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RESPONSE TO COMMENTS OPERABLE UNIT 5 TREATABILITY STUDY WORK PLAN NOVEMBER 1991 MARCH 1992

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RESPONSE TO COMMENTS

OPERABLE UNIT 5 TREATABILITY STUDY WORK PLAN
NOVEMBER 1991

MARCH 1992

SUMMARY OF RESPONSES TO COMMENTS

OU5 TREATABILITY STUDY WORK PLAN

General Comments

1. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 1

Comment: **Sampling and analyses performed for the treatability study must be conducted according to the approved QAPP.**

Response: The existing approved site-wide QAPP does not address the development of treatability study programs. This treatability study work plan has been developed in accordance with the QC requirements of the EPA's "Guide for Conducting Treatability Studies under CERCLA". The work plan will be revised to identify the DQO levels for each of the analytical tests and will provide the details of the analytical and testing procedures in the appendix.

Action: Insert a table with the DQOs for each analytical procedure for each phase of testing and provide methodologies or references in the appendix.

2. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 2

Comment: **Provide a text summary, list of samples, and location map for all samples that will be included in the treatability study.**

Response: Figure 6-1 is the location map for locations to be sampled for soils to be used in the treatability study. It will be modified to show the two locations in common with the ID program. It will also be modified to show the exact locations of the four soils selected for initial sampling and characterization. Two of these four soils will be selected for use in the treatability study, based on the analytical results. A summary list will be inserted at the end of Section 6, noting sampling locations, samples, and analyses.

Action: The text has been modified as noted in the response.

3. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 3

Comment: **DOE must include analyses for all waste forms resulting from the treatment process, including both liquid and solid wastes. Additionally, the final disposition of these waste forms should be discussed.**

Response: A discussion of this information will be provided in the report.

Action: Chapter 10.0 of the text will be revised to include this information.

4. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 4

Comment: **The portion of Operable Unit 5 designated for soil washing would have to be cleared, scalped, and then excavated to a depth of several feet, yielding an enormous quantity of excavated material that will be widely heterogeneous. Particle size separation and classification as envisioned by the work plan will be unreasonably costly unless an offsetting cost-benefit can be achieved by reducing the volume of soil which must be subjected to soil washing.**

Response: The cost-effectiveness of this technology as a remedial action will be evaluated within the detailed analysis of alternatives section of the Feasibility Study. The physical separation stage of soil washing should elucidate the potential for this treatability technology effectiveness relative to volume reduction. This type of information derived during the treatability study should aid in evaluating a cost-benefit comparison for application of soil washing at FEMP.

Action: None required.

5. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 5

Comment: **Unless a cost-benefit justification for the proposed particle size separation can be made, a coarser study should be conducted initially to determine if the remedial objectives can be met at much less cost using standard, commercial technology. Such a simplified treatment process is outlined below.**

All excavated material should be separated into >10 mm and <10 mm size fractions. During the treatability study, analysis should be conducted to verify that the >10 mm fraction is "clean". Separation and treatment of the <10 mm fraction in further divisions is probably not cost-effective.

The <10 mm fraction should be digested with HCl to solubilize all metals and radionuclides. This is a standard commercial operation in rare earth processing plants where thorium and uranium are constantly removed.

The acidified slurry should be subjected to gravity separation and the resultant sludge should be washed with the rinse re-introduced to the gravity separate-on system. The sludge (settled material) should be roasted and used to refill the site.

The effluent from the gravity separator should be neutralized and then steam-stripped to remove VOCs and

semi-VOCs. The overhead should be condensed, then carbon-filtered, and the aqueous phase should be returned to the digestion system.

The steam stripper bottoms should be subjected to selective ion exchange (IX) to remove the metals, etc. Treated effluent water should be returned to the digestion system. IX regenerant solutions may be processed to recover valuable metals or the metals may be precipitated, encapsulated, and then placed in a secure landfill onsite or offsite.

Response: A coarser study should not be conducted initially. Although the suggested approach is, in general, similar (although condensed) to the experimental design in Section 4, the proposed separation of excavated material into >10 mm and <10 mm size fractions, does not optimize the initial stage of investigation. Stage I, physical Separation, is a relatively small portion of the total study. It allows for a rather significant evaluation of the volume and size fractions of the soil that can be effectively washed in the initial step of the soil washing process (volume reduction). Determining the association of contaminants with the proposed individual soil size fractions (>50 mm, 50-9.5 mm, 9.5-2 mm, 2 mm - 50 um, 50 - 2 um, <2 um) is the basis for evaluating the feasibility of soil washing as a viable remedial technology for these soil, not only from an operational standpoint but also from an economical one. In addition, Stage I studies which incorporate this particle size division will provide data that will allow the study to focus treatment processes in Stage II on specific size fractions housing the contaminants.

Action: None required.

6. Commenting Organization: OEPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 6

Comment: It is unclear what, if any, attempt has been made to entice treatment system and resin manufacturers to provide free research, design, and treatability services with the incentive of demonstrating the effectiveness of their products.

Response: The idea presented in this comment is noteworthy. However, within the RI/FS program for the Fernald site, no attempts were made to entice manufacturers to provide free research, design, and treatability services. The project is being conducted within the context of an Amended Consent Agreement with established schedules. There would be little incentive for manufacturers performing free services to adhere to these schedules.

Action: None required.

OEPA Specific Comments

7. Commenting Organization: OEPA Commentor:
Pg. # Section # 1.1.1 Paragraph # Sent./Line # 29-30
Original Comment # 1

Comment: **The plan should state that options were identified during the first initial screening of alternatives, and that another "initial" screening of alternatives is being prepared because of the changes in operable unit definitions.**

Response: Technology process options were identified for the remediation of soils within the final Operable Unit 5 Initial Screening of Alternatives document, December 1990. Technology process options for the remediation of soils were also identified during the preparation of the draft Initial Screening document for Operable Unit 3. These documents were prepared within the schedule and scope of the 1990 Consent Agreement. Because of the changes in operable unit definitions during the renegotiation of the Amended Consent Agreement, a new Initial Screening Document will be prepared for Operable Unit 5.

Action: The text will be revised to include the information provided in the response as requested by the reviewer.

8. Commenting Organization: OEPA Commentor:
Pg. # 3 Section # 1 Paragraph # Sent./Line # 20
Original Comment # 2

Comment: **How will the results from the Integrated Demonstration and the OU 5 soil washing Treatability Study be coordinated? The report discusses sampling but does not mention results so that information is not omitted or duplicated.**

Response: Coordination of the ID program and the OU5 soil washing study is being maintained via a number of methods. ASI and IT personnel participate in meetings with the ID group designed to exchange information relative to technical developments. Sampling and analytical data are being shared and even incorporated, when appropriate, into support documents for the study (see Appendix E of the Work Plan).

The OU5 Soil Washing Treatability Study includes two soils common to the ID program and two soils unique to the OU5 study. All four soils will be tested and evaluated relative to the efficacy of contaminant removal using soil washing. This is the scope of the OU5 study. Section 4, page 1, line 20, notes the "treatability testing of site soils", which is meant to include the ID and OU5 soil.

The results from each program will be shared by each group as they become available, and reported. If results from the Integrated Demonstration project are not available when

required by the RI/FS Operable Unit 5 schedule, Operable Unit 5 deliverables will continue on schedule and not incorporate the other program results.

Action: A sentence discussing the integration of program results will be added to the text.

9. Commenting Organization: OEPA Commentor:
Pg. # 3 Section # 1 Paragraph # Sent./Line # 30
Original Comment # 3

Comment: What is the basis for choosing 35 pCi/g as an action level?

Response: No standards currently exist for radiological contamination levels in soil (other than radium). Radiological contamination levels used as action levels for soil in uncontrolled areas of FEMP are consistent with levels set by the Nuclear Regulatory Commission and published in the Federal Register on October 23, 1981. The levels are consistent with what is used throughout the DOE complex and are below the levels used for residual contamination in surface soil for most unrestricted locations in the United States. The levels are documented in FEMP site policy and procedures, which have been provided to the Environmental Protection Agency (EPA). [Amendments to the RI/FS Work Plan that have been submitted to EPA include references to these FEMP site policies and procedures and discuss soil radiological contamination relative to risk.] The RI/FS process will be the vehicle for determination of final cleanup levels, including radiological levels in soil. The value of 35 pCi/g will be used as a preliminary action level in this treatability study.

Action: The use of this level will be clarified in the text.

10. Commenting Organization: OEPA Commentor:
Pg. # 5 Section # 1.2.3 Paragraph # Sent./Line # 20-22
Original Comment # 4

Comment: Define "high levels" of other contaminants.

Response: "High levels" refers to concentrations above background for radiological and inorganic constituents and above the contract required detection limits for organics.

Action: The use of the word "high" will be eliminated from the paragraph and the text will be revised as noted in the response.

11. Commenting Organization: OEPA Commentor:
Pg. # 5 Section # 1.2.3 Paragraph # Sent./Line # 26-27
Original Comment # 5

Comment: **The fire training area also has organic chemical contamination.**

Response: This sentence will be revised to note that organic contamination is present in the fire training area.

Action: The text will be revised as noted in the response.

12. Commenting Organization: OEPA Commentor:
Pg. # 8 Section # Paragraph # Sent./Line #
Original Comment # 6

Comment: **Table 1-1, footnote c. Describe the construction program.**

Response: A construction program was initiated in August 1988 to connect the health and safety building with the services building. Soils located between these buildings were removed during the construction activities after initial sampling of these areas had been conducted under the RI/FS program.

Action: The construction program will be described in the text.

13. Commenting Organization: OEPA Commentor:
Pg. # 17 Section # 1 Paragraph # Sent./Line # 3-6
Original Comment # 7

Comment: **Will total metal concentrations be determined at various steps in the process?**

Response: Total metal concentrations will be initially determined in the soil from each of the four locations. In the EPA document "Guide for Conducting Treatability Studies Under CERCLA" (EPA/540/2-89/058), it is recommended that target compounds be used during the Remedy Screening phase. Remedy Screening, Stage I testing will use uranium as the target radioactive and metal compound. In addition, the radiological activity will be tracked by analyzing for gross alpha and gross beta in the extracted soils and washing solutions. See Table 3-5.

Remedy Screening, Stage II testing will use As, Ba, Cd, Cr, Pb, Se, and Ag as the target metal compounds. Uranium and gross alpha and gross beta will be used to track the radioactive compounds. See Table 3-7. A more detailed laboratory analysis is conducted in the Remedy Selection phase. See Table 3-9.

Action: None required.

14. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 2 Paragraph # Sent./Line # 3-8
Original Comment # 8

Comment: **Ohio EPA understands that the goal of returning a significant volume of decontaminated soil to the site is important, but State of Ohio ARARs may designate this material as solid waste. This issue needs to be resolved and DOE may eventually need to submit a request for exemption to the Director of the Ohio EPA.**

Response: DOE agrees with this comment. A request for exemption will be submitted to the Director of the Ohio EPA if the resolution of this issue indicates that the material should be designated a solid waste.

Action: Replace Section 2, page 1, lines 3-8 text with the following: "Based on characterization data, it has been determined that a relatively large quantity of FEMP surface soils may contain radioactive components. In isolated cases, non-radioactive components may exist in conjunction with radioactive components. To address these cases where these soils' components are present at levels exceeding risk based action levels, soil washing was selected as the technology to be evaluated within this treatability study. This soil may be designated a solid waste as per State of Ohio ARARs. Based on this designation, an exemption may be required from the OEPA prior to returning the soil to the site. Soil washing, if successful, produces large volumes of remediated soil which can be returned to the site from which it was excavated, while significantly reducing the final volume of material requiring selective handling. The success of the . . ."

15. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 2.1 Paragraph # Sent./Line # 10-12
Original Comment # 9

Comment: **Explain the rationale for this statement. Simple volume assessments will not necessarily determine the applicability of soil washing as a treatment method.**

Response: Section 2, pg. 1, lines 6-12, describes, in general terms, the guidelines for evaluating the success of the soil washing experimental design in terms of volume reduction. It does not mean to constitute the applicability of soil washing as a treatment method by assessing simple volume reduction alone. The implementability and effectiveness of this technology will be further evaluated within the detailed analysis portion of the FS.

Action: This explanation will be added to the text.

16. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 3 Paragraph # Sent./Line # 10-23
Original Comment # 10

Comment: **This is an excellent description of the risk levels and efforts to meet preliminary remediation goals (PRGs).**

Response: None required.

Action: None required.

17. Commenting Organization: OEPA Commentor:
Pg. # 13 Section # 3.0 Paragraph # Sent./Line #
Original Comment # 11

Comment: **Table 3-5. Give a method number and/or reference for uranium analysis by ion chromatography.**

Response: The uranium analysis by IC is a non-standard method and a description of the method will be provided in Appendix B, Standard Operating Procedures.

