of the Operable Unit 4 Treatability Study Work Plan for Stabilization and Chemical Extraction.

The DCR accounts for operations performed in preparation of the extraction fluid for vitrification of the leachate resulting from the chemical separation treatability program.

These modifications were due to the presence of unreacted EDTA and KCL.

If you or your staff have any questions, please contact Randi Allen at FTS/Commercial 513-738-6158.

Sincerely,

for Jack R. Craig
Fernald Remedial Action
Project Manager

FN:Allen

Enclosure: As Stated

DOCUMENT CHANGE REQUEST

This form is used to initiate permanent change to controlled distribution project-specific procedures such as the QAPP. Work Plan, and Sampling Plan.

REQUEST NO. 92
Issue Date:
Page ___ of ___
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REQUESTOR Darrell Drouhard PHONE NO. 615-690-3211 DATE: 8-7-92
DOCUMENT TITLE Treatability Study Work Plan for Operable Unit 4
SECTION/PARAGRAPH/PAGE NO.: 4 / 4 / 16 DOCUMENT NUMBER: WP
ISSUE DATE: January 1992 LATEST REVISION DATE: January 1992

JUSTIFICATION:

A) In the extraction process, it is economical to precipitate and recycle the unreacted EDTA before evaporation and vitrification. Also if free EDTA is left unoxidized, the high carbon content would produce a more reducing waste/reagent mixture, a condition likely to corrode the Pt crucible and have detrimental effects on vitrification.

B) To increase the solubility of radium, large concentrations of KCl were sometimes added to the extraction fluid. The majority of the resulting evaporite would be KCl, a known glass flux. Large quantities of site soil would have to be added to provide enough glass formers (e.g. SiO_2 and Al_2O_3) to produce a successful vitrified product. As a result, the final volume of the vitrified material would be undesirably large.

CONTENT OF CHANGE:

Section 4.2.2 will be modified to reflect the following changes:

A) The free, unreacted EDTA will be precipitated from the spent chemical extraction fluid prior to the evaporation step by lowering the pH of the fluid. The precipitated EDTA will be filtered from the solution. The filtrate will then be evaporated and vitrified.

B) The leachate with high concentrations of KCl will be treated with reagents to precipitate the metals and radionuclides prior to the vitrification process. The precipitate will be dried and vitrified.

EFFECTIVE DATE OF CHANGE:

☐ When all approvals have been obtained ______________________
Effective Date

☐ Other (Specify): June 5, 1992

REQUIRED APPROVALS:

[signature] 8/24/92			
Project Director	Date		
[signature] 8/24/92		[signature] 9/10/92	
Project QA Officer	Date	~~WEMCO~~ QA Officer	Date
[signature] 8/26/92		[signature] 9/8/92	
Deputy Director/Technical	Date	~~DOE COTR~~	Date

TO BE COMPLETED BY DOE

A. Prior EPA Notification Required? ☐ Yes ☐ No
B. Prior EPA Approval Required? ☐ Yes ☐ No
C. Immediate Implementation? ☐ Yes ☐ No

ASI Form 0027 Rev. (0) 7/91 SHW8195sw4

experiments will be analyzed at the IT Analytical Services (ITAS)-Oak Ridge Laboratory. The analyses will include TCLP analysis to establish that the extracted materials are nonhazardous as defined by RCRA. In addition, lead, thorium, radium, polonium, and uranium content will be determined by radiation analyses. In the optional, stage radon emission and radon leach tests will be performed on the insoluble residue if the combined Ra-226 and Ra-228 levels in the treated residue are below the 40CFR192.12(a)(2) limit of 15 pCi/g. The 15 pCi/g limit was selected because the waste will ultimately be buried. Archive samples will be used for these experiments.

To evaluate Alternatives 8 and 9, the removal effectiveness of the leaching step is the most important step. The results will provide a rough guide by which the viability of remedial action Alternatives 8 and 9 can be preliminarily evaluated.

4.2.2 Vitrification of Leachate - Preliminary Phase - Stage 1

This laboratory screening will consist of one phase - preliminary phase - Stage 1. The effects of adding sodium hydroxide, site fly ash, and site soil will be demonstrated. Except for tests on the dried leachate, no experiments will be conducted until the chemical characterization of the leachate, soil, and fly ash are completed. As a target, the reagent waste mixture will have between 40 to 60 percent combined SiO_2 and Al_2O_3 content and 10 to 20 percent sodium oxide content when dried. It is expected that this range of SiO_2 and Al_2O_3 content will produce a durable glass. The melting point of the glass mixture can be lowered by increasing the sodium oxide content of the glass. Sodium hydroxide may be added to the mixture before heating to increase the sodium oxide content of the vitrified waste (sodium hydroxide is converted to sodium oxide during the vitrification process). Enough sodium hydroxide will be added to cause the mixture to melt at 1250°C in a muffle furnace. This temperature was chosen to give a reasonable compromise between the cost of adding sodium oxide content to lower the melting point, the expected increase in leachability as the melting point of mixture is lowered, and the energy cost to melt and form the vitrified material. It is generally recognized in the glass manufacturing industry by companies such as Corning that to form homogenous and durable glass mixture with hazardous waste, melt temperatures between 1250° and 1350°C are needed. If this process is carried forward to the remedy design phase, the effect of melt temperature may be investigated.

Figure 4-4 presents a flow sheet for the vitrification process. The leachate solutions will be subjected to precipitation. The EDTA solution will be treated with HCl to precipitate the EDTA, leaving the metals and radionuclides in solution. The KCl leachate solutions will be treated to precipitate the metals and radionuclides out of solution. The leachate and precipitate that contain the metals and radionuclides will be analyzed on a dry basis for the content of total aluminum as alumina, silicon as silica, and sodium as sodium oxide. These materials will be slowly dried in a beaker on a hot plate. Using the chemical analyses of the leachate and precipitate, fly ash, and soil as guide, a series of range-finding experiments will be performed. Various amounts of sodium hydroxide will be added to mixtures of waste, fly ash, and soil to determine the sodium hydroxide concentration needed to lower the melting point temperature to about 1250°C. These range- finding experiments will be followed by an experimental matrix similar to Table 4-4. The ranges given in Table 4-4 may be changed after completion of the range-finding experiments and consideration of the chemical

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cc w/enc.:

J. J. Fiore, EM-42, TREV
K. A. Hayes, EM-424, TREV
L. Jensen, USEPA-V, AT-18J
B. Barwick, USEPA-V, 5CS-TUB-3
J. Kwasniewski, OEPA-Columbus
P. Harris, OEPA-Dayton
M. Proffitt, OEPA-Dayton
T. Schneider, OEPA-Dayton
F. Bell, ASTDR
T. W. Hahne, PRC
L. August, GeoTrans
R. L. Glenn, Parsons
N. C. Kaufman, FERMCO/72
J. A. Rasile, FERMCO/72
J. W. Theising, FERMCO/72
D. J. Carr, WEMCO/52-8
L. S. Farmer, WEMCO/2
J. P. Hopper, WEMCO/52-8
J. D. Wood, ASI/IT
J. E. Razor, ASI/IT
AR Coordinator, WEMCO