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August 29, 1994
SP307:082994:01

Mr. Andy Ledford
EG&G Rocky Flats, Inc.
Rocky Flats Plant
P.O. Box 464, Building 080
Golden, Colorado 80402-0464

Subject: MTS 343756 GG
OU4 Solar Ponds IM/IRA
Response to Regulatory Agency Comments on the Draft Proposed IM/IRA-EA Decision Document

Dear Mr. Ledford:

Enclosed is a draft document that includes:

1) Response to CDPHE comments on the draft proposed IM/IRA-EA Decision Document

2) Responses to EPA/PRC comments on the draft proposed IM/IRA-EA Decision Document

3) A summary of the changes that will be made in the IM/IRA-EA Decision Document to include sludge as a component of the IM/IRA.

This document is compiled to meet the milestone that was established for an IAG secondary document summarizing the results of the dispute resolution baseline re-evaluation. The final document is due for submittal to the CDPHE/EPA on September 12, 1994. This draft document is provided for EG&G/DOE review prior to submittal to the regulatory agencies. Please review this document and provide comments by September 7, 994 so that ES can finalize the document for submittal to the agencies on September 12, 1994.

Please call me at 764-8811 or pager 687-2551 if you have any questions.

Sincerely,

Philip A. Nixon
Project Manager: Solar Pond IM/IRA

DOCUMENT CLASSIFICATION
REVIEW WAIVER PER
CLASSIFICATION OFFICE

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Colorado Department of Health

Hazardous Materials & Waste Management Division

Comments

on

DRAFT

OU4 SOLAR EVAPORATION PONDS

INTERIM MEASURE/INTERIM REMEDIAL ACTION

ENVIRONMENTAL ASSESSMENT

DECISION DOCUMENT

U. S. DEPARTMENT OF ENERGY

ROCKY FLATS PLANT

MAY, 1994

GENERAL COMMENTS:

The comments provided herein constitute a follow-up to informal comments on a "roundtable" review document presented to the Division in February, 1994. As such, the review of the formal draft document is intended to verify the incorporation of initial comments, resolve any lingering concerns of the Division, ascertain whether the comments of other parties as incorporated are acceptable, and thus ensure that the document is adequate for distribution to the public as a proposed closure action on the Solar Evaporation Ponds.

Executive Summary:

Page ES-1: At the sentence (seventh line from the bottom of the second paragraph) beginning with, "Phase II will consist of additional hydrological investigations..." strike the word "hydrological". Based on our roundtable review and comment, the Phase II Work Plan will need to include additional soil sampling unless specifically proposed in this IM/IRA DD.

Response Page ES-1: Will comply: DOE will make a global change from "additional hydrogeological studies" to "Phase II RFI/RI". DOE will prepare a discussion considering additional soil sampling outside OU4. The discussion considering additional soil sampling outside OU4 will be included in the Phase II work plan.

In the last sentence, second paragraph, add a reference to the RCRA Corrective Action Decision (CAD) as a concurrent action to the CERCLA Record of Decision (ROD).

Response: Will comply: a reference to a CAD will be included.

Page ES-2: In the first ordinary paragraph, DOE's intent to excavate contaminated soils beneath the proposed location of the engineered cover is not adequately described. The current language suggests, incorrectly, that only the soils outside the SEPs or beneath Pond 207-C would be excavated. Please modify. Also in the same sentence, change "engineered cover" to "engineered system;" and contaminated media" to "contaminated soils". A change to engineered system includes the proposed drainage layer, in general terms, without delving into details. "Contaminated soils" is a more precise description of the proposed action but does not require elaboration.

Response Page ES-2: The executive summary will be changed to specify that the soils beneath IHSS 101 will be excavated to the mean seasonal high water table elevation, and soils outside the IHSS within the remediation boundary will be excavated to the extent that Contaminant of Concern (COC) Concentrations exceed applicable Preliminary Remediation Goals (PRGs).

In the last two sentences of the first paragraph, delete "hydrogeologic".

Response: Will comply.

In the second paragraph, edit the second sentence to read, "The "cover component of the engineered system is based on research..."

Response: Will comply.

Page ES-3: The last paragraph must also specify that the cover also prevents direct contact with the waste and soils by human and ecological receptors.

Response Page ES-3: Will comply.

Section I.0:

Page I-2: In the first sentence, second paragraph, change "additional hydrological studies" to "a Phase II RFI/RI" This comment was made by the Division to the round table document but was not incorporated.

Response Page I-2: Will comply: See response to Comment #ES-1.

Section I.3:

Page I-19: In the second sentence, second paragraph, the statement is made that remediation will be deferred if the remediation actions "may" interfere with ongoing RFP activities. This should be modified to place emphasis on actions that may be taken versus actions that may not be logical or appropriate due to interference with plant operations. As now written, DOE would not have to close the ponds because the closure action would interfere with above and below ground utilities. Please rewrite the sentence to specific that all reasonable actions are being done as part of the proposed closure action.

Response Page I-19: The text will be modified to state that remediation will be deferred if it will interfere with necessary RFP operations. If deferred, remediation will be addressed when the RFP operations cease.

The last sentence, second paragraph, is slightly incorrect. The transfer from OU-9 to OU-4 was approved by the Division earlier in the year.

Response: The text will be modified to state that the CDH and EPA approved the annexation of OU9 lines (within the area of remediation) into OU4.

In the next to last sentence, third paragraph, change the "additional hydrological studies" to Phase II investigations.

Response: Will comply: See response to Comment #ES-1.

Section I.3.1:

Page I-19: At the third bullet, ARARs are presented in **Part III, Section 5.2**. Likewise at the fifth bullet Section IV.5 is Part IV, Section 5; however, this is an incorrect reference. IV.5 is entitled "Required Specifications". Is the consistency with the final remedy information in Part III? Neither the Part III or Part IV Table of Contents is explicit.

Response: The references will be corrected. The Consistency with the final Remedy is discussed in Part IV Section 11.5.

Section I.3.2:

Page I-20: The Division's comment to page 1-16, lines 12-13, of the round table review document have not been incorporated. In the second sentence, second paragraph, change "proposed final IM/IRA" to "Proposed IM/IRA". The proposed document is a "proposal" to the public, once their comments are received a "Final" IM/IRA DD is prepared by DOE for approval by the Division. **DO NOT** confuse the separate aspects of the documents. Once again, the document sequence is Draft, Proposed and Final not Draft Proposed (as this version has been entitled) or Proposed Final.

Response: Will comply.