Action: The text has been revised as noted in the response.

18. Commenting Organization: OEPA Commentor:
Pg. # 9 Section # 3.2 Paragraph # Sent./Line # 22
Original Comment # 12

Comment: **It is stated that the establishment of DQOs is the part of the process that defines the data quality needs of the project. The process should work in the opposite fashion. The DQOs are determined by the intended uses of the data or data needs. Please revise this sentence.**

Response: The statement in question is a quote from the EPA Guide for Conducting Treatability Studies Under CERCLA, December, 1989, but is misstated as written. It should read, "The establishment of DQOs is part of the process that defines the data quality needs of a project," not . . . "is <u>the</u> part of the process . . .".

Action: The text has been revised as noted in the response.

19. Commenting Organization: OEPA Commentor:
Pg. # 12, 14 Section # Paragraph # Sent./Line #
Original Comment # 13

Comment: **Table 3-4, Table 3-6. Required Detection Limits: Provide a brief synopsis of section 4.0 of the QAPP, possibly as an appendix.**

Response: The analysis conducted at the ORL in support of the advanced phase testing program will be conducted at a DQO level of 4 and will be in compliance with the detection levels as stated in the site-wide QAPP. The required detection limits as excerpted from the QAPP are presented in Table 3-1 for chemicals and Table 3-2 for radionuclides. Analyses conducted in support of the remedy screening and remedy selection testing phases of the program will be done at DQO levels consistent with the proposed methodologies and data use needs.

Action: Detection limits have been removed from Tables 3-4 and 3-6. An additional table is added to the text in support of DQOs for remedy selection which includes a reference to the detection limits on Tables 3-1 and 3-2.

20. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 4.0 Paragraph # Sent./Line # 2-3
Original Comment # 14

Comment: **Mixed waste has a specific regulatory definition - a waste which contains both a radioactive component subject to the Atomic Energy Act and a hazardous component that is either listed as a hazardous waste in Subpart D of 40 CFR Part 261 or exhibits any of the hazardous characteristics identified in Subpart C of 40 CFR Part 261. If the treatability study work plan intends for materials referred to as "mixed waste" to have a different meaning, mixed waste should be defined in the plan for purposes of the treatability study.**

Response: Replace Section 4.0, page 1, lines 2-3 text with the following: "Washing of soils containing radioactive components, possibly in conjunction with chemical constituents, has been selected as a technology to be considered for the remediation of Operable Unit 5 soils. The collection and characterization of soil . . ."

Action: The text has been revised as noted in the response.

21. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 4.0 Paragraph # Sent./Line # 8-9
Original Comment # 15

Comment: **Soils chosen for soil washing should also be selected to represent soil types at the site, e.g., Henshaw soil, Fincastle soil, construction borrow soil, etc. Locations that are**

representative of the contaminants at the site may not be representative of the majority of the types of soils that are contaminated.

Response: Consideration was given to the soil series and type at the FEMP site. Soils at the FEMP site are primarily categorized as Fincastle-Xenia silt loams. However, areas that are currently planted with grasses and maintained as lawns or buffer zones tend to represent native Fincastle soils. Since Fincastle soils are the predominant soil-type at the FEMP site, they are considered representative of the type of soils contaminated. Therefore, they are appropriate for use in the soil washing treatability study.

Action: None required.

22. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 4.0 Paragraph # Sent./Line # 16-18
Original Comment # 16

Comment: Physical and chemical characterization of soils must be included in the experimental design and procedures.

Response: Initial baseline physical and chemical characterization of the soils collected from the field is described in Section 6.0. Samples or aliquots of these soils that are sent to the laboratory for remedy selection testing will be further characterized in support of the experimental design as described in Section 4.1.1 of the revised plan.

Action: None required.

23. Commenting Organization: OEPA Commentor:
Pg. # 3 Section # 4.2.1 Paragraph # Sent./Line # 12-15
Original Comment # 17

Comment: What are the "as received" samples? Describe the samples that will be used for Stage I of the study. Because this work plan attempts to use several different sampling plans and previously collected samples, this wording is particularly confusing.

Response: Soil is collected in the field, homogenized, and placed into drums. Aliquots of soil taken from the drum and sent to the lab for testing during Stage I of the study are described as "as received" soils. A description of this soil will be provided in Section 4.1.1 of the revised text.

Action: The text has been revised to reflect the response.

24. Commenting Organization: OEPA Commentor:
Pg. # 3 Section # 4.2.1 Paragraph # Sent./Line # 32-33
Original Comment # 18

Comment: **Describe which samples will be used for this determination and the rationale for their selection.**

Response: A five to ten kg portion of soil will be removed from each of the four site collection drums and separately homogenized. (A description of the collection of samples for the treatability study is in Chapter 6.) A series of baseline tests will be conducted on each of these four aliquots.

The average activity for each sample of homogenized soils will be determined by analyzing six 400-mg aliquots for gross alpha and gross beta. The sample from each site location drum will be considered homogeneous if the six gross alpha and six gross beta values have a percent relative standard deviation (RSD) less than or equal to 30 percent. If the percent RSD is greater than 30 percent, the sample will be re-mixed and tested again for homogeneity. After the soil sample is determined to be homogeneous, it will be analyzed for uranium content, alkalinity, acidity, and organic compound content. Random aliquots will be collected from each of the homogenized four samples for the latter analyses.

Action: The text has been revised as noted in the response.

25. Commenting Organization: OEPA Commentor:
Pg. # 4 Section # 4.2.2 Paragraph # Sent./Line # 30-32
Original Comment # 19

Comment: **The characterization will determine the type and amount of contaminants associated with particle-size fractions <u>after washing</u>, not as collected from the four locations.**

Response: There is no way to separate soil into individual particles or size fractions without the use of a wet sieving method and a possible dispersing agent. Although this may be construed as a soil washing step, it is considered in this study as an initial characterization procedure for determining the type and amount of contaminants associated with individual particle-size fractions.

Action: None required.

26. Commenting Organization: OEPA Commentor:
Pg. # 6 Section # 4.2.3 Paragraph # Sent./Line # 17
Original Comment # 20

Comment: **Explain the rationale for conducting the Stage I chemical extraction at elevated temperatures. A previous U.S. EPA study indicated that no significant benefit was observed as compared to tests conducted at ambient temperatures (Hazardous Waste Consultant, 1991).**

Response: IT Technology Development Laboratory (TDL) experience on the extraction of uranium and other hazardous metals from mixed waste biological and waste sludges and from the Fernald Silo 1 and 2 waste material has shown that the extraction efficiency was greater at 80 degrees C than at ambient temperatures. The extraction efficiency at room temperature will be evaluated from a processing viewpoint in Stage II testing.

Action: None required.

27. Commenting Organization: OEPA Commentor:
Pg. # 6 Section # 4.2.3 Paragraph # Sent./Line # 18-19
Original Comment # 21

Comment: **How will the analyst determine that the extractants have decomposed?**

Response: Under the conditions of the tests, neither the acid/base/salt nor the chelant extractants will decompose to an extent that will lower the quality of the data. The HNO_3 may partially decompose as a result of the 80 degree C temperature and due to oxidation of organic and inorganic compounds in the soil. This decomposition does not affect the validity of the test. The test objective is to determine if HNO_3 will extract the contaminants of concern (see Tables 3-5, 3-7, and 3-9) at 80 degrees C. The surfactants may decompose under these conditions. The surfactants will be investigated at ambient temperature instead of 80 degrees C.

Action: The text has been revised as noted in the response.

28. Commenting Organization: OEPA Commentor:
Pg. # 6 Section # 4.2.3 Paragraph # Sent./Line # 25-26
Original Comment # 22

Comment: **If additional extractants need to be investigated, a list should be provided to U.S. EPA and Ohio EPA for approval.**

Response: A list containing the additional extractants will be provided to the U.S. EPA and Ohio EPA for approval, if the experimental results indicate that tests with additional extractants would be prudent. The text will be revised as follows: The ethylenediaminetetraacetic

acid (EDTA) solutions will be tested at three different pH values. The surfactants will be tested at three different concentrations. The other extractants, noted in the table, may be tested at various pH values provided that the standard pH values being tested give unsatisfactory results.

Action: Text has been revised as noted in the response.

29. Commenting Organization: OEPA Commentor:
Pg. # 9 Section # 4.2.3 Paragraph # Sent./Line # 2-4
Original Comment # 23

Comment: **In a previous U. S. EPA study, contaminant concentration in the less than 0.25 mm size fraction increased after washing. If chemical extraction and analysis in stage 1 is performed using the entire sample (all size fractions), the results may be meaningless.**

Response: Extraction of the entire sample will provide useful screening information as to the effectiveness of the extractants regardless of the distribution of the contaminants on the particle size fractions. The results of this phase of the testing will be used to determine which of the extractants will be used in Stage II with the discrete particle size fractions.

Action: None required.

30. Commenting Organization: OEPA Commentor:
Pg. # 16 Section # 4.3.3 Paragraph # Sent./Line #
Original Comment # 24

Comment: **Washing solutions are likely to contain other contaminants in addition to uranium. Explain the rationale for testing only for uranium. Define the concentration that will denote successful contaminant removal from washing solutions.**

Response: All filtrate samples from the precipitation tests will be analyzed for U, As, Ba, Cd, Cr, Pb, Sc, and Ag, and turbidity. If it is determined that a metal is not in the mother liquid, then that metal will not be analyzed for in the filtrate.

If this alternative is carried forward to the full scale, the effluent will be sent to the site-wide water treatment facility. Therefore, the filtrates from this treatability project must meet the waste treatment plant acceptance criteria.

Action: None required.

31. Commenting Organization: OEPA Commentor:
Pg. # Section # 4.4 Paragraph # Sent./Line #
Original Comment # 25

Comment: **The remedy selection testing must incorporate complete physical and chemical characterization of the soil before soil treatment begins.**

Response: The remedy selection testing, Section 4.4, is conducted on soil taken directly from the drums that contain soil collected during the initial sampling and analysis of the four locations (Section 6.0). The soil in these drums was completely characterized, both physically and chemically at that time. Although their storage time on site will be approximately 6 to 12 months after collection and prior to use in remedy selection testing, further characterization of the soil is not considered necessary. The initial analyses will be used as baseline values for this soil.

Action: The text will be revised as noted in the response.

32. Commenting Organization: OEPA Commentor:
Pg. # 18 Section # 4.4.1 Paragraph # Sent./Line # 21-22
Original Comment # 26

Comment: **Explain the rationale for assuming that the size of contaminated particles is less than 75 microns.**

Response: The basic bonding mechanisms for contaminant affinity to soil particles is via electrochemical forces, whether it be specific or non specific adsorption mechanisms. The clay size fraction (< 2 um) is the only soil fraction with a charged surface. However, there does seem to be some indication of contaminants being associated with the silt fraction (2 - 50 um), but to a much less extent. The 75 um criteria, which will also include the very fine sands, should be a conservative estimate of the soil size fractions considered to retain contaminants with any bonding affinity. In addition, this size fraction is conducive to normal mechanical operations for the sieving steps in soil washing.

Action: None required.

33. Commenting Organization: OEPA Commentor:
Pg. # 18 Section # 4.4.1 Paragraph # Second Sent./Line #
Original Comment # 27

Comment: **The use of "clean" in this paragraph is confusing. Clarify its use.**

Response: Clean will be defined as the "action level" for the soil washing treatment process. It will encompass RCRA criteria for organic and inorganic constituents, (data derived from TCLP results) for determining if "washed soil" can be placed back on site. Uranium levels in

the "washed soil" ($\leq$ 35 pCi/g) will be the determining radiological criteria for placing soil back on site.

Action: "Clean" will be defined in the text as described above.

34. Commenting Organization: OEPA Commentor:
Pg. # 22 Section # 4.5 Paragraph # Sent./Line # 7
Original Comment # 28

Comment: When is data about concentration of target organic compounds associated with each particle-size fraction acquired during the treatability study?

Response: Data about concentration of target organic compounds associated with each particle size fraction is acquired for 4 targeted semivolatile organic compounds (SVOCs) in Stage I (Table 3-5) and 4 volatile organic compounds (VOCs) and 4 SVOCs in Stage II (Table 3-7). In addition, all size fractions resulting from the remedy selection testing (Section 4.4) will be characterized according to Table 3-9 to ensure that contaminants (not just targeted contaminants during Stage I & II testing) have been removed from each size fraction.

Action: None required.

35. Commenting Organization: OEPA Commentor:
Pg. # Section # 6 Paragraph # Sent./Line #
Original Comment # 29

Comment: The use of two programs with similar titles, "Soil washing treatability study work plan" and "Uranium soils integrated demonstration treatability sampling plan" in the work plan is confusing and requires very careful reading by reviewers. For example, Figure 6-1 is titled,"Treatability soil sampling locations" and is referenced in the text by both programs. A review of this section for clarity would be helpful.