Section I.4.6.2:

Page I-47: In the round table review document a Figure I.4.16 was presented. Although the figure was not a "Bedrock Geology Map" as captioned, in that it did not depict mappable geologic units, the Division indicated its desire that the map be retained in the document since it showed the bedrock topography. The Division now insists that the map be specifically included in Part I. Regarding the three mappable units discussed in the next to last line of page I-47, if the units are mappable then the Division insists that the map be included in Part I. There is no value in stating that units are mappable if a map is not provided.

Response Page I-47: The map will be returned to Part I. The map will be titled as "bedrock topography".

Section I.4.8:

Page I-51: The Division's "Necessary" comment to page 1-50, line 9, of the Round Table document may not have been addressed. The comment called DOE's attention to National Environmental Resource Damage (NERD) as an issue that must be addressed. The actions proposed in the IM/IRA, specifically removal of contaminated soils and the consequent effect upon vegetation and habit, could be impacted by NERD limitations or requirements. DOE must investigate this potential issue. (See our "Additional Comments to Part I 3/10/94" relative to the round table review document.)

Response Page I-51: Please see the response to round table review comments on Part III for a response to the NRDA issue.

Section II.1.3:

Page II.1-14: In the last sentence, third paragraph, Building 910 has not been used on a routine basis for the treatment of ITS water. To the Division's knowledge, ITS water has routinely been treated in Building 374. Building 910, however, remains available.

ES Response Page II.1-14: The text will be revised to indicate that ITS water was treated in Building 374 and that Building 910 was available for treatment, but not used routinely

Section II.2: The last sentence, last paragraph, of the section should be changed since Pond 207-C will not be cleaned out as scheduled. Instead indicate that DOE has committed to completing pond cleanout by January 20, 1995.

ES Response Section II.2: The statements referencing the scheduled cleanout dates for SEP 207-C will be revised in accordance with the most recent schedule.

Figure II.2-16: Specifically show, with an additional symbol, the location of the five wells that were equipped with data loggers.

ES Response Figure II.2-16: This figure will be revised to indicate which wells were equipped with data loggers and the dates over which water level measurements were made using the data loggers.

Section II 2.7.5: The statement on page II.2-77 is different from the statement in the roundtable review draft. This document states that duplicates and equipment reinstate blanks requirements were not met; whereas, the roundtable version states that they were obtained. It is the Division's understanding that duplicates were obtained but not at the appropriate frequency. DOE should discuss the potential of impact upon data quality and useability.

Response Section II.2.7.5: The text on page II.2-77 is awkward, will be revised, and will reference the appropriate sections in Part II.3 where more detail regarding the QA/QC results lies.

To the best of our knowledge, not meeting the field sample collection QA/QC requirements does not have a detrimental impact on the quality, useability, or reliability of the data. The duplicate sample Relative Percent Differences (RPDs) were within acceptable limits (with the exception of the chemical toluene), and it not expected that additional field duplicate samples would change this assessment.

It is acknowledged that the total number of equipment rinsate samples were not collected, but the analytical results for the samples that were collected indicate that equipment decontamination procedures were adequate to ensure that cross-contamination resulting from improperly decontaminated equipment is unlikely. Additionally, the presence of site contaminants in the equipment rinsate blanks were at sufficiently low levels that remediation decisions could not be influenced by possible cross-contamination of samples from improperly cleaned sampling equipment.

Section II.3.1.1.3:

The circular anomaly discussed in the third paragraph of page II.3-6 does not appear to have been addressed per the Division's comment on the roundtable document (re: page II.3-6, line 11). Please indicate the page number elsewhere in the DD that this anomaly is discussed and resolved or efforts that will be undertaken to allow resolution.

Response Section II.3.1.1.3: The "circular anomaly" described in Section II.3.1.1.3 refers to an approximately 35-foot, circular subsurface feature detected on three ground-penetrating radar (GPR) lines near Building 779. This anomaly may reflect an area of disturbed soils, possibly representing an excavated area associated with the Original Ponds or foundation construction associated with Building 779 or former Building T707. The area probably does not represent an underground storage tank or former tank excavation because of the diffuse GPR signature and the shallow depth of the disturbed soils suggested by the GPR data. No additional data are available or planned to determine the exact nature of this circular feature.

Section II.3.1.1.4:

Page II.3.8: The reference to Pond 2B in the second full paragraph is still incorrect. Reference should be to Pond 2D. The caption to Figure 3.1-8 also remains in error (2B should be 2D).

Response 11.3.8: The reference to Pond 2B (and other references to Pond 2B) will be changed to Pond 2D.

Section II.5.3.2: The Division indicated in its comments on the roundtable document the necessity of providing a short explanation of the term "matric potential" now found in the third full paragraph of page II.5-21. This request had been made for the benefit of the public. While the Division does not intend that each and every scientific term be defined in the DD, there are selected terms that do warrant a brief definition. Matric potential is an example because "soil suction" or the "ability of the soil to pull in water", however one cares to express the concept, has meaning that matric potential clearly does not offer.
Other jargon like 2:1 clay and +/-3 sigma were among those that needed clarification. Is there, for example, anything improper about calling 2:1 clay a swelling clay?

Response Section II.5.3.2:

1). When soil water is at hydrostatic pressure less than atmospheric, a subpressure commonly termed tension or suction, the pressure potential is considered negative. A negative pressure potential is termed capillary potential or matric potential. The matric potential of soil water results from the capillary and adsorptive forces exerted by the soil matrix on pore water. These forces attract and bind water in the soil. However, soil water under negative pressure moves in response to varying pressure gradients.

2). +/-3 sigma refers to "the mean +/-3 standard deviations." This approach was used to determine whether chemical data were accepted or rejected. If a result exceeded the mean +/-3 standard deviations, the result was rejected.

3). A clay mineral is a fine-grained, crystalline, hydrous silicate with structures of the layer lattice type or "sheet silicates." The complex group of 2:1 clay minerals includes the micas, vermiculite, the smectite (or montmorillonite) group, pyrophyllite, talc, and various mixed-layer species. These clays are all based on a sheet structure consisting of two (2) tetrahedral layers with one (1) octahedral layer in between, i.e. "2:1." This structure allows the clay to swell through the uptake of moisture. The Division is correct in describing the clay as a "swelling clay," however, 2:1 clay is the correct technical term for these minerals.

Section II.3.4.1: For consistency and clarity of information, please provide a summary paragraph a the end of this section comparable to that in Section II.3.4.2, page II.3-271. Please check all such data presentation sections to ensure that either an interpretation or summary ES paragraph is presented.