Response: Section 6 will be modified for clarity.

Action: The text will be modified as requested by the reviewer.

36. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 6.0 Paragraph # Sent./Line # 11-13
Original Comment # 30

Comment: This statement should be included in the objectives in Section 3, pg. 9.

Response: This statement will also be included in Section 3, page 9.

Action: The text has been revised as noted in the response.

37. Commenting Organization: OEPA Commentor:
Pg. # 2 Section # 6.1 Paragraph # Sent./Line # 11-15
Original Comment # 31

Comment: In order for the results from the treatability study to be comparable, all samples must be collected and analyzed using the same methods and procedures. DOE must clearly demonstrate that the sampling and analysis plan for the treatability study is the same as the sampling and analysis plan for the integrated demonstration project. In Appendix E the site media sampling plan appears to have different objectives and protocol than the integrated demonstration project as described in Section 4 and 6. Describe how the plan in Appendix E is related to the other sampling plans.

Response: The site media sampling plan in Appendix E was written for the ID program. It was included in this work plan as a supplementary document in support of the integration effort. This does not reflect the chemical characterization of soils as described in Section 6, e.g., HSL analyses and full radiological analyses. Coordination of the initial analysis of the soils collected for both the ID and OU5 programs was conducted so that all soils receive the same characterization as noted in Table 6-1. This initial characterization of the soil will be used by both the ID and OU5 programs as the starting baseline levels of contaminants.

The ID media sampling plan, relative to the excavation, removal and mixing of soil prior to placement in drums, is more extensive than that proposed for the two additional soils to be used in the OU5 study. The ID program had a need for a greater volume of soil, and therefore required different excavation and soil preparation techniques. The commonalities that are important, relative to the integrative approach of the two studies, is that all soils are collected from the surface 15 to 30 cm, and soils are homogenized and sieved prior to being placed in a drum. All sets of drums will be sampled and analyzed for homogeneity by the same methodology. Initial chemical and physical characterization will be the same. This provides an integrated approach to the simultaneous but separate treatability studies being conducted on the same soil by the two studies.

Action: Clarification of the subject will be provided in the revised text.

38. Commenting Organization: OEPA Commentor:
Pg. # 4 Section # 6.2 Paragraph # Sent./Line # 11-13
Original Comment # 32

Comment: Action levels have not been defined in this section. Explain the action level of 35 pCi/g.

Response: Cleanup goals for the site have not been established. The selection of the 35 pCi/g for uranium in soils was intended to be used as a reasonable preliminary action level to aid in defining areas and volumes of contaminated soil. This level was developed in the Nuclear Regulatory Commission (NRC) Technical Branch position paper, "Disposal or On-Site Storage of Residual Thorium or Uranium (Either as Natural Ores or Without Daughters Present) From Past Operations." This level is not intended as a final cleanup goal.

Action: The use of 35 pCi/g will be explained in the text.

39. Commenting Organization: OEPA Commentor:
Pg. # 4 Section # 6.2 Paragraph # Sent./Line # 26-27
Original Comment # 33

Comment: This sentence is not logical as written. Correct any typographical errors.

Response: The sentence will be rewritten for clarity as follows: "TCLP and HSL volatile organic analyses will not be conducted on the homogenized soil since these analyses were conducted prior to excavation."

Action: The text will be revised as stated in the response.

40. Commenting Organization: OEPA Commentor:
Pg. # 6 Section # 6.3 Paragraph # Sent./Line # 3-4
Original Comment # 34

Comment: Correlate the locations with a numbered sample location in Figure 6-1.

Response: Sample locations will be numbered in Figure 6-1. In addition, sampling locations of the two soils common to the ID program will also be noted.

Action: Figure 6-1 has been revised as stated in the response.

41. Commenting Organization: OEPA Commentor:
Pg. # 10 Section # 6.5 Paragraph # Sent./Line # 2-3
Original Comment # 35

Comment: The use of a rototiller to loosen surface soil does not seem to be a likely soil excavation technique that would be used during remediation. Although volatile organic compounds may be lost during soil excavation, more losses would occur by rototilling the soil. An alternative method of soil excavation should be considered.

Response: The proposed use of a rototiller or similar device to prepare soil for collection and placement into drums serves two functions. It first loosens the soils and breaks down the

coarse aggregates into smaller aggregates that can pass a 3/4-inch screen. It also serves as a method for homogenizing the soil while it is still on the ground. This process may accentuate volatile losses compared to the actual mechanical removal of soil during a full scale soil washing operation. Loss of VOCs occurring during this process could possibly be evaluated by comparison of VOC levels in the soil during the initial sampling prior to excavation with the levels of targeted VOCs analyzed in Stage II.

Action: The text will be revised to provide information as noted in the response.

42. Commenting Organization: OEPA Commentor:
Pg. # 1 Section # 10.1 Paragraph # Sent./Line #
Original Comment # 36

Comment: At the present time, the FEMP does not have any permitted units that are accepting RCRA or CERCLA wastes for disposal. Revise this section to reflect the current status of the FEMP.

Response: Currently, the FEMP is operating under RCRA rules through the 1988 OEPA/DOE Consent Decree. The first Part A Permit Application was submitted on July 6, 1984, to the U.S. Environmental Protection Agency (U.S. EPA). There have been 13 revisions to the Part A Permit since the 1984 submittal, the first of which was sent for informational purposes only. The most recent Part A Permit revision was submitted on October 31, 1991. The revised RCRA Part B Permit Application was also submitted on October 31, 1991, to the U.S. EPA and Ohio Environmental Protection Agency (OEPA) for review. FEMP has been permitted for interim storage in accordance with requirements. Final disposition of these wastes will be conducted in accordance with CERCLA, under the Amended Consent Agreement.

Action: The text has been modified to reflect the comment response.

General Comments

43. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 1

Comment: The work plan does not provide any supporting information (either theoretical or experimental) for the experimental design and procedures for the soil washing treatability study. In most cases, it appears as though about ten to fifteen experiments are proposed for each phase of the treatability study without a logical approach to remove target contaminants. For example, to remove primarily uranium from the soil washing extracts, the work plan proposes fifteen different experiments without providing any rationale for the experimental design. It is

essential that the revised work plan provide supporting data to demonstrate that the experimental design and procedures are based on a scientific approach.

Response: The soils for this study are collected from areas adjacent to the production area and other areas within the FEMP site. (See Chapter 6 for more details on the soil collection.) The soils will contain various metals besides uranium, e.g., arsenic, barium, and lead, as well as organic compounds. (See Tables A-1, A-2, A-3, and A-4.) The extractants were selected to test the removal efficiencies for the metals and organic compounds listed in Chapter 3.0 of the work plan.

The soil contains a relatively high clay content. It is anticipated that the uranium and other metals present in soil will be tightly bound to the clay portion of the soil. Aggressive extractants were therefore selected for the process. A brief rationale for the selection of each extractant follows. Sulfuric acid, hydrochloric acid, nitric acid, and the carbonate solutions are used in uranium mining and contaminated water purification. phosphoric acid was selected due to potential phosphate complexes that may form. The acids may also protonate some organic compounds making them more soluble. Sodium hydroxide is used to increase the pH and with some metals, e.g., lead, increase their solubilities. Sodium hydroxide may deprotonate some organic compounds making them more soluble. Sodium and potassium chloride have been used to convert the less soluble $RaSO_4$ into the more soluble $RaC1_2$ so that it could be extracted. Chelants have been used to extract metals from ores. Surfactants and alcohols are used to increase the solubility of organic constituents in the matrix.

Action: The text will be revised as noted in the response and references will be provided.

44. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 2

Comment: **The work plan needs to provide more details on most of the treatability study activities. There are several statements in the work plan which describe the experiments to be conducted in one or two sentences (for example, (1) settling rates will be determined; and (2) biodegradation studies will be carried out). These statements are not adequate either to perform the proposed experiments or to evaluate the usefulness of the data to be generated by these experiments. It should be noted that the experimental procedures should be written in a step-by-step manner with all details included for the experiments to be carried out properly.**

Response: More detail will be given to individual treatability study activities and descriptions of Stage I and II testing, as well as remedy selection testing, will be written in a more descriptive manner to detail experimental procedures.

Action: The text has been revised per the action noted in the response.

45. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 3

Comment: **The work plan does not provide sampling and analytical activities information for all phases of the study. For example, such information specific to the experiments performed in the treatability study is not included in the work plan.**

Response: The sampling and analytical activities for the sampling, analysis, and collection of soils from the designated locations are presented in Section 6. Greater detail will be given as to the sampling and analytical activities during the various phases of the bench-scale treatability testing.

Action: The text has been revised per the actions noted in the response.

46. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 4

Comment: **Although the work plan states that the quality assurance and quality control (QA/QC) procedures described in the remedial investigation and feasibility study quality assurance project plan will be followed during the treatability study, it would be helpful if summary tables showing all samples to be collected (including QA/QC samples) during the treatability study are included in the revised work plan. The summary tables would be very helpful to the sampling team and data reviewers.**

Response: Summary tables showing samples to be collected (including QA/QC samples) during the treatability studies will be included in Chapter 6.0 and Chapter 4.0. A table that contains a list of analytical procedures, DQO levels for each procedure and a reference to a description of each procedure will be added to Chapter 3.0

Action: The text will be revised as noted in the response.

<u>Specific Comments</u>

47. Commenting Organization: U.S. EPA Commentor:
Pg. # 4 & 5 Section #Sub-1.2.2 Paragraph # Sent./Line #
Original Comment # 1

Comment: **This subsection should state in which year the data presented in Figures 1-2 and 1-3 and Table 1-1 were collected. Without this information, it is difficult to judge**

whether this data can be used to select preliminary sampling locations. This is because in the work plan, Appendix A, page 1, paragraph 1 states that surface water transport might have introduced significant variability in soil contaminant concentrations in a given area over time.

Response: The data used to develop the soil contour figures and Table 1-1 were collected and analyzed from the spring of 1988 through 1990. The intent of these figures and this summary table is to provide a brief overview of the contamination in site soils based on existing data. The work plan proposes further characterization of soils prior to collecting samples that will be used in the treatability testing. This ensures that samples are representative of site conditions.

Action: Clarification of dates of sample collection will be provided in Chapter 1.0.

48. Commenting Organization: U.S. EPA Commentor:
Pg. # 1 to 7 Section # 3.0 Paragraph # Sent./Line #
Original Comment # 2

Comment: Line 19 states that the preliminary remediation goals (PRG) presented in Tables 3-1 and 3-2 will be used as target levels for evaluating the effectiveness of the soil washing technology. However, for several compounds, contract required detection limits presented in these tables are higher than the PRGS. For example, the contract required detection limits for (1) arsenic, beryllium, and benzo(a)pyrene in Table 3-1 and (2) actinium-227, protactinium-231, and thorium-228 in Table 3-2 are higher than the PRGS. For this reason, it would not be possible to evaluate whether the PRGs have been met unless the actual detection limits to be achieved are lower than PRGS.

Response: The NCP (40CFR300) stipulates that final cleanup levels are based on other considerations in the overall RI/FS process in addition to risk (e.g. detection limits, background levels of constituents, best available technology, compliance with ARARs, reduction of toxicity, mobility or volume through treatment, implementability, cost).

Action: On line 17, change the phrase "cleanup levels" to "PRGs". On line 18, change the phrase "final action levels" to "final cleanup levels".

49. Commenting Organization: U.S. EPA Commentor:
Pg. # 2 Section #3.0 Paragraph # Sent./Line #
Original Comment # 3

Comment: **Table 3-1: The ratio of the soil concentration for meeting the PRG (column 3) to the reference dose (column 2) appears to be constant and equal to 80,000 for all compounds except cadmium, manganese, and mercury. It should be determined if these inconsistencies are errors.**

Response: The ratio of column 3 to column 2 is not constant in Table 3-1.

Action: Data in Table 3-1 has been checked.

50. Commenting Organization: U.S. EPA Commentor:
Pg. # 12 & 14 Section # 3.0 Paragraph # Sent./Line #
Original Comment # 4

Comment: **Tables 3-4 and 3-6: Activity 5 in these tables states that chemical extraction effectiveness will be statistically determined. However, neither this section nor Section 8.0 (data analysis and interpretation) presents any information on statistical methods to determine the chemical extraction effectiveness.**

Response: No statistical analyses will be conducted. Chemical extraction effectiveness will be based on 40 and 80 percent extraction constants in the Remedy Screening Stages I and II, respectively.

Action: The text will be modified per the response.