Response Section II.3.4.1: A summary paragraph will be added. This paragraph will read:

"In summary, some of the inorganic, non-radiological PCOCs appear to be elevated either beneath or in close proximity to the SEPs with concentrations that appear to decrease with depth. Nitrate is broadly distributed throughout OU4, but the highest concentrations occur immediately beneath the SEPs and at the water table both in the vicinity of the SEPs and in the buffer zone. Cyanide was detected primarily in the immediate vicinity of the SEPs; however, sporadic detections above background occur in the buffer zone. The highest cyanide detections occur immediately beneath the SEPs in the 0-6 feet depth interval. The locations where cadmium exceeds background are directly beneath the SEPs and immediately north of SEP 207-A and SEP 207-B North at the drainage tile outfall. Some samples below 12 feet exceeded the background value for cadmium. Conversely, lithium was determined to be a PCOC by statistical methods but was not detected above background concentrations in any samples from OU4. Barium and zinc do not appear to have any apparent correlation with proximity to the SEPs, but a general trend of increasing concentrations of barium and zine is suggested by the data."

Section II.4: A clear statement should be made in bold print that this section describes the nature and extent of contaminate releases from the SEPs but that the degree of cleanup will be limited to acceptable risk levels or background, which ever is applicable, rather than to pre-release levels. A reference to the subsequent PRG discussion would also be appropriate.

Response Section II.4: The first paragraph of Section II.4 will be rewritten as follows.
To evaluate the impact of releases from the SEPs on the surface and vadose zone (subsurface) environments, an evaluation of the nature and extent contamination was prepared and is discussed in this section. Cleanup activities associated with the IM/IRA will be conducted based on the extent determination, but the degree of soil remediation will be limited to acceptable risk levels or background, which ever is applicable, rather than to pre-release concentrations. Discussion of the nature and extent of contamination is limited to the PCOCs determined as part of the IM/IRA (Section III.2.1 and Appendix III.B). Both the horizontal and vertical extent of contamination was determined to provide an understanding of the three-dimensional distribution of contaminants in the surficial and vadose zone soils. These correlated analyses and evaluations considered specific criteria including: **The bulleted list that follows this text needs no changes.**

Section II.4.3: Regarding the last sentence, first paragraph on page II.4-4, the Division has merely allowed the use of the Rock Creek data in lieu of background data which the Division has repeatedly asked DOE to develop. DOE must not infer that the Division has determined the Rock Creek data to represent background for surficial soils. Rewrite the sentence to correctly represent the current situation.

Response Section II.4.3: The first paragraph will be rewritten to reflect CDHs' above comment. The paragraph will be changed as follows.

Phase I RFI/RI and historical OU4 data were compared to available surficial and vadose zone soil data outside of OU4 to evaluate the nature and extent of contamination at OU4. The Phase I RFI/RI surficial soil data for inorganic compounds and radionuclides were compared to data from the Rock Creek surficial soil study conducted by DOE as part of the site-wide background data evaluation. The Phase I RFI/RI and historical subsurface soil data were compared to background data for the Rocky Flats Alluvium that were identified in the Background Geochemical Characterization Report (EG&G, 1993). Data from these two studies were considered to be the most acceptable soil data for comparison to OU4 soils.

Figure II.4.4-23: In the title block, change "Extend" to "Extent".

Response Figure II.4.4-23: The figure will be changed as requested by CDH.

Section II.4.5.2: Under the headings for Acetone, Methylene Chloride, Bis(2-ethylhexyl)phthalate, and Toluene, pages II.4-59, 61 and 63, the bullet list of reasons precedes the sentences that indicate that the results may represent laboratory or secondary contamination. Please correct these sections.

Response Section II.4.5.2: The referenced paragraphs will be corrected so that the sentence introducing the suggested reasons for laboratory contamination precede the listed reasons.

Section II.4.5.4: The last sentence, under the heading "Cyanide", page II.4-82 is incomplete.

Response Section II.4.5.4: The last sentence will be rewritten as follows:

The extent of cyanide in the vadose zone is shown on Figure II.4.5-20. The most extensive occurrence of cyanide is found at depths between 0 and 6 ft bgl in the areas beneath Ponds 207 A and 207 B North. Cyanide occurs at deeper depths in the northeast corner of Pond 207B North (between 6 and 12 ft bgl) and at two boring locations (at depths greater than 12 ft bgl) situated along the northern boundary of OU4.

Section III.1: Add CHWA at the top of page III.3.

Response Section III.1: Will comply.

Section III.2.2.1: The Division will not agree to the public release of this document until DOE directly refers to the Phase II RFI/RI (See next to last sentence of the section). Although the primary focus of the investigation is hydrogeologic investigation, the overall focus under RCRA and CHWA is corrective action relative to releases from the ponds. Since these releases were to soils and groundwater, any soil contamination above risk based levels derived from the ponds, must either be addressed under the closure action or under corrective action. Therefore, it is imperative that DOE recognize, and convey to the public, the full purpose and nature of the second phase of activity. If DOE believes that the Phase I investigation has fully delineated soil contamination and no further investigation of soils is warranted, it must clearly convey and support that conclusion in the document. As an alternative, the Division will accept a plan within the document to verify that all "above risk level" soils attributable to the ponds, including any beyond the OU boundary, will be excavated. Only then will the Division agree to limit the Phase II to hydrogeologic investigations.

Response Section III.2.2.1: The term "Additional hydrogeologic studies" with "Phase II RFI/RI" to comply with the comment. The scope of the Phase II work is generally discussed in Part I of the IM/IRA-EA Decision Document. DOE will propose a plan (if necessary) to characterize the soils outside the OU4 boundary to complete the nature and extent of contamination resulting from the Solar Evaporation Ponds. The plan for additional characterization outside the OU4 boundary may be limited to surface soil sampling because there has not been any vadose soil contaminants of concern identified at concentrations that exceed PRGs. The analytes that may be sampled for will include those OU4 Contaminants of concern that are identified near the OU4 boundary. The presentation of the plan will be provided in the Phase II Work Plan.

Section III.2.2.1.1:

Page III-10: In the next to last sentence of the first paragraph, change "additional hydrological investigation" to Phase II RFI/RI per the previous comment on Section III.2.2.1.

Response Page III-10: Will comply: See the response to comment #ES-1.

Section III.2.4.4: In this section DOE proposes to excavate contaminated soils to the "mean historic high ground water elevation or until a level of contamination is reached that is ... determined to be protective of ground water." Near the end of the section it is stated that catastrophic dissolution and MYGRT models can be performed to estimate a concentration in soil that will result in a ground water concentration at or below the applicable ground water criteria. The Division believes that empirical leachability data, as discussed in team meetings, will be needed in addition to modeling information to support an appropriate level unless concentrations in the soils drop to levels at or below the applicable ground water standard. Unless DOE plans to excavate to such stringent levels, it must propose and gain Division and EPA acceptance on the leachability method to be performed.