51. Commenting Organization: U.S. EPA Commentor:
Pg. # 13, 15, & 17 Section # 3.0 Paragraph # Sent./Line #
Original Comment # 5

Comment: **Tables 3-5, 3-7, and 3-9: These tables list different constituents of concern for different phases of the treatability study. However, it is unclear why only these constituents are constituents of concern. A rationale for identifying only certain constituents as constituents of concern should be provided (for example, these constituents are (1) difficult to remove from soil using the soil washing technology; (2) present at relatively high concentrations; and/or (3) highly toxic).**

Response: The phrase "constituents of concern" is incorrect and will be changed to Target Analytes. The rationale for the selection of target analytes during remedy screening stages is to focus the evaluation of treatment techniques on a few selected representative contaminants so as to minimize the analytical costs during these screening procedures. Full analyses

are conducted during the initial characterization of soils and during the remedy selection part of the study.

In the EPA document "Guide for Conducting Treatability Studies Under CERCLA" (EPA/540/2-89/058), it is recommended that target compounds be used during the Remedy Screening phase. Remedy Screening, Stage I testing will use uranium as the target radioactive and metal compound. In addition, the radiological activity will be tracked by analyzing for gross alpha and gross beta in the extracted soils and washing solutions. Four target organic compounds will also be tracked. See Table 3-5. During the Remedy Screening, Stage II tests, uranium and gross alpha and gross beta will be used to track the radioactive compounds. In addition, seven target metals and eight target organic compounds will be analyzed. See Table 3-7. A more detailed analysis will be conducted in the Remedy Selection phase. See Table 3-9.

The minimum performance criteria for the Remedy Screening Stage I are that the uranium concentration, or target organic concentration or measured gross alpha and gross beta in the extracted soil is decreased by 40 percent. During the Remedy Screening Stage II, the minimum performance criteria are that the extracted soil passes the TCLP leaching standard for As, Ba, Cd, Cr, Pb, Se, and Ag, or the measured gross alpha and gross beta, uranium concentration, or target organic compound concentrations are decreased by 80 percent. During the Remedy Selection phase, the minimum performance criteria are that the extracted soil passes the TCLP leaching standard for As, Ba, Cd, Cr, Pb, Se, and Ag, or that the soil contains less than 35 pCi/g uranium.

Although PRGs are used to provide preliminary goals for evaluating the effectiveness of the treatment technologies, they are not intended to provide final action levels for contaminants in the soils. Therefore, if the technology does not achieve individually specified levels, it should not be judged ineffective solely for that reason. The technology may later be determined to be the best available technology for treating Operable Unit 5.

Action: The text will be revised as noted in the response.

52. Commenting Organization: U.S. EPA Commentor:
Pg. # 3 Section #Sub-4.2.1 Paragraph # Sent./Line # 26
Original Comment # 6

Comment: According to this line, alkalinity is initially determined for the soils to help determine the quantity of certain extraction reagents necessary to overcome buffering effects and effectively remove contaminants. Alkalinity titration is adequate to identify the buffering effects if the extraction reagents are acidic. However, several alkaline agents are planned to be used during the treatability study (for example, sodium hydroxide and sodium carbonate - see page 4, line 23; and page 8, Table 4-1). For this reason, acidity titration for soils should also be performed to adequately identify the buffering effects.

Response: Acidity titration for soils will be conducted and will be discussed in the text.

Action: The text has been modified as noted in the response.

53. Commenting Organization: U.S. EPA Commentor:
Pg. # 3 Section # Sub-4.2.1 Paragraph # Sent./Line #32
Original Comment # 7

Comment: This line states that the average concentration of eight selected target organic compounds in three samples will be determined during initial sample preparation and analysis of the Remedy Screening - Stage I. However, Table 3-5 (Section 3, page 13) identifies only four target organic compounds instead of eight. This inconsistency should be resolved.

Response: A five to ten kg portion of soil from each of the four site collection drums will be removed and separately homogenized. (A description of the collection of samples for the treatability study is in Chapter 6..) For each soil location, only one batch of soil will be homogenized and analyzed for the Remedy Screening Stages I and II. The data collected must therefore provide all the data necessary for "Analyses for Initial Soils" in both stages. See Tables 3-5 and 3-7.

Action: Text revised to indicate that for each sample location, one set of homogenizations and analyses will be conducted for both Stages I and II.

54. Commenting Organization: U.S. EPA Commentor:
Pg. # 4 Section # 4.2.2 Paragraph # Sent./Line #18
Original Comment # 8

Comment: Line 18 states that tap water will be used for soil washing. It is unclear from this sentence what kind of tap water (potable, industrial, or other) will be used. Contaminant-free water should be used because wash solution is also to be characterized after soil washing. Otherwise, the tap water should be analyzed before soil washing to avoid introduction of an unknown quantity of contaminants in the soil and the soil wash solution.

Response: The type of tap water to be used in the soil washing studies will be potable water. This water will also be analyzed for organic compounds and metals listed in Table 3-9 prior to use in treatability studies and will serve as a blank during analytical determinations.

Action: The text has been modified to reflect the information provided in the response.

55. Commenting Organization: U.S. EPA Commentor:
Pg. # 4 Section # Sub-4.2.2 Paragraph # Sent./Line #22
Original Comment # 9

Comment: **Line 22 states that five dispersing agents are being considered, and one of these five agents may be added to tap water to deflocculate any soil aggregates. However, the work plan does not identify the criteria to be used in selecting the dispersing agent, or the concentration of dispersing agent. This part of the treatability study is intended to identify contaminants and contaminant concentrations associated with different particle-size fractions of the soil, and the subsequent parts of the study will use that particle-size fraction of the soil determined to be the most contaminated. Because dispersing agents are not proposed to be used in the subsequent stages of this study, it would seem appropriate to carry out this part of the study without using dispersing agents.**

Response: Dispersing agents may be critical in providing a single grain product of the soil used in the Stage I tests. The importance of this lies in the need to determine the association of contaminants with individual size fractions of the soil. This association will be the basis for all further mechanical separation parameters as well as the focus of all chemical extraction tests.

The use of dispersing agents in subsequent testing may present a problem during the chemical extraction tests relative to the interferences of the dispersing agent with the chemical extraction of uranium and other contaminants. This is the primary reason for the listing of the five dispersing agents as potential deflocculants during the particle size separation tests.

In consideration of the interferences noted above, a physical means of aggregate dispersion will also be investigated. Mechanical mixing or ultrasonic dispersion will be investigated in addition to the five dispersing agents.

The soil fractions derived from the addition of dispersing reagents and from separation by physical means will be analyzed for metals listed in Table 3-7 using ICP. A comparison of the metals in each soil fraction will be made.

If dispersing reagents appear to be necessary, they will be carried forward into Remedy Screening, Stage II to determine their effects on the chemical extractions. Before proceeding to the Remedy Selection phase, it will be determined if chemical dispersing reagents are necessary.

Action: The text will be modified to reflect the above justification for the selection of dispersing agents and the testing of mechanical separation techniques. The proposed concentration of dispersing reagent will range from 5 to 20 millimolar solutions depending on the success of the lower concentrations on deflocculation.

56. Commenting Organization: U.S. EPA Commentor:
Pg. # 6 Section # Sub-4.2.3 Paragraph # Sent./Line # 18
Original Comment # 10

Comment: **According to this line, during chemical extraction using acids, bases, chelants, salts, surfactants, and/or alcohols, if decomposition of extractants occurs because of the elevated extraction temperature (80 degrees C), extraction will be carried out at a lower temperature. However, the work plan does not mention any method to determine whether an extractant has decomposed during the chemical extraction step.**

Response: Under the conditions of the tests, neither the acid/base/salt nor the chelant extractants will decompose to an extent that will lower the quality of the data. The HNO_3 may partially decompose as a result of the 80 degree C temperature and due to oxidation of organic and inorganic compounds in the soil. This decomposition does not affect the validity of the test. The test objective is to determine if the HNO_3 will extract the contaminants of concern (see Tables 3-5, 3-7, and 3-9) at 80 degrees C. The surfactants may decompose under these conditions. The surfactants will be investigated at ambient temperature instead of 80 degrees C.

Action: The text has been revised as noted in the response.

57. Commenting Organization: U.S. EPA Commentor:
Pg. # 6 Section # Sub-4.2.3 Paragraph # Sent./Line # 24-27
Original Comment # 11

Comment: **Line 24 states that ethylenediaminetetraacetic acid (EDTA) solution will be tested at three different pH values. It is unclear from the work plan why pH is varied only for one of the three chelants used to extract contaminants from soil. It is also unclear why only the surfactants will be tested at different concentrations. Lines 25 to 27 state that additional extractants not mentioned in the work plan may be tested and that some of the extractants listed in the work plan in Table 4-1 may be tested at pH values not noted in the table. These statements suggest that the experiments are not planned based on proper supporting information (either theoretical or experimental) and several things are left open. Because of this, it is difficult to evaluate the usefulness of the data to be generated from the treatability study.**

Response: In Keys to Chelation by Dow Chemical (1985) the metal-EDTA stability constant is a strong function of pH. For a complex mixture of metals, the pH of the solution must be varied to maximize the solubilities of all the metals of concern. By vendor description, the NS1 and Citraklean are buffered solutions whose pH is optimized for their application.

The Remedy Screening phase, Stage I experiments are designed to look for gross effects. The conditions were selected to yield favorable results, i.e., what reagents have a

reasonable probability of working. The conditions chosen are high temperature (80 degrees C), relatively high reagent concentrations (e.g., 1:1) and relatively high dose rate (10:1). The high dose rate will minimize the effects of common ion effect and ionic strength on the dissolution of the desired material. In Stage II, after the number of extractants are decreased, the effect of extractant concentration will be determined.

Remedy Screening, Stage I

Acids: The 1:1 acid concentrations are chosen as a reasonable compromise of acid strength and having adequate water for dissolution. In unpublished IT data on the extraction of uranium and other hazardous metals from mixed waste biological and waste water sludges and from the Fernald Silo 1 and 2 waste material, the efficiency of extractions with acids were highest with acid concentrations between concentrated acids and solutions which were diluted by 50 percent with water.

Sodium hydroxide: Four normal sodium hydroxide concentration is a compromise between total alkalinity, water content of the extractant, and viscosity of the extractant.

Carbonate solutions, NS1, and Citraklean: These extractants are being used at typical commercial concentrations.

EDTA: The EDTA concentration is selected to provide a significant excess of exchange equivalents for favorable extraction ability.

Chloride salts, surfactants, and alcohols: The correct range of concentrations for NaCl, KCl, surfactants, and alcohols cannot be determined without experimentation.

Remedy Screening, Stage II

A list of the ranges of concentrations are given below. The chloride salts, surfactants, and alcohols will be used at similar levels determined in Stage I.

Extractant	Strength Tested
Acids	Concentrated, 1:1, 1:3
NaOH	4 N, 2 N, 1 N
NS1, Citraklean	Commercial, 1:1, 1:3
EDTA	30%, 15%, 7.5%

By vendor description, the NS1 and Citraklean are buffered solutions whose pH is optimized for their application.

Action: The text has been revised as noted in the response.

58. Commenting Organization: U.S. EPA Commentor:
Pg. # 8 Section # 4 Paragraph # Sent./Line #
Original Comment # 12

Comment: **Table 4-1: This table shows that each of the several extractants is tested at only one concentration, but no supporting data is provided to show that these extractants are effective at the proposed concentrations. The work plan should explain the rationale for testing each of the several extractants at only one concentration.**

Response: See response to U.S. EPA Original Comment #11/Comment 57.

Action: The text has been revised as noted in the response.

59.
Commenting Organization: U.S. EPA Commentor:
Pg. # 9 Section # Sub-4.2.4 Paragraph # Sent./Line # 6-10
Original Comment # 13

Comment: **The work plan proposes fifteen tests for contaminant removal from washing solutions. Each test consists of adding two reagents in sequential order to the washing solution in order to precipitate metals. The work plan states that these series of reagents have been investigated in earlier studies and have been determined to be effective under selective circumstances. However, the work plan neither cites any references nor provides any theory to support this experimental design. Without such information, it is difficult to evaluate the usefulness of the proposed tests. It should be noted that significant published work is available on the removal of radionuclides from water, and such work can definitely be used in experimental design (for example, see Sorg, T., "Methods for Removing Uranium from Drinking Water," Journal of American Water Works Association, July, 1988). Also, it is unclear why this subsection does not discuss organic contaminant removal from washing solution.**

Response: A list of references will be given.

Organic compound removal technology is contingent on identification of the types of organic compounds found in the liquid. The scope of the organic compound removal study cannot be defined at this time.

Action: Text will be revised per response.

60. Commenting Organization: U.S. EPA Commentor:
Pg. # 9 Section # Sub 4.2.4.1 Paragraph # Sent./Line # 12 to 30
Original Comment # 14

Comment: **Subsection 4.2.4.1, page 9, lines 12 to 30: This subsection proposes to use 3 to 5 milliliters (ml) of soil washing solution to perform precipitation tests. In each of the fifteen tests proposed, two reagents will be added in sequence to the washing solution. The first reagent is allowed to react before the second reagent is added. The work plan states that the most promising reagent combinations will be determined by professional judgement. During each test (1) onset of turbidity and precipitation along with pH changes and (2) the solids settling rate will be recorded. At the end of each test, the solution will be filtered and uranium concentration will be measured in the filtrate. The concerns associated with this experimental design are listed below.**

(a) Several details regarding the experimental design are missing. The work plan does not specify the volume of the first reagent added or the criterion used to stop the addition of the first reagent and begin the addition of the second reagent. Line 21 states that the first reagent is added and allowed to react, but does not state for how long it will be allowed to react. Similarly, the work plan does not specify a criterion to end a test. Noting the appearance of turbidity does not allow a good professional judgment regarding uranium precipitation because turbidity may result from the precipitation of other metals present in washing solution, or the addition of some of the reagents (for example, magnesium oxide and calcium hydroxide) in slurry form.

(b) This subsection does not give the concentrations of the reagents used. It is important to specify the concentration of reagents because only 3 to 5 ml of washing solution is to be used in each test. If very small quantities of concentrated reagents are to be added, the volume of the reaction mixture (washing solution plus reagents) may be too small to measure pH or the solids settling rate. If large quantities of dilute reagents are to be added, contaminant concentrations in the reaction mixture will be lowered simply due to dilution.

(c) Lines 18 and 19 state that to improve filtration or settling characteristics, polymers and filter aids may be used. The work plan should identify what types of polymers and filter aids will be used and what experiments will be done to determine the their doses.

Response: a. The work plan will be re-written to describe precipitation testing in more detail. The precipitation program will be divided into two parts - preliminary screening (Remedy Screening Stage IIa) and confirmational testing (Remedy Screening Stage IIb). The screening tests (using 20 ml samples) will be used to eliminate obviously deficient treatments and establish dosages, while the confirmatory tests (using 100 ml samples) will be used to demonstrate treatments on a larger scale for settling tests and more extensive analyses.

All filtrate samples in Stages IIa and IIb will be analyzed for U, As, Ba, Cd, Cr, Pb, Se, and Ag, and turbidity. Due to sample size, the filtrates from Stage IIa may have to be diluted before analyzing the sample. Except for lime and MgO tests, the lack of turbidity after precipitant addition will indicate failure of the test. In the case of lime and MgO treatments, the effectiveness of the treatment will be determined by analyses of the uranium and metals results.

b. Sample sizes for stage IIa have been increased to 20 ml to accommodate extra analyses. Volume changes attributed to dilution effects of added reagents will be corrected for during analyses. Settling tests will only be performed on 100 ml samples during Stage IIb. In addition, the supernatent liquids will be analyzed for turbidity.

c. The jar test procedure will be added to an appendix and will contain a list of reagent concentrations to be used during the test. The jar test procedure is based on ASTM procedure D3036-80. Development of Design Criteria for Wastewater Treatment Processes, Vanderbilt University, Parkson Corp Lamella Operator Manual, and NALCO and DOW polymer jar testing procedures). The procedure is modified for reduced sample size due to limited sample quantities. The filter aid to be used will be identified in the text.

Action: The text has been revised per response.

61. Commenting Organization: U.S. EPA Commentor:
Pg. # 12 Section # Sub-4.3.2 Paragraph # Sent./Line # 24 to 26
Original Comment # 15

Comment: According to these lines, in Remedy Screening Stage II, the effect of extractant to soil dose ratio (dose rates) will be studied at 2:1 and 4:1. It is unclear why these two dose rates differ from the dose rate (10:1 -- see page 8, Table 4-1) planned to be used in the Stage I. The revised work plan should justify why the dose rate used in the preliminary study (Stage I) is not used as one of the two doses in the subsequent parts of the study (Stage III).

Response: See response to original U.S. EPA Comment #11/Comment 57.

Action: The text has been revised as noted in the response.

62. Commenting Organization: U.S. EPA Commentor:
Pg. # 16 to 18 Section # Sub-4.3.3 Paragraph # Sent./Line #
Original Comment # 16

Comment: **This subsection lacks detail in several areas. Some examples of such areas are described below.**

(a) The work plan (for example, see subsection 4.3.3.1) should clearly describe the type of reactor used and type of mixing provided, concentrations of reagents used, contact time provided, and several other details necessary to carry out precipitation experiments. Similarly, statements such as (1) "settling rates will be determined," and (2) "aliquots of these mixtures will be filtered or centrifuged," do not give any idea about what type of data will be collected and how useful the data will be. The experimental procedures should contain details necessary to carry out the experiments properly.

(b) Line 17 states that if settling or filtration rates are very slow, jar tests will be conducted using inorganic coagulants and/or organic polymers. The work plan should specify the range of settling and filtration rates that will be considered very slow.

(c) Subsection 4.3.3.4 should explain the purpose of the kinetic experiments and how the data from these experiments will be used. Line 5 of this subsection states that column experiments will be conducted and 600 ml of liquid will be treated. Again, more details on the size of the column, empty bed volume, and contact time should be provided for the column experiments. It is unclear why a minimum of 600 ml will be treated. The work plan should explain whether breakthrough is expected after treating 600 ml, and how the breakthrough will be monitored.

Response:

a. The jar test procedure will be added to an appendix. The jar test procedure will include a list of reagent concentrations to be used during the test, details of necessary equipment, duration of each step, and acceptance criteria. Analytical data will further help to eliminate less promising treatments.

b. Settling rate acceptance criteria will be listed in the new jar test procedure. A filtration procedure will be added to an appendix. Acceptable filtration rates will be listed in the filtration procedure.

c. The ion exchange isotherm/kinetics experiments will be used to determine type of resin, column size, and flow rate for the column tests to follow. A minimum of 600 cc batch size for column study is based on the minimum column size needed for use with 20 to 50 mesh resins and analytical sampling requirements. The re-write for this section of the work plan will include the necessary details for the ion exchange study.

Action: Text revised as per response.

63. Commenting Organization: U.S. EPA Commentor:
Pg. # 18 Section # 4.3.4 Paragraph # Sent./Line #
Original Comment # 17

Comment: **This subsection makes a reference to the use of bioremediation technology to remove any excessive organic residuals present in the treated soil after soil washing. Other than stating that a slurry batch reactor will be used, the subsection does not provide any details about the technology or the experimental procedure. These details should be included in the revised work plan.**

Response: Section 4.3.4 will be rewritten as an optional phase of the treatability studies. It is premature at this stage to detail a study for removal of organic residues in the soils. The details will be determined when analyses of the cleaned soils are completed.

Action: The text will be revised per the comment response.

64. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # 6.0 Paragraph # Sent./Line #
Original Comment # 18

Comment: **This section provides soil sampling methods for different locations of the production area at the Fernald site in Ohio; and methods for soil sample analysis. However, this section does not provide any information on sampling and analytical methods specific to treatability activities for solids and liquids. The revised work plan should include the missing information for all activities described in Section 4.0**

Response: This section should not provide detailed sampling and analytical procedures for treatability testing described in Section 4.0. Sampling, sample preparation, and analytical procedures in support of treatability testing should be included in Section 4.0.

Action: The sampling and analytical methods for tests conducted during the various stages of bench-scale soil washing studies will be added to each appropriate subsection in Section 4.0, Experimental Design and Procedures. All appropriate analytical methods specific to treatability activities for solids and liquids will be included as part of the appendix.

65. Commenting Organization: U.S. EPA Commentor:
Pg. # 8 Section # Sub-6.4 Paragraph # Sent./Line # 3 to 8
Original Comment # 19

Comment: **The work plan states that each sampling location will be first staked out, a grid of the area will be laid out, and six discrete soil samples will be collected from each area. This subsection should also mention how the six discrete sampling points will be determined (for example, by generating six random numbers for the nodes or by some other approach).**

Response: A centroid will be located within each effective area. An equal distance will be measured and marked in six directions from this centroid, each direction emitting from 60 degree intervals around the centroid. The distance for each discrete sampling point will be a uniform length from the centroid to the edge of the delineated boundaries to approximate a midpoint of the total length.

Action: The text has been revised to incorporate the information presented in the response.

66. Commenting Organization: U.S. EPA Commentor:
Pg. # 9 Section # 6.0 Paragraph # Sent./Line #
Original Comment # 20

Comment: **Table 6-3: This table should (1) cite an analytical method for the RAD screen, (2) state the holding time for mercury (one of the HSL metals) as 28 days, (3) correctly site the analytical method for total organic carbon measurement in soil (the method cited is for liquids), and (4) include relevant information for mineralogy (one of the analytical parameters listed in the table).**

Response: Table 6-3 will be modified to include: 1) analytical method for rad screen, as RSL-308 and 2) analytical method for TOC in soil as Walkey-Black. Mineralogy will not be determined on these samples and will be removed from the list of physical analyses.

Action: Revisions will be made to the text as noted in the response.

67. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # 8.0 Paragraph # Sent./Line #
Original Comment # 21

Comment: **This section should be expanded to include information on how the data will be evaluated and interpreted in conformance with the treatability study objectives as applied to each phase of the study. Appropriate equations should be given wherever applicable, and a brief description of how these equations will be used to analyze the data should also be included.**

Response: The text will be modified to describe data evaluation and interpretation. Appropriate equations will be given whenever applicable, including a brief description. A determination of successful solvents and conditions will be made by using the minimum performance criteria presented in response to Comment 51. A list of data required will be added to the text.

Action: Modification of text as noted in the response.

U.S. EPA
Region V, Radiation Section

General Comments

68. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 1

Comment: **Uranium as Screening Agent: It may be appropriate to use uranium as a screening agent given that it has been found whenever other radiological contaminants have been detected. However, there are a number of concerns that must be addressed in order to ensure that hazards other than uranium are not being neglected: If uranium is used as a screening agent, calculations should be made to establish a relationship between hazards from uranium and those due to other contaminants. Preliminary calculations based on measured soil concentrations indicate that doses from contaminants other than uranium - such as actinium decay series products -- may contribute more than twice as much inhalation dose as uranium does. Therefore, it is crucial that if uranium is used as a screening contaminant in soil testing, there must be some means of accounting for hazards from other radionuclides. Otherwise, analysis for specific radionuclides besides uranium should be undertaken throughout all stages of the treatability study.**

Response: The use of uranium analyses as an indicator of the effectiveness of a soil washing alternative is appropriate for the Remedy Screening stages of the treatability study process because the targeting of indicator constituents is consistent with EPA guidance. The Remedy Screening stage represents the initial step in the treatability study process. Subsequently, the Remedy Selection stage of the treatability study process includes analyses for a more comprehensive list of analytes (as presented in Table 3-9). Therefore, the Remedy Selection stage of the treatability study process will include consideration of the removal from soil of radionuclides (and chemicals) other than uranium. Also refer to response to Comment 51.

Action: None required.

69. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 2

Comment: Even if uranium is used for screening purposes, the removal from soil of other radionuclides must be considered when a treatment option for Operable Unit 5 (OU5) is being chosen. Testing for some transuranics, as well as a number of other radionuclides (such as Cs-137, Ra-226, Sr-90, Tc-99, etc.), has been incorporated into the treatment selection step of the work plan. However, a number of inconsistencies in the plan make it questionable whether all contaminants of concern will be adequately addressed. There are a number of steps necessary to ensure that adequate control will be exerted. First, all contaminants of concern must be identified in the initial soil characterization, and baseline levels of contamination established. Second, contaminants found during initial characterization need to be followed throughout the treatability study. Monitoring of various media in the study material must be done since it is unclear how the treatment process may concentrate specific radionuclides. Lastly, final contamination levels need to be established. These levels should be compared to preliminary (or final) remediation goals (PRGs). Such a comparison needs to be part of the decision-making process for choosing the treatment option for OU5. As stated earlier, this is crucial because the residual risk at the site depends on the cleanup levels of a variety of radionucildes and not on uranium only.

To this end, three lists must be reconciled so that they are entirely consistent: Table 6-1 (Initial Characterization), Table 3-9 (remedy Selection Testing), and Table 3-2 (Preliminary Remediation Goals). Those contaminants for which PRGs are identified are obviously considered important since preliminary goals have been developed for them. Therefore, each of the radionuclides in Table 3-2 would be included in the initial characterization and so that it can be tracked throughout the study if need be. All contaminants of concern found should also be added to the list of contaminants to be analyzed in treatment selection. For example, Ac-227 and Pa-231 (among others) appear in Table 3-2 with PRGs identified, but are not included in Tables 3-9 and 6-1. It is important that specific isotopes also be identified and followed since PRGs differ for each. Final levels will obviously be compared to the list of PRGs.