Response Section III.2.4.4: The initial part of the Section will be changed to indicate that the soils beneath the IHSS will be excavated to the mean seasonal high water table elevation. Soils outside the IHSS will be excavated to PRG concentrations. The section referencing the potential use of computer modeling to reduce the necessary amount of the excavation will be deleted. It was previously included because the U-238 PRG was exceeded in the north hillside vadose zone soils at concentration that were suspected to be reflective of site specific background. Since the standard HEAST toxicity valves for U-238 were published incorrectly, ES has re-calculated the U-238 PRG. The hillside vadose zone soils no longer exceed the PRG. Therefore, vadose zone U-238 remediation is not required on the north hillside and modeling is not necessary. Since

DOE is excavating soils beneath the IHSS the mean seasonal high water table elevation, leachability testing should not be required to close the surface impoundments. Any soil leachability testing for the protection of groundwater should be a Phase II activity in combination with the Baseline Risk Assessment.

Section III.3.2: The Division considers the Pond Liners to be hazardous waste through application of the mixture rule 6 CCR 261.3 (a)(2)(iv) not the derived from rule. The liners are not derived from hazardous waste they are mixed with hazardous waste since leakage occurred through the liners.

Response Section III.3.2: Will comply.

Section III.3.3.2: In the last sentence, second paragraph, change "interim" to initial. Since the document is entitled an Interim Measure/Interim Remedial Action use of "interim" in the context of this paragraph is inappropriate and potentially confusing to the public.

Response Section III.3.3.2: Will comply.

Section III.5.2:

Page III-98: In the last paragraph, the statement is made that, with the exception of GRA I, each GRA under consideration will comply with their respective ARARs/TBCs. However, in the last sentence of the same paragraph, the statement is made that Section IV.11 contains the strategy to achieve compliance with or justification to waive the ARARs for the preferred IM/IRA. These two statements appear to be contradictory; if the ARARs can be met why is there a need to justify any waivers? Please revise as necessary.

Response Page III-98: The text will be revised to delete "or justification to waiver" because the preferred IM/IRA does not require any waivers.

Section IV.2.2:

Page IV-12 & 13: Regarding design requirement IV.2.2.4 & IV.2.2.9, DOE has not yet demonstrated, nor has the Division determined, that waste from demolition of Building 788 (RCRA Units 21 & 48) can be deemed remediation waste for the purpose of inclusion in the CAMU. The Division does not concur with DOE's espoused position that inclusion of the Building 788 closure in this IM/IRA Decision Document constitutes the incorporation of a regulated unit into the CAMU and therefore qualifies the waste as remediation waste. The inclusion of the Building 788 closure was merely to expedite and streamline the closure process; Building 788 remains a separate closure action. Until this issue is resolved the extent of inclusion of Building 788 debris, except that expressly OU-4 (including e.g. the former OU-9 Old Process Waste Lines), is disallowed.

Regarding design requirement IV.2.2.9.1, page IV-13, the underground utilities probably will be excavated concurrent with vadose zone soil excavation and drainage layer construction, therefore, final disposition options, other than abandonment and closure in place, are possible. These utilities, to the extent they are physically located in the zone of remediation (i.e vadose zone) of contaminated soils, are remediation waste. DOE must not construe that contaminated components from Building 788 may be disposed in the same manner. Waste from Building 788 are not remediation waste. This design requirement may need to be rewritten since "in-place closure equipment and materials" and grouting of underground lines may no longer be applicable or only partially applicable.

Response Page IV-12 & 13: The response to this comment will be dependant upon the outcome of the dispute resolution. If it is agreed that Building 788 debris is remediation waste and enhances the closure design, then this information/justification will be added to the text. If Building 788 debris is not considered to be remediation waste, then the text will be modified to remove the references to dispositioning this debris beneath the engineered cover.

With respect to the discussion of in-place closure of utilities, it is unlikely that this methodology will be used. However, until the footprint of the engineered cover is finalized and the utilities verification work is completed. The document will maintain the discussion to provide DOE with closure flexibility.

Section IV.3.1.1:

Page IV-23: In the fourth paragraph, please refer to a possible upgradient interception trench as UIT, UITS or any acronym other than ITS to avoid confusion with the current ITS.

Response Page IV-23: Will comply: The acronym UITS will be used.

Section IV.3.2:

Page IV-58: Regarding the second paragraph of this section, the waste generated from the closure of RCRA Units 21 and 48, or from Building 788, do not constitute "remediation waste" since the closure of the units and demolition of the building do not constitute corrective action as the term "remediation waste" is defined in the preamble to the CAMU rule. Meeting minutes of the OU-4 IM/IRA Team Meeting dated April 12, 1994 are correct in suggesting that B788 and RCRA unit wastes can be considered remediation waste if management of the waste in a CAMU constitute an enhancement to the facility. Since DOE has yet to demonstrate that management in the CAMU will enhance effective, protective and reliable remedial actions for the facility, the Division will not approve the inclusion of the B788 materials into the CAMU.

Response Page IV-58: See the response to the comment numbered IV-12 & 13.

Section IV.6.3: This section states that construction should be completed in June, 1997; however, Figure IV-6.3, Activity ID 11000, states that the early finish for installation of the engineered cover will occur on December 10, 1997 with follow-up activities through July, 1998. At face value these dates are not consistent. Please verify or revise as necessary. The Division retains the right to revisit and approve the final schedules to be incorporated in the Title II Design document.

Response Section IV.6.3: The text will change to indicate that the remediation completion date will be December 1997. The remaining scheduled activities include demobilization and start-up of the post closure monitoring system. Start-up is not typically considered an installation activity.

Section IV.6.5:

Page IV-99: Regarding the use of PRGs to limit the excavation of the Pond C vadose zone soils (top of page), DOE has yet to develop PRGs that would be at levels protective of ground water resources relative to state standards. Given the potential for catastrophic dissolution of nitrates, is a PRG possible? Please reconsider the use of a PRG limiting factor. It appears DOE should plan to excavate to the water table due to the difficulty of demonstrating appropriate PRG levels.

Response Page IV-99: Under SEP 207-A, SEP 207-C and the 207-B series SEPs (IHSS 101) the excavation will cease when the mean seasonal high water table elevation is encountered. Outside of the IHSS soil remediation will pursue to the PRG (target level) concentration within the OU4 remediation area.

Table IV.11-2:

Page IV-186: In the Implementation/Compliance Strategy paragraph relative to Part 2 Requirement, 2.4.2, the word "between" should be changed to "'beneath' the hazardous waste".