Monitoring for Alpha and Beta: It is unclear what significance measurements for gross alpha and beta in soil samples will have (see Tables 3-5 and 3-7, for example). This is especially true given that self-absorption for alpha is likely with soil. Standards for alpha and beta usually apply to water and even then are based on assumed relationships between specific radionuclides. The use of monitoring for gross alpha and beta should be justified. In addition, it should be indicated what relationship exists between these measurements and actual (or estimated) levels of contaminants of concern. Any assumptions made should be stated.

Leachate Disposal: **The definition of "leachate" in this document should be expanded and articulated so that it clearly includes rinsate, filtrate, and washing waters generated during the treatability testing. Otherwise, disposal procedures for these liquids may not be immediately apparent. Also, the means of disposal for these wastes should be outlined and applicable or relevant and appropriate requirements (ARARs) identified. For instance, are these liquids to be discharged to nearby waterways?**

Cleanup Goals: **Preliminary remediation goals (PRGs) identified in Section 3.0, Test and Data Quality Objectives, need to be integrated with the rest of the work plan. For example, they should appear in the flow sheets showing experimental processes so that they are utilized in the evaluation of the treatments. Contaminants for which PRGs are specified should also be monitored in initial characterization and followed throughout the testing in order that the removal effectiveness can be evaluated (see comment above on uranium as screening agent). Cleanup levels should be risk-based. All action levels given which are not risk-based, or are not clearly risk based -- such as the 35 pCi/g limit used -- should be justified.**

The 35 pCi/g limit in particular must be examined. This limit seems to focus primarily on uranium concentrations without leaving room for risk contributions from other radionuclides. It must not be used as a cleanup goal unless the total risk does not exceed 10^{-4}. Calculations using measured contaminant concentrations (Table 1-1) in OU5 show that the goal of 10^{-4} residual risk may be exceeded for the number of radionuclides identified if 35 pCi/g is used as a cleanup level. The use of the rule of ratios may be a more appropriate method of determining an action level.

Health and Safety Plans: **The health and safety plans need to be more specific with regards to radiological monitoring and action levels. Both the instrumentation to be used and the frequency of monitoring should be stated for all monitoring. The sources of actions levels should be referenced, and their use justified. The specific actions to be taken when action levels are exceeded should also be stated. Personal protection equipment levels should be triggered by definite action levels for radionuclides or radioactivity just as they are for chemical contaminants.**

Response: Table 3-2 lists the PRGs for the FEMP site. These PRGs are associated with all operable units, not only Operable Unit 5. Table 6-1 lists the analytical tests that will be conducted during the characterization of the soil collected from the site. Table 3-9 lists the analytical tests that will be conducted on the treated samples during the Remedy Selection phase. The list of organic compounds and radiological compounds in Table 3-9 may be expanded or reduced depending on the results of the characterization analysis (see Table 6-1). (Refer to response to Comment 51).

The list of analytes in Table 6-1 includes all constituents that are reasonably expected to be found in soil samples from the site during the initial soil characterization study. The

list of analytes in Table 3-9 (Remedy Selection stage) will not necessarily include all analytes from Table 6-1 because some of those may not be determined to be constituents of concern in the initial soil characterization. Those analytes determined not to be constituents of concern in the initial soil characterization will not be analyzed for in the Remedy Selection stage. The list of analytes in Table 3-2 (PRGs) is a compilation of constituents associated with the operable units at the site collectively, the same list of PRGs is used in all of the operable unit treatability study documents. Those analytes determined not to be constituents of concern in the initial soil characterization will not be of concern in the table of PRGs (Table 3-2). In addition, gross alpha and gross beta tests are used as a qualitative test to track the radiological contaminants. See Tables 3-5 and 3-7.

Action: No text change is required.

Response: The second portion of this comment discusses monitoring for alpha and beta. Tables 3-5 and 3-7 present proposed analyses/analytes for Remedy Screening Stages I and II respectively. Determination of gross alpha and gross beta levels are included as typical screening measurements performed on samples collected for the FEMP RI/FS. While it is true that alpha particles are subject to self absorption within a soil sample as collected, the laboratory analytical procedure involves analysis of a thin sample preparation to minimize self absorption within the sample. The results of the gross alpha and gross beta measurements are not intended to be used in the quantification of radionuclide concentrations in samples.

Action: No text change is required.

Response: In response to the third portion of this comment regarding leachate disposal, the definition of leachate has been broadened to include washing, filtering, and rinsing solutions, in addition to TCLP and MTCLP leachate. FEMP has been permitted for interim storage in accordance with RCRA requirements. Final disposition of wastes will be conducted in accordance with CERCLA.

Action: The text will be modified to incorporate the wording provided in the response.

Response: The fourth portion of this comment addresses cleanup goals. The 35 pCi/g uranium level is not presented in the work plan as a cleanup goal. Section 1.2 of the work plan uses the 35 pCi/g level to provide perspective for comparison to soil contamination levels to ensure that soil samples collected for use in the treatment tests exhibit significant contamination (it is desirable to test the effectiveness of treatment on significantly contaminated soil).

The 35 pCi/g uranium level used by DOE is consistent with the levels set by the Nuclear Regulatory Commission in a branch technical position paper (NRC 1981) and published in the Federal Register on October 23, 1981.

The determination of cleanup levels at the FEMP must arise from completion of the entire RI/FS process for the site. Cleanup levels will be based on considerations that include a risk basis, but will not be solely based on risk. Cleanup levels cannot be determined at the treatability study stage of the RI/FS process.

Action: The text in Sections 1.2 and 6.2 will be revised to better clarify the basis for and use of the 35 pCi/g uranium level.

Specific Comments

70. Commenting Organization: U.S. EPA Commentor:
Pg. # 1-4 Section # 1.2.2 Paragraph # Sent./Line #
Original Comment # 1

Comment: The significance of dividing contaminated areas according to whether they are above or below 35 pCi/g is unclear. Clarification should be given as to why 35 pCi/g is used as division for delineating areas for contamination. This is not specified as either an action level or cleanup goal, but is cited several times throughout the document.

Response: Cleanup goals for the site have not been established. The selection of the 35 pCi/g level for uranium in soils was intended to be used as a reasonable preliminary action level to aid in defining areas and volumes of contaminated soil. This level was developed in the Nuclear Regulatory Commission (NRC) Technical Branch position paper, "Disposal or On-Site Storage of Residual Thorium or Uranium (Either as Natural Ores or Without Daughters Present) From Past Operations." This level is not intended as a final cleanup goal.

Action: The use of 35 pCi/g will be explained within the text.

71. Commenting Organization: U.S. EPA Commentor:
Pg. # 1-15 Section # 1.3.3 Paragraph # 5 Sent./Line #
Original Comment #2

Comment: The ARARs to be used should be identified in the document since residuals will be produced in testing and must be disposed of regardless of whether a treatability option is selected.

Cleanup levels have yet to be established; however, PRGs based on risk are identified. These must be cross-referenced in this document and integrated more closely with the work plan.

Response: The requirements of CERCLA 121 generally apply as a matter of law only to remedial actions. Remedial actions must attain a general standard of cleanup that assures protection

of human health and the environment, must be cost effective, and must use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, for any material remaining on site, the level or standard of control that must be met for the hazardous substance pollutant, or contaminant is at least that of any applicable or relevant and appropriate standard requirement or criteria (ARARs and TBCs). In other words, ARARs must be attained for hazardous substances remaining on site at the completion of a remedial action.

ARARs are not intended for conducting treatability studies, however, when accepting material from the treatability study back to the FEMP site, RCRA solid waste criteria will be evaluated (refer to Comment 14). The residuals will be stored on-site and subsequently disposed at a permitted facility. We agree with the second part of this comment concerning PRGs. Refer to response to Comments 51 and 69.

Action: None required for ARARs comment. The cross-reference to PRGs will be better integrated into the work plan.

72. Commenting Organization: U.S. EPA Commentor:
Pg. # 1-15 Section # 1.3.3 Paragraph # 6 Sent./Line #
Original Comment # 3

Comment: The levels of residual risk, after cleanup, which will be considered acceptable, must be specified.

Response: It is not possible to specify, in the treatability study work plan, the levels of residual risk that will remain after cleanup. The levels of residual risk that will be deemed acceptable after cleanup of Operable Unit 5 will depend on the outcome of the entire RI/FS process for Operable Unit 5, and those levels of residual risk will be addressed in the ROD for Operable Unit 5. At the treatability study stage of the RI/FS process the only guidance available for acceptable residual risk is that presented in the NCP (40CFR300), which stipulates that the total risk from the site after cleanup must not exceed the 10^{-4} to 10^{-6} risk range. As stated in Section 1.3.3, page 1-15, paragraph 6, the results of treatability testing will be used to evaluate the ability of soil washing to provide long-term effectiveness and permanence.

Action: No text change is required.

73. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-1 Section # 3.0 Paragraph # 3 Sent./Line #
Original Comment # 4

Comment: The targets are not effectively integrated into the work plan, particularly the decision-making process that determines which treatments advance to the next stage of testing. For example, a comparison with the PRGs must be specified in the experiment design flow sheets.

Response: See response to Comments 51 and 69.

Action: As noted in Comments 51 and 69.

74. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-1 Section # 3.1 Paragraph # 3 Sent./Line #
Original Comment # 5

Comment: **Although it may be true that a treatability option should not be eliminated on the basis of failing to achieve an individual remediation goal, it is certainly relevant to specify that any treatment accepted must a) meet or exceed cleanup levels for specific contaminants (such as uranium), and b) must meet limits on the residual risk remaining at the site if that treatment option is utilized. (Again, such a limit on the acceptable risk is not included in the current version of this document, but should be added.) Both of the above criteria should be clearly outlined as necessary for acceptance of a soil washing treatment scheme.**

Response: It is not possible to specify the cleanup levels (cleanup concentrations) and levels of residual risk that will remain after cleanup in the treatability study work plan. The levels of residual risk that will be deemed acceptable after cleanup of Operable Unit 5 will depend on the outcome of the entire RI/FS process for Operable Unit 5, and those concentrations and levels of residual risk that remain will be specified in the ROD for Operable Unit 5. At this stage of the RI/FS process the guidance available for acceptable residual risk is the goal presented in the NCP (40CFR300), which stipulates that the total risk from the site after cleanup must not exceed the 10^{-4} to 10^{-6} risk range.

Action: None required.

75. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-1 Section # 3.1 Paragraph # 4 Sent./Line #
Original Comment # 6

Comment: **All contaminants included in the preliminary soil characterization should have PRGs specified. It is impossible to determine the effectiveness of contaminant removal if initial levels are unknown.**

More importantly, it seems that contaminants have had PRGs identified because they are hazards of concern and should therefore be followed throughout the cleanup process. Therefore, they MUST be included in the initial soil characterization since only those contaminants found during initial characterization will be targeted for cleanup.

Response: Only selected constituents found during the initial soil characterization in this treatability study will be targeted and followed through the treatability study process. The list of

analytes in Table 3-2 (PRGs) is a compilation of constituents associated with the operable units at the site collectively. The same list of PRGs is used in all of the operable unit treatability study documents. Those analytes determined not to be constituents of concern in the initial soil characterization will not be of concern in the table of PRGs (Table 3-2).

Action: In Section 3.0, page 1, revise lines 29 and 30 to read: "Only selected constituents found during the initial soil characterization in this study (Section 6.0) will be targeted and followed through the treatability study."

76. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-7,8 Section # Paragraph # Sent./Line #
Original Comment # 7

Comment: Table 3-2, -- Again, the radionuclides for which PRGs are identified are inconsistent with the targeted contaminants analyzed during the initial soil characterization (see Tables 3-9 and 6-1). Radionuclides included in the characterization should have PRGs specified. Likewise, radionuclides considered important enough to have PRGs should be included in the initial characterization so that they can be traced throughout the treatment process if need be. Otherwise, such inconsistencies may give the impression that there is indefinite commitment to the use of risk-based cleanup levels, or to the use of any cleanup goals (since these are the only goals identified), in the selection of cleanup technology.

Response: The list of analytes in Table 6-1 includes all constituents that are reasonably expected to be found in soil samples from the site during the initial soil characterization study. The list of analytes in Table 3-9 (Remedy Selection stage) will not necessarily include all analytes from Table 6-1 because some of those may not be determined to be constituents of concern in the initial soil characterization. Those analytes determined not to be constituents of concern in the initial soil characterization will not be analyzed for in the Remedy Selection stage. The list of analytes in Table 3-2 (PRGs) is a compilation of constituents associated with the operable units at the site collectively. The same list of PRGs is used in all of the operable unit treatability study documents. Those analytes determined not to be constituents of concern in the initial soil characterization will not be of concern in the table of PRGs (Table 3-2).