Response Page IV-186: Will comply.

IV.11.5: The first paragraph of this section continues to refer follow-up hydrological studies rather than as the Phase II work plan. Also, the document is still referred to as Part VI of the document rather than as a separate document.

Response IV.11.5: See the response to comment ES-1. ES will replace references to the Part VI with references to the Phase II RFI/RI.

Section V.5.1.4: DOE is reminded that the August 14, 1990 detailed working schedule of the IAG provides for a performance assessment report five years after implementation of the pond closure. Page V-53 discusses an initial monitoring phase of three years and a secondary phase of ten years. Since the text, last full paragraph of page V-53, suggests that the initial three year effort will allow DOE to determine the appropriate time of year to attempt to collect pore liquid samples, a report at the five year mark is remains reasonable. Please refer to this IAG reporting requirement in this section and other sections as necessary. The post-closure and monitoring permit when issued will specify a delivery milestone for this assessment report.

Response Section V.5.1.4: Not applicable.

Section V.5.2.4: All references to future actions by, or submittals to, the Colorado Department of Health should reflect the revised name "Colorado Department of Public Health and Environment" effective July 1, 1994. References to past actions by the department may include "formerly the Colorado Department of Health".

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Response Section V.5.2.4: Not applicable to the IM/IRA. Future references will be made to CDHE.

CDHE comment on Figure III.0-1 In the "Risk Analysis" section of the flowchart, the risk assessor "Calculates modified PRGs (for each Potential COC) at Cumulative Risk of 1.0×10^{-6} per Organ." This follows with the CDHE draft policy, but, as we have noted in verbal comments on the policy, IRIS and HEAST do not provide cancer risk estimates for specific organs. The number reflects a general risk of cancer. Organ specific affects should be limited to qualitative discussions.

Response Figure III.0-1: Refer to telephone conversation occurring on 10/27/93 between Harlan Ainscough (CDHE) and Phil Nixon (ES) stating that "target organs may be addressed individually while modifying the PRGs. For example, if 5 carcinogens affect the liver, and 4 carcinogens affect the kidney, then the PRG for the liver carcinogens will be modified by dividing the target risk by 5, and the kidney carcinogens will be divided by 4." This conversation was a result of consultation between Harlan Ainscough and Joe Schieffelin (CDHE) and subsequent discussion between CDHE and Alexis Fricke (ES) on 10/27/93. In summary, CDHE suggested this approach and it is consistent with EPA guidance therefore the comment is inappropriate.

Section III.2 Figure III.2-1a: In the "Exploratory Data Analysis" section, a box reads "Compare OU4 RFI/RI Data to historical Data using Nonparametric Tests." If the distribution of the data is normal, a parametric test can be used and, most likely, will have more statistical power than a nonparametric test.

Response Figure III.2-1a: As part of the approved Gilbert methodology (refer to the working team meeting notes from October 20, 1993) nonparametric tests were employed to minimize work in defining populations before comparisons.

Section III.2.1 In the "Statistical Evaluation" section, analytes are eliminated from consideration if they do not meet the statistical evaluation for PCOC selection. In the "PRG Development" section, analytes are eliminated if they exceed PRG or Background comparison. In both instances, environmental characteristics of the analytes are not considered. Does the analyte degrade into something more toxic? bioaccumulate? or interact with other chemical to become more or less toxic?

Response Section III.2.1: The approved Gilbert Methodology does not include environmental characteristics as an analysis component. However, a qualitative review was completed during the PCOC selection process to account for environmental characteristics (i.e., additional criteria used to re-evaluate statistical results). A thorough analysis of PCOC environmental characteristics was also conducted in determining which PCOCs would be modeled using VLEACH, MYGRT, and HELP (see Part IV, Section 10.4).

Section III.2.2.1.1(Pathways of exposure): VOCs in the vadose zone soils were detected at low concentrations. What were the detectable levels and what criteria were used to define low concentrations? A quantitative comparison should be made.

Response Section III.2.2.1.1: Refer to Part II, Section 3.4, specifically Table II.3.4-5 and Figures II.3.4-52 through 60 for information on detection limits for organics PCOCs in vadose soils. In a few cases, VOCs were only detected using pre-RFI/RI data with concentrations reported as detection limits. As no controls were placed on data collected under earlier programs, these values could be JDLs, MDLs, PQLs, RQLs, or CRQLs. This data was used conservatively by assuming if it was not identified as a nondetect, it was a detect.

Section III.2.2.1.1 (Pathways of exposure): Default values for dermal absorption were determined by adopting absorption factors from similar chemicals. However, dermal absorption factors are defined both by the chemical and by the type of dose administered in the critical study form which a toxicity value was calculated. For example, if a dose was administered orally, the factor would always be 1.0.

Response Section III.2.2.1.1: The methods used for developing dermal absorption values are described in Part III, Section 2.2 CDHE's comment is unclear as to whether the methods and/or the absorption values are inappropriate.

Section III.2.2.1.3 (Calculation of Preliminary Remediation Goals): PRGs were calculated for PCOCs in surficial soils only. For a residential scenario, PRGs for vadose zone soils should also be calculated because of the existence of basements and crawl spaces, and the use of vadose zone soils in landscaping.

Response Section III.2.2.1.3: PRGs were calculated for vadose zone soils (see Table III.2.3). Vadose Zone Soils PRGs were calculated only for a worker exposure scenario pursuant to RAGS. To consider residential exposure to vadose zone soils is contrary to RAGS and completely insupportable. (Also, refer to item 6 of the working group's meeting notes from November 9, 1993 for further clarification.)

CDHE comment continued: Also, as mentioned in comments on Figure III.0.1, IRIS and HEAST do not provide cancer risk estimates for specific organs. The number reflects a general risk of cancer. Organ specific affects should be limited to qualitative discussions.

Response: See response to Figure III.0.1.

Table III.2-3 (Summary of COCs based on Risk Analysis): This table needs to provide the detection level, detection frequency, and the range of detections. Otherwise, the reviewer cannot determine whether or not the risk assessor selected appropriate statistical tests or sufficient statistical power.

Response to Table III.2-3: This information is provided in Appendix III.A. The text will be modified to state that Appendix III.A includes the detection level, detection frequency, and the range of detections in OU4. The statistical tests are appropriate as discussed earlier under Gilbert methodology.

Section III.2.4.4 (Defining Areas of Concern): What is the technical rationale for excavating contaminated surficial soils within the OU4 boundary (north of the SEPs) to 6-inches bgs.?

Response to Section III.2.4.4: The minimum amount of soil that can be effectively removed by a bulldozer was estimated at six (6) inches. This is conservative in that the surface soil samples were taken at a depth of 3 inches.

CDHE comment continued: It is not clear why the method of determining the areas of concern provides a very conservative estimate of the extent of contamination actually present and why it will provide a conservative estimate of the actual extent of contamination.

Response: The area of concern is based on concentration point to point extrapolation and not on actual concentration contours. We subdivided areas into excavation zones based on these point to point estimates. Thus, for example, the disposition of the material underlying the SEPs and the berms was determined by a few sample points. If one sample in a berm was above the PRG, the whole berm was identified for removal. This approach is conservative as it assumes mass contamination rather than point-source problems. This rationale will be added to the text of the IM/IRA.

Appendix III.A Figure III.A-1: If the analyte concentrations are significantly different than background data, what criteria will be used to re-evaluate the results.

Response Appendix III.A Figure III.A-1: Refer to the statistical methods described in Appendix A. Additionally, see response to Section III.2.1.

Appendix III.A: The frequency histogram graphs should be redone using standard scales. When the scale for the analyte is different than the scale used for the background data, comparisons are difficult. The scales seem arbitrary and misleading.

Response Appendix III.A: The analyte data plots will be regenerated on the same scale as the background data. However, this may make it difficult to read data from one population. The scale was selected to provide the most resolution for the data set.

Section III.A.3 (Exploratory Analysis): The text states that,

> "Non-detect values were only replaced with one-half the reported result before computing summary statistics for each analyte suspected to represent site contamination."

Figure III.A-1 indicates that the summary statistics were conducted several steps before the non-detects were transformed into one-half of the detection limit. Which method was actually used?

Response Section III.A.3: The text statement is the correct method and the one used when generating statistical information. The figure will be revised to clarify the procedures followed.

Table III.A: It seems odd that none of the chemicals listed have historical evidence indicating the presence of the analyte. What historical sources were reviewed?

Response Table III.A: A list of historical data reviewed can be presented and Table III.A will be modified to further explain the issue of historical data. The current notation in these tables only means the there is no definitive evidence of that particular chemical being placed in the SEPs, although site-wide data may support its presence. Detailed records of material pumped/place into the SEPs over time have not been identified. However, the analyte list developed for Phase I was based on some type of historical review of possible sources. Since Phase I RFI/RI data was used as the primary source of data, based on the uncertainty associated with the historical data all chemicals included in the initial evaluation to identify PCOCs may have been present at some period at the site. Refer to the position paper (November 11,1993) on use of historical data discussed at the team meeting on November , 1993.

CDHE comment continued: If there is not enough data to calculate a 99% upper tolerance limit for background surficial soil analytes, why have CDHE, DOE, and EPA expended so much time, energy, and money on developing a methodology for background comparisons that cannot be applied? Our resources could be better spent collecting more data that would enable us to conduct statistical tests with greater confidence.

Response: Calculation of a nonparametric 99 UTL requires 59 samples or more; otherwise, one must default to the maximum value. However, this value is only used as an initial screen. The methodology that has been developed by CDHE, EPA, and DOE consists of other tools that can be applied to the background surficial soil data set. The text describes how these other, more statistically powerful tools (such as the Gehan test, etc.) were used to identify surficial soil PCOCs. Unfortunately, since this project is on an accelerated IAG schedule there was not adequate time to collect additional background samples.

Table III.A-12: Why were gross beta, Radium-226, Radium-228, Strontium, and gross alpha not considered potential COCs?

Response Table III.A-12: Table III.2-3 presents PCOCs including Radium-226 and Strontium (as a metal and isotope). Gross alpha and gross beta measure radiation form all radionuclides present. Only chemical-specific radiation is appropriate for PCOC development. Radium-228 and any other radionuclide not listed as a PCOC were screened out in Table III.A-13 or were not analyzed for in the field studies. Refer to Appendix A for further detail.

Table III.A-14: Why were so few chi-square tests done for lognormally distributed data?

Response Table III.A-14: Chi-square tests were conducted on all PCOC data to determine distribution. In many cases the test could not be completed on the lognormally transformed data due to data inadequacies or limitations (number of datum, degrees of freedom, etc.). In these instances, the data were assumed to fail the chi-square test for goodness-of-fit to a lognormal distribution. However, the K-S goodness-of-fit test was also performed on the transformed data and evaluated separately from the chi-square test to determine the data distribution.

Table III.B-7: As of 2/16/94, the RfD value for Aroclor-1254 is under review. How was the value submitted derived?

Response Table III.B-7: All toxicity data used was taken from the TOMES™ database (Micromedex, 1994) using the 1/31/94 updated information. Therefore, the RfD for Aroclor used in the IM/IRA risk analysis is the one that was subsequently placed under review.

Appendix III.C: Many of the chemical profiles for potential contaminants of concern refer to Ohio state standards and Ohio state methodologies (see barium, beryllium, bis(2-ethylhexy)phalate, etc.). This information should be derived from Colorado standards and policies.

Response Appendix III.C: The chemical profiles for PCOCs will be modified to reflect Colorado standards and policies where appropriate.

attachment 2

EPA/PRC COMMENTS

2.1 EXECUTIVE SUMMARY

1. Page ES-2, Paragraph 2. The paragraph states that the drainage layer will be installed beneath the hazardous waste. This paragraph is misleading. The sentence should be revised to specify that the drainage layer will be installed beneath the hazardous waste liner materials and the excavated contaminated media (or soils).

Response: Will comply. The document will be modified to state that the drainage layer will be installed at the elevation of the mean seasonal high water table elevation to prevent the potentially rising ground water from contacting contaminated materials.

2.2 PART I

General Comments

1. The categories of land use listed in Section 5.4 (urban and suburban residential, business/industrial, and open space/agricultural) do not correspond with the categories listed in I.4.1 (residential, commercial, industrial, agricultural, and open space). They should be made consistent.

Response: The terminology will be made consistent.

Specific Comments

1. Section 1.2, Page I-7, Figure 1.2-1. The figure shows RFP in relation to the entire state of Colorado, but not in relation to Denver. The small scale of the state map makes it difficult to accurately place the RFP in relation to Denver. The figure used in the roundtable review draft showed the RFP in relation to Denver. A combination of the two figures would be more helpful.

Response: A combination of figures (Figure I.2-1A and I.2-1B) will be used to show the relation of the RFP to Denver more clearly.

2. Section 1.2, Page I-8, Figure I.2-2. The protected area fence line on the far left side of the figure shows a different fence line than was previously shown on the roundtable draft figure. If this fence line is incorrect, it should be corrected.