Action: No text change is required.

77. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-12 Section # Paragraph # Sent./Line #
Original Comment # 8

Comment: Table 3-4 -- It would be useful to have the detection limits spelled out in this work plan, if only by the use of an appendix copied from the QAPP. This applies also to Tables 3-6 and 3-8.

Response: See response to Comment 19.

Action: As noted in Comment 19.

78. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-16 Section # Paragraph # Sent./Line #
Original Comment # 9

Comment: **Table 3-8 -- The use of the term remedial action objectives (RAOs) for levels of concern may lead to confusion since the goals identified in this document are PRGs. Levels of targeted contaminants should be referenced to the preliminary remediation goals (PRGs) or to final cleanup goals (once identified).**

Response: There is no reference to remedial action objectives in Table 3-8, page 3-16 (nor in Tables 3-1, 3-2, 3-3, or 3-9 which are referenced in Table 3-8). Table 3-8 addresses Data Quality Objectives. A search of the document for the use of the term RAO will be completed and corrected as applicable.

Action: See response.

79. Commenting Organization: U.S. EPA Commentor:
Pg. # 3-17 Section # Paragraph # Sent./Line #
Original Comment # 10

Comment: **Table 3-9 -- Again, there are inconsistencies between this list of contaminants and those that are targeted and followed according to the initial characterization. These inconsistencies should be resolved.**

Response: The list of analytes in Table 6-1 incudes all constituents that are reasonably expected to be found in soil samples from the site during the initial soil characterization study. The list of analytes in Table 3-9 (Remedy Selection stage) will not necessarily include all analytes from Table 6-1 because some of those may not be determined to be constituents of concern in the initial soil characterization. Those analytes determined not to be constituents of concern in the initial soil characterization will not be analyzed for in the Remedy Selection stage. The list of analytes in Table 3-2 (PRGs) is a compilation of constituents associated with the operable units at the site collectively. The same list of PRGs is used in all of the operable unit treatability study documents. Those analytes determined not to be constituents of concern in the initial soil characterization will not be of concern in the table of PRGs (Table 3-2).

Action: None required.

80. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-9 Section # 4.2.4.1 Paragraph # 3 Sent./Line #
Original Comment # 11

Comment: **Filtrate should be analyzed for gross alpha and beta (if deemed appropriate) in addition to uranium so that analysis is consistent. In addition, the suspended solids collect on the filter should be analyzed for uranium (and for gross alpha and beta if deemed appropriated), both because the solid must also be disposed of (whether in solution or filtered out) and because the radioactivity measurements may be useful in a mass balance to assure that all contaminants have been accounted for.**

Response: The extracted solid, extractants, and wash solutions are being tested for gross alpha and gross beta. See Table 3-5. Gross alpha and gross beta analyses will be added to the list of analyses on the filtrate and filter cake in Remedy Screening Stage IIb if there is enough sample for the tests. Refer to Comment 60.

A mass balance will not be calculated in this treatability study. Mass balance analyses are best conducted during the Remedy Design phase.

Action: The text has been revised as noted in the response.

81. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-10 Section # Paragraph # Sent./Line #
Original Comment # 12

Comment: **Figure 4-4 -- Figure should be amended so that analysis of solid collected on filter is included.**

Response: Figure 4-4 will be modified as suggested in the comment.

Action: The text will be revised as noted in the response.

82. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-14 Section # Paragraph # Sent./Line #
Original Comment # 13

Comment: **Figure 4-5 -- Figure should be amended so that analysis for uranium is also specified in the last step.**

Response: Figure 4-5 will be amended as suggested in the comment.

Action: The text will be revised as noted in the response.

83. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-16 Section # 4.3.3.2 Paragraph # 4 Sent./Line #
Original Comment # 14

Comment: **Solids collected should be tested for uranium and gross alpha and beta (if justified). Similar guidelines for analysis apply to all measures used to purify treatment solutions, including settling and settling with filter aids.**

Response: Gross alpha and gross beta analyses will be added to the list of analyses of the solids collected during Remedy Screening Stage II if there is enough sample for the tests. Refer to Comment 60.

Action: The text has been revised as noted in the response.

84. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-17 Section # Paragraph # Sent./Line #
Original Comment # 15

Comment: **Figure 4-6 -- Analysis of filter solids should be included in this flow chart.**

Response: Analysis of filter solids will be included in the flow chart presented in Figure 4-6.

Action: The text will be modified as stated in the response.

85. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-18 Section # 4.4.1 Paragraph # 4 Sent./Line #
Original Comment # 16

Comment: **The last sentence should be amended to read, "Before the soil is processed, it will be homogenized as described in Section 4.1.1, and analyzed for organics, inorganics, <u>and radionuclides</u> in accordance with Tables 3.1 <u>and 3.2</u>.**

Response: This sentence is incorrect, and should read: Soil will be taken directly from the drums of soil collected during the sampling program described in Section 6.0. Complete chemical and physical characterization of the soil will have already been completed in accordance with the analytical description in Section 6.0.

Action: The text will be revised as noted in the response.

86. Commenting Organization: U.S. EPA Commentor:
Pg. # 20-21 Section # Paragraph # Sent./Line #
Original Comment # 17

Comment: **Figure 4-7 -- Analysis and comparison with cleanup goals should be incorporated into the process description and flow sheet.**

Response: The comparison with cleanup goals will be conducted in the detailed analysis of the FS.

Action: None required.

87. Commenting Organization: U.S. EPA Commentor:
Pg. # 4-21 Section # 4.4.2 Paragraph # 5 Sent./Line #
Original Comment # 18

Comment: **The first sentence should be amended to read, "The radioactive constituents <u>found during initial characterization and identified in Table 3-2</u> will be analyzed in the extracted soils, extractant solutions, and wash water."**

Response: This sentence will be amended to read, "The radioactive constituents found during the initial characterization and identified in Table 6-1 will be analyzed . . .

Action: The text will be modified as noted in the response.

88. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # 4.5 Paragraph # Sent./Line #
Original Comment # 19

Comment: **Bullet 1 -- Complete soil characterization includes radionuclide analysis of contaminants identified in Table 3-2, as well as gross alpha and beta if such measurements are justified for soils.**

Response: Bullet 1 will be revised to include radionuclide analysis of contaminants identified in Table 6-1.

Action: The text will be modified as noted in response.

89. Commenting Organization: U.S. EPA Commentor:
Pg. # 6.1 Section # 6.1 Paragraph # 4 Sent./Line #
Original Comment # 20

Comment: **The ARARs and exposure limitations should be specified here to facilitate determination of the constraints.**

Response: The personnel exposure limitations are presented in Tables C.3-1 and C.3-2 of the Health and Safety Plan. The sample size restrictions are based on the level of radioactivity per sample that the analytical laboratory is licensed to accept.

Action: The text will be modified to provide clarification of the exposure limitations and sample size restrictions as noted in the response.

90. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-4 Section # 6.2 Paragraph # 1 Sent./Line #
Original Comment # 21

Comment: It is not clear that an alpha-beta frisker is the appropriate instrument to be used for soil monitoring. Information critical to this determination should be provided, including instrument type, monitoring methodology, and required sensitivity. It should be shown that the required detection limits will be met or exceeded.

Response: The sentence will be modified to read: ". . . while radiation levels will be measured using either a beta-gamma frisker or a sodium iodide scintillation detector." Specific instrument identification will also be included. A description of the actual monitoring process will also be included. Required detection limits are not considered a necessary part of this monitoring process since it is being used as a comparative tool.

Action: The text will be modified as noted in the response.

91. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-4 Section # 6.2 Paragraph # 2 Sent./Line #
Original Comment # 22

Comment: Further justification must be provided for the use of 35 pCi/g as an action level. The various levels of contamination in OU5 -- ranging from depleted uranium to slightly enriched -- may make it an inappropriate guideline for all uranium isotopes and mixtures of uranium isotopes. Any assumptions made in the use of this number as an action level should be stated. In addition, it is unclear how the 35 pCi/g action level relates to the risk-based remediation goals levels given in Section 3 (see general comments on Cleanup Goals). Clarification on this point should be provided.

Response: Section 6.2 of the work plan uses the 35 pCi/g level as an action level to ensure that soil samples collected for use in the treatment tests exhibit significant contamination (it is desirable to test the effectiveness of treatment on significantly contaminated soil).

The 35 pCi/g uranium level used by DOE is consistent with levels set by the Nuclear Regulatory Commission in a Branch Technical Position Paper (NRC 1981) and published in the Federal Register on October 23, 1981.

The determination of cleanup levels at the FEMP must arise from completion of the entire RI/FS process for the site. Cleanup levels will be based on considerations that include a risk basis, but will not be solely based on risk. Cleanup levels cannot be determined at the treatability study stage of the RI/FS process. (Refer to response to Comment 9).

Action: The text in Section 6.2 will be revised to better clarify the basis for and use of the 35 pCi/g uranium level.

92. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-5 Section # Paragraph # Sent./Line #
Original Comment # 23

Comment: Table 6-1 -- Inconsistencies between this table and Tables 3-2 and 3-8 should be resolved so that all contaminants of concern are addressed. Each contaminant for which a PRG has been developed should be included in the initial characterization and followed through the treatment process (including Treatment Selection analysis and comparison with cleanup goals) to determine its fate.

Response: The list of analytes in Table 6-1 includes all constituents that are reasonably expected to be found in soil samples from the site during the initial soil characterization study. The list of analytes in Table 3-9 (Remedy Selection stage) will not necessarily include all analytes from Table 6-1 because some of those may not be determined to be constituents of concern in the initial soil characterization. Those analytes determined not to be constituents of concern in the initial soil characterization will not be analyzed for in the Remedy Selection stage. The list of analytes in Table 3-2 (PRGs) is a compilation of constituents associated with the operable units at the site collectively, the same list of PRGs is used in all of the operable units at the site collectively. The same list of PRGs is used in all of the operable unit treatability study documents. Those analytes determined not to be constituents of concern in the initial soil characterization will not be of concern in the table of PRGs (Table 3-2).

Action: No text change is required.

93. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-6 Section # 6.4 Paragraph # 4 Sent./Line #
Original Comment # 24

Comment: The second sentence should be amended to read, "Two of the four locations will be selected based on high levels of uranium (>200 ug/g) . . ."

Response: The sentence has been revised as suggested in the comment.

Action: See response.

94. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-8 Section # 6.4 Paragraph # 2 Sent./Line #
Original Comment # 25

Comment: **The type, method of utilization, and sensitivity of the beta-gamma frisker must be provided in order to determine if it is an appropriate instrument to be used for mapping radioactivity levels. Minimum required sensitivity should be identified, and it should be verified that such sensitivity levels can be met.**

Response: See response to Comment 90.

Action: Action as noted in Comment 90.

95. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-8 Section # 6.5 Paragraph # 5 Sent./Line #
Original Comment # 26

Comment: **Again, more detailed information on the detector must be provided in order to document that it is an appropriate instrument for mapping radioactivity levels in soil.**

Response: See response to Comment 90.

Action: Action as noted in Comment 90.

96. Commenting Organization: U.S. EPA Commentor:
Pg. # 6-9 Section # Paragraph # Sent./Line #
Original Comment # 27

Comment: **Table 6-3 -- No specific analytical method has been specified for radiological analysis. At a minimum, an internal standard operating procedure (SOP) or source of quality assurance/quality control (QA/QC) requirements and minimum detection limits should be identified in the table.**

Response: A reference to standard operating procedures (SOPs) and minimum detection limits will be provided in Table 6-3 for radiological analysis. The SOPs will be provided in Appendix B.

Action: The text will be modified as noted in the comment response.

97. Commenting Organization: U.S. EPA Commentor:
Pg. # 10-1 Section # 10.2 Paragraph # 4 Sent./Line #
Original Comment # 28

Comment: **Under this study, the leachate produced includes not only those from the modified toxicity characteristics leaching procedure (MTCLP) and toxicity characteristics leaching procedure (TCLP), but also all washing ,filtering and rinsing solutions. All such solutions must undergo characterization and comply with all applicable guidelines for packaging and disposal. This section should be amended to reflect the broader definition of leachate as it applies to this site.**

Response: Section 10.2 has been revised to incorporate the broader definition of leachate which includes washing, filtering, and rinsing solutions in addition to TCLP and MTCLP leachate. Also, the estimated quantity of aqueous waste requiring disposal has been recalculated.

Action: The text has been modified as noted in the response.