Response: The current location and symbolism for the Protected Area Fence is correct.

3. Section 1.2, Page I-16, Paragraph 1. The first sentence states that the solar evaporation ponds (SEPs) are "interim status hazardous waste management units." It should be clarified that they are Resource Conservation and Recovery Act (RCRA) interim status hazardous waste management units.

Response: Will comply.

4. Section 1.2, Page I-17, Figure I.2-4. The figure from the roundtable draft shows the footing drain that runs along the east side of SEP 207-C extending north all the way to the french

drain system. The current draft shows the footing drain stopping about 200 feet south of the french drain. If the footing drain extends to the french drain, the current figure should be corrected.

Response: The pipe daylights about 200 feet south of the ITS and runs by a drainage ditch to the ITS. The drainage ditch will be placed onto the figure (by legend and marking).

5. Section I.3, Page I-20, Second Line. The second line on the page says "Section Part IV.2.2." The word "Section" or the word "Part" should be deleted.

Response: The word Section will be deleted.

6. Section I.4, Figure 1.4.3. In response to comments on the roundtable review draft IM/IRA document, a paragraph on the development of the Rock Creek project in Superior, which will eventually have 3,500 residences, has been included. However, Figure I.4.3, which shows year 2010 expected residential population, has not been revised to include this development. The figure should be updated to reflect the new information so that the text and the figure are consistent.

Response: Will comply by revising the Figure.

7. Section 1.4, Page I-21. The second paragraph discusses but does not specifically reference Figure I.2-2. That reference should be included.

Response: Will comply.

8. Section 1.4, Page I-28, Figure I.4-4. The roundtable version of Figure I.4-4 provides a scale and notes the approximate location of OU 4. The current version shows neither, and should be revised to show both.

Response: Will comply.

9. Section 1.4.3.2, Page I-33, Paragraph 1. The text states, "The RFP is now considered to be a 'major source' (see Note [2] below) only for emission of oxides of nitrogen." The potential significance of being classified a "major source" is not, but should be, discussed. For instance, a facility classified as a "major source" may be required to implement stringent measures to reduce or control air emissions. Information that may have a significant impact on regulatory compliance for RFP should be clearly discussed.

Response: The text will be modified by deleting the term "major source" and adding the following statement; "The RFP emissions of oxides of nitrogen are potentially greater than 100 TPY." The CDPHE has confirmed that the "250 TPY" threshold regarding criteria pollutants for "major source" classifications is legally valid for new or modified sources seeking a construction permit; provided the source is in an attainment area and not on the list of 28 specific industrial categories. Therefore, the definition in the IM/IRA is not outdated as implied by the USEPA. (Note that prior to 1990 CAA amendments operation permits did not have threshold limits for "major source" classification so USEPA could not have been commenting on operation permits.) The IM/IRA definition will be revised for the purpose of clarification between attainment versus nonattainment areas.

Furthermore, the Denver Metropolitan area is considered in attainment for NO_x and SO_2. However, under CDPHE's recent permitting regulation number three, (February 1994) NO_x and SO_2 are now considered precursors to PM10. Since Denver is nonattainment for PM10 the "major source" threshold for NO_x and SO_2 is 100 TPY. The statements in the IM/IRA regarding emissions and "major source" are valid.

10. Section 1.4.3.2, Page I-33, Bottom of Page Under "Note 2". The text states that "Sources not on the list of the 28 source categories are allowed to emit up to 250 tons per year (TPY) of criteria or non-hazardous pollutants." This definition does not appear correct. The current interpretation of the Clean Air Act Amendments of 1990 indicates that the value "250 TPY" should be changed to "100 TPY." The text should be revised to present accurate information.

Response: Will comply.

11. Section 1.4, Page I-34, Figure I.4-7. There is a large unlabeled water body on the west side of the Woman Creek Drainage Basin in Figure I.4-7 that appears to be Rocky Flats Lake. This water body should be labeled.

Response: Will comply.

12. Section 1.4, Page I-36, Figure I.4-8. This figure does not outline the perimeter of OU4. An outline would clarify what part of OU4 is in the floodplain. The figure should be revised.

Response: Will comply.

13. Section 1.4, Page I-40, Figure I.4-11. Not all the soil types listed in Figure I.4-11 are included in the legend. Soil types 30, 103, and 169, as well as the letter "w" are missing from the legend. The missing information should be included on the figure.

Response: Will comply.

14. Section 1.4, Page I-44, Figure I.4-14. The summary description of the Benton formation in Figure I.4-14 contains a typographical error: "owry" should be "Mowry." This should be corrected.

Response: Will comply.

15. Section 1.4, Page I-51, Line 4. The study referenced is by "OE." This appears to be a typographical error and should be changed to U.S. Department of Energy ("DOE").

Response: Will comply.

16. Section 1.4, Page I-59, Paragraph 1. According to this paragraph, the total 20-year traffic projection for State Highways 72 and 93 in the May report is 42,000 average daily traffic (ADT), based on a 1994 report. The roundtable draft's projection, based on 1991 and 1992 reports, was 27,430. However, the population estimates in Figures I.4-2 and I.4-3 have not changed when compared to the roundtable review draft. The figures should be reviewed and any new data incorporated into them.

Response: The figures will be reviewed and updated as necessary.

17. Section I.4.8. The spellings of scientific names used throughout the section are frequently incorrect or inconsistent. All of the names should be reviewed.

Response: Will comply.

18. Page I.A-8, December 1960. Appendix I-A (Solar Ponds History) states that all 207-B SEPs were returned to service in December 1960. Section I.2.1.3, page I-14, of the report states that only SEP 207-B South was returned to service at that time, and that repairs on the others were deferred due to funding problems. This inconsistency should be resolved and the appropriate corrections made.

Response: The inconsistency will be investigated and corrected.

19. Section I.2.1.1, Page I-11. This section states that there was a discharge to the original SEPs in March 1963. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

20. Section I.2.1.3, Page I-14. This section states that "an unsuccessful attempt was made to fill the cracks on the side walls of SEP 207-B North with asphalt mastic." This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

21. Section I.2.1.1, Page I-11. This section states that ponds 2 and 2D were regraded in 1970, and that the soils and dikes may have been used to construct SEP 207-C. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

22. Page I.A-20, May 1978. Appendix I-A states that asphalt from the 207B SEPs was removed and boxed, but Section I.2.1.3, page I-15 of the report states that "asphalt concrete liners were not removed." It is unclear whether these two statements are consistent. They should be clarified.

Response: This issue will be investigated and corrected so that the document is consistent between sections.