98. Commenting Organization: U.S. EPA Commentor:
Pg. # Section # Paragraph # Sent./Line #
Original Comment # 29

Comment: **References -- The QAPP cited in the treatability study should be included in the list of references. Since there are several versions available currently, it is necessary to provide detailed information so that the correct document can be identified.**

Response: The QAPP is listed in the references. The reference is U.S. Department of Energy, 1988, "Remedial Investigation and Feasibility Study, Feed Materials Production Center, Fernald, Ohio, Work Plan Requirements," Revision 3, Vol. V: Quality Assurance Project Plan, DOE, Oak Ridge Operations Office, Oak Ridge, TN.

Action: None required.

99. Commenting Organization: U.S. EPA Commentor:
Pg. # A-1 Section # A.1.0 Paragraph # 1 Sent./Line #
Original Comment # 30

Comment: **Detection limits should be specified, either in this paragraph or on the site maps where uranium concentrations are mapped out.**

Response: The detection limit for uranium will be added to the text.

Action: The text has been modified as noted in the response.

100. Commenting Organization: U.S. EPA Commentor:
Pg. # A-2 Section # A.1.0 Paragraph # 2 Sent./Line #
Original Comment # 31

Comment: **It is stated that both thorium and radium were found in soils. Details should be given on which specific isotopes are present. For what other radionuclides was analysis performed? Data in the tables of this Appendix concerning radionuclide testing is sparse. All analysis for specific radionuclides (including individual isotopes) which was performed should be specified, and any negative or positive results reported also, so that the extent of previous characterization of soils is clear.**

Response: Thorium-230, -228, and -232, and radium-226 and -228 are present in the soils. Samples were analyzed for total uranium, total thorium, isotopes of uranium, thorium, radium, plutonium, cesium, technetium, strontium, and neptunium.

Action: Additional detail will be added to Appendix A regarding site characterization of soils.

101. Commenting Organization: U.S. EPA Commentor:
Pg. # C-7 Section # C.5.1 Paragraph # 1 Sent./Line #
Original Comment # 32

Comment: **Although short-lived decay products are identified as radiation hazards in addition to uranium, there is no monitoring to assess their concentrations in air. This deficiency must be addressed. Specifically, the hazards from radon and its associated decay products must be accounted from. Since radon is easily measured, such measurements should be taken. Alternatively, environmental data documenting levels of radon may be presented and used to assess health hazards.**

Response: Westinghouse operates five radon monitoring stations within the Process/Administration area. Monitoring results indicate that on average, radon concentrations are less than 2 pCi/l. Additionally, a flux emissions study of the K-65 silos was conducted in 1985 by personnel from Mound. The K-65 silos represent the largest potential radon source term on site. Results of this study show that radon concentrating in the waste pit areas were well within the radiation worker exposure limits. All data indicates that radon monitoring is not required as ambient concentrations are well below the monitoring action levels of DOE Order 5480.11.

Action: None required.

102. Commenting Organization: U.S. EPA Commentor:
Pg. # C-7 Section # C.5.2 Paragraph # 3 Sent./Line #
Original Comment # 33

Comment: **The analytical equipment to be used and a summary of analysis to be performed on the filter samples should be summarized here for clarification of the sampling method although it is included elsewhere in a SOP. At a minimum, the type of detector used for counting and its sensitivity should be presented.**

Also, the flow rates of portable air pump (BZA) and a high volume air sample pump are vastly different. The duration of sampling (and the sampling interval) should be determined for each instrument based on the ability to detect contaminants at action levels.

Response: This paragraph will be modified so that the last line of paragraph 3 will read, "Samples shall be collected and counted for gross alpha and beta activity using a gas proportional counter in accordance with . . ."

Methods to be used for sampling of worker breathing zones are established. Detection limits vary, but typically are in the low 10^{-13} uCi/ml levels for uranium. These levels are several orders of magnitude less than DAC values for airborne uranium. Detection levels for high volume air samples are typically in the 10^{-15} uCi/ml levels. Either method offers adequate sensitivity.

Action: The text has been modified as noted in the response.

103. Commenting Organization: U.S. EPA Commentor:
Pg. # C-7 Section # C.5.3 Paragraph # 5 Sent./Line #
Original Comment # 34

Comment: **Instruments to be used for monitoring sample locations must be specified (including information such as instrument manufacturer, model, sensitivity, etc.); it is unclear from the description whether such monitoring will be able to provide accurate or appropriate information about the radiological hazards existing at the work site.**

Minimum requirements for periodic radiation monitoring at sample locations should be specified so that changing hazard conditions related to soil removal, dust generation, and changing soil profiles and contamination with depth are detected. Time intervals between sampling should be more specific than "periodically." Sampling duration and intervals should be based on minimum required detection limits.

Response: Radiation surveys will be performed at the start of work using Ludlum Model 9 Ion Chamber or equivalent. Contamination measurements will be performed using a Ludlum Model 2 survey meter with a GM pancake probe or equivalent. These instruments provide adequate detection sensitivities for worker protection.

Soil samples will be monitored for radioactive contamination and organics as collected. Measurement results are used to assess worker potential exposure.

Sample duration and intervals are based on potential exposure as work progresses, not on minimum detection limits. Flexibility in sample regime is required to allow monitoring personnel to react to changing status.

Action: This section will be reworded to reflect what instruments will be used for radiation and contamination measurements.

104. Commenting Organization: U.S. EPA Commentor:
Pg. # C-10 Section # C.6.0 Paragraph # 3 Sent./Line #
Original Comment # 35

Comment: Protective clothing requirements should be formalized so that specific levels of contamination or radioactivity at a sampling site automatically necessitates a given level of protective clothing. Such limits have been identified for non-radiological chemical contaminants and should be for radiological hazards as well. A number of measures could be used as an action level, including activity or a percentage of the Derived Air Concentration (DAC); however, the decision to choose a specific measure must be justified, and the applicable action level clearly stated. More conservative judgements would of course be allowed in the field according to the professional judgement of the field team supervisor.

Response: The wording of the first sentence will be modified with the addition of the following" . . . or wherever airborne radioactive contaminants exceed 25 percent of a DAC. For mixtures of airborne radioactive contaminants, the sum of the DAC fractions will be used, and when the fractions sum is greater than 0.25, level C protective clothing will be required . . ."

Action: The text has been modified as noted in the response.

105. Commenting Organization: U.S. EPA Commentor:
Pg. # C-13 Section # C.7.0 Paragraph # 5 Sent./Line #
Original Comment # 36

Comment: The support zone must be clearly marked as a <u>clean</u> area to emphasize the importance of avoiding any cross-contamination from the controlled zones.

Response: Sample locations are within WEMCO process areas, many of which are controlled areas for radioactivity. Therefore, a support zone will not be marked "clean" as the zone may be in an area that is already a radioactive controlled area.

Action: None required.

106. Commenting Organization: U.S. EPA Commentor:
Pg. # C-13 Section # C.7.0 Paragraph # 6 Sent./Line #
Original Comment # 37

Comment: **Adequate justification is <u>not</u> provided for abandoning the site control program described. The basis for the assumption that significant contamination will not occur must be explained.**

Response: This statement will be deleted and replaced with "Work zones will be identified as necessary, to prevent the spread of contamination from the sample collection site to the surrounding area."

Action: The text will be modified as noted in the response.

107. Commenting Organization: U.S. EPA Commentor:
Pg. # C-14 Section # C.8.0 Paragraph # 5 Sent./Line #
Original Comment # 38

Comment: **There is no "Section 5.2.5," either in this appendix or in the main body of this document. The required levels of respiratory protection must be clearly stated, accessible, and correctly cross-referenced.**

Response: The sentence will be modified to reference Section C.6 Personal Protective Equipment.

Action: The text will be modified as noted in the response.

108. Commenting Organization: U.S. EPA Commentor:
Pg. # C-16 Section # C.8.2.1 Paragraph #4 Sent./Line #
Original Comment # 39

Comment: **Monthly bioassays are inadequate for characterizing doses from uranium, as such sparse testing may result in significant missed dose. Urinalysis samples should be submitted at least weekly.**

Response: The wording of this section is consistent with the approved WEMCO bioassay program. As WEMCO is the provider of this service, and has passed DOE audits of their bioassay program, the monitoring frequency is acceptable for this sampling program. If a worker is exposed to 25 percent of a DAC the bioassay frequency will be biweekly for a month.

Action: The last sentence of the response will be included in the text.

109. Commenting Organization: U.S. EPA Commentor:
Pg. # C-19 Section # C.9.0 Paragraph # Sent./Line #
Original Comment # 40

Comment: **Bullets 7 and 8 -- The level of monitoring must be detailed, including the specifications of the instrumentation, particularly sensitivity and detection limits.**

Response: Instrumentation to be used will be identified in Section C.5.0. It is not required to restate the information in this section.

Action: The text will be modified as stated in the response.

110. Commenting Organization: U.S. EPA Commentor:
Pg. # C-20 Section # C.10.2 Paragraph # 5 Sent./Line #
Original Comment # 41

Comment: **It should be specified where decontamination is to take place. Again, there was inadequate justification presented for abandoning the three-zone control system, which is a useful delineation both for personnel monitoring when leaving a controlled area and for providing a more controlled area where decontamination may be undertaken.**

Response: The following will be inserted in the first sentence of the second paragraph: " . . . Remove disposable protective equipment at the exclusion zone. Personnel leaving the process area are required to wash . . ." This wording better reflects WEMCO policy.

Contaminated equipment is driven or transported to a WEMCO decontamination facility to remove external/internal contamination. The wording in this paragraph is consistent with WEMCO policy.

Action: The text will be modified as stated in the response.

111. Commenting Organization: U.S. EPA Commentor:
Pg. # C-28 Section # Paragraph # Sent./Line #
Original Comment # 42

Comment: **Table C.3-2 -- Justification is needed for the choice of action levels. In addition, it is unclear what action is to be taken when the action level is exceeded. For instance, is work to be stopped and the work area cleared while the health physics (HP) review takes place?**

Response: These action levels represent exposures that are insignificant in relationship to DOE Orders and NRC 10 CFR 20 regulations. They are used here to flag the presence of radioactive material.

Action: A footnote will be added to the table which states "HP review of the work will be initiated when the action limit is reached. At 10 times these limits, work will be stopped until the new conditions can be evaluated by Health and Safety personnel."

112. Commenting Organization: U.S. EPA Commentor:
Pg. # C-30 Section # Table C.3-4 Paragraph # Sent./Line #
Original Comment # 43

Comment: Personal protection equipment (PPE) action levels must be provided also for radionuclides in terms of air concentrations or activity levels to ensure that exposure to radionuclides is not excessive. Specified protection levels, as with chemical contaminants, must be automatically triggered by certain levels of radiological contaminants. Of course, PPE levels could be upgraded in the field if the field team supervisor so directs.

Response: Wording will be added to this table which is consistent with that used in resolution of U.S. EPA Original Comment #42/Comment 111.

Action: The text will be modified as noted in the response.

113. Commenting Organization: U.S. EPA Commentor:
Pg. # D-4 Section # D.4.1 Paragraph # 2 Sent./Line #
Original Comment # 44

Comment: What action is triggered by this action level, and how are these requirements integrated into the rest of this safety plan? There is little evidence that this action level is carried through the remainder of the plan. How is this action level related to the action levels presented in Section D.5.2.1?

Response: The Derived Air Concentration (DAC) of uranium-238 shall be changed to the Maximum Permissible Concentration (MPC) in air of U-238 for a 40-hour week. Section D.5.2.1 shall be amended to include the limit and action required should the limit be exceeded.

Action: The text will be revised as noted in the response.

114. Commenting Organization: U.S. EPA Commentor:
Pg. # D-6 Section # D.5.2 Paragraph # 3 Sent./Line #
Original Comment # 45

Comment: The frequency of monitoring, or the minimum requirements (at least hourly, for example) should be clearly stated.

Response: The frequency of the monitoring is determined by the operation being performed. The work areas are cleaned after each eight-hour shift and surveyed for contamination. Intermittent surveys may be performed during the shift but are not required by this work plan. No work will be allowed in the work area until the area has been declared free of contamination by a health physics technician.

Action: The text will be modified to incorporate the information provided in the response.

115. Commenting Organization: U.S. EPA Commentor:
Pg. # D-6 Section # D.5.2.1 Paragraph # 4 Sent./Line #
Original Comment # 46

Comment: The source of these action levels should be referenced. In addition, the specific actions to be taken when the action levels are exceeded should be outlined. For instance, is work to be suspended while an HP review takes place and mitigation measures are undertaken? Should workers don respirators?

Response: The limits as specified in the Health and Safety Plan have been changed to meet the requirements of the ETDC Radiation Protection Program. The source of the action levels is defined as the ETDC Radioactive Material License # R-01060-J95.

All work is suspended when an action level has been exceeded until that time when a health physicist has determined that the area is safe.

Action: The text will be modified to include the information provided in the response.