23. Section I.2.1.4, Page I-15. This section states that the Petromat liners in SEPs 207B Center and South were removed in 1978. None of the events described in the first paragraph on that page are included in the Appendix I-A. They seem significant enough to warrant inclusion.

Response: Will comply.

24. Page I.A-21, April 1981. Water from the french drain was pumped into SEP 207-B North and then periodically into the other two 207-B SEPs. The periodic transfer procedure is included in the Appendix I-A, but not in Section I.2.2.1 of the report. It seems significant enough to warrant inclusion.

Response: Will comply by making a reference to the procedure in Appendix I-A or by adding summary information to the text.

25. Section I.2, Page I-6. This section states that "removal, treatment, and disposal of SEP 207-A sludge began on June 19, 1985....In 1985, Building 788 was constructed between SEPs 207-C and 207-A as a storage facility for the pondcrete waste containers. In 1988, an addition was made to the northern end of Building 788. This addition was constructed to increase the pondcrete storage capacity." None of these events are included in Appendix I-A. They seems significant enough to warrant inclusion.

Response: Will comply.

26. Section I.2, Page I-6. This section states that "placement of process wastewater into [the SEPs] ceased in 1986 due to changes in the RFP waste treatment operations." Page I-13 also refers to this event, although it is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

27. Section I.2.1.4, Page I-15. This section states that SEP 207-A sludge was used to produce the first pondcrete in 1986. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

28. Page I.A-23, October 1986. Appendix I-A states that a new pondcreting building was completed in October 1986. Section I.2.2.2 of the report states that Building 788 was constructed in 1985 to store pondcrete waste containers. It is unclear whether this is the same building. The building referenced in Appendix I-A should be identified.

Response: Will comply.

29. Section I.2.1.2, Page I-13. This section states that SEP 207-A was relined in the fall of 1988. This is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

30. Section I.2.1.4, Page I-15. This section states that a leak detection system was installed for SEP 207-C in the late 1980s. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

31. Page I.A-23, March 1990. Appendix I-A states that "excess water in pond 207A was then to be transferred to Building 374 for evaporation." This implies that the transfer from the pond was conducted soon after the March 1990 transfer into the SEP. However, according to Section I.2.1.2, page I-13, the water was not transferred until the fall of 1992, more than 2 years later. The time of the actual transfer should be included in the appendix to avoid misleading the reader.

Response: Will comply.

32. Section I.2.2.1, Page I-18. This section states that the interceptor trench system (ITS) water was diverted to the temporary Modular Tank System instead of to the SEPs beginning in April 1993. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

33. Section I.2.1.3, Page I-14. This section states that the 207-B SEPs were used to hold treated wastewater from June/July 1993 hot systems operations testing of the Building 910 evaporators. This information is not included in Appendix I-A. It seems significant enough to warrant inclusion.

Response: Will comply.

2.3 PART II

General Comments

1. The placement of the figures and tables within the document should be checked. To eliminate confusion, the figures and tables should be placed within the document after they are first mentioned in the text, and in numerical order. It appears that this was attempted, but some have been misplaced.

Response: The final document will be reviewed to correct figure and table placement in the next revision.

2. Sections II.3 and II.4 of this report discuss only the nature and extent of contaminants identified as potential contaminants of concern (PCOCs). Limiting these discussions to PCOCs only may be inappropriate as several technical inadequacies in the PCOC selection process were also noted. Any revisions to the PCOC or contaminants of concern (COC) selection process and the resulting PCOC lists should be reflected in Sections II.3 and II.4 also.

Response: It was agreed by the CDPHE and EPA during the roundtable meetings and after the Roundtable Review Draft was released that the Results (Section 3.0) and Nature and Extent (Section 4.0) sections of Part II would only include the PCOCs. If the PCOC list is subsequently revised during this response period, then Sections 3.0 and 4.0 will be revised as appropriate.

3. The data summary tables provided in Section II.3.4, Subsurface Soil and Bedrock Analytical Results, are not data summary tables. These tables list location, sample number, start depth, end depth, QC (quality control) Code, QC Partner, Chemical, Result Lab Qualifier, Validation Code, Detection Unit, and Units. Much of this information is extraneous and should be presented in an appendix. It appears that database tables were reprinted rather than creating summary tables. Existing Tables II.3.4-3, II.3.4-4 and II.3.4-5 should be removed from the report.

   Data summary tables should be created and incorporated into the report. The information to be included is sample number, sample depth, and detected concentration. As a general rule, data summary tables should summarize the chemicals detected in subsurface soil and bedrock samples.

Response: Table II.3.4-2, *Summary of Subsurface Soil and Bedrock Analytical Results*, is a table that summarizes by chemical constituent the analytical results of the PCOCs found at OU4. Tables II.3.4-3, II.3.4-4, and II.3.4-5, are tabular presentations of the individual subsurface soil and bedrock PCOC analytical results and are not represented to be summary tables in either the table titles or the corresponding report text. The information presented in these tables is required for proper understanding of the results. These tables were provided to facilitate the reader's review and understanding of the results presented graphically in the associated figures.

4. The text of Section II.3 refers to Section II.4 as providing a detailed analysis of the occurrence of the PCOCs discussed. The references are on pages II.3-226, II.3-242, and II.3-272. However, Section II.4, Nature and Extent of Contamination, does not discuss

contamination in subsurface soils. As currently written, Section II.4 discusses only vadose zone and surficial soil contamination. A new subsection that specifically discusses the nature and extent of PCOCs in subsurface soil should be written and incorporated into Section II.4. The remedial investigation (RI) report cannot be considered complete until the nature and extent of contamination in all media investigated is discussed.

Response: Vadose zone soils as defined in the Phase I RFI/RI are subsurface soils. However, not all subsurface soils are vadose zone soils since some of the soils sampled during the Phase I occur below the water table. Although some of the subsurface soils sampled are below the water table, all of the results were evaluated and presented in the Phase I RFI/RI. In order to eliminate any confusion, the text will be modified to clarify the data that was evaluated in the Phase I RFI/RI.

5. The conclusions and recommendations discussion in Section II.6 is incomplete. It only discusses surficial and vadose zone soil contamination. The discussion of subsurface soil contamination should also be summarized in this section.

Response: See above response.

6. Data presented and conclusions drawn in the site characterization reaffirm that water levels in the alluvium show a rapid response to spring precipitation. This conclusion contradicts the assertion in the document prepared by Engineering Science, Inc. (Solar Evaporation Ponds OU4 IM/ERA Evaluation of Potential Groundwater Fluctuations) dated April 11, 1994, that groundwater in the alluvium is not recharged directly by precipitation. The data presented in Volume II of the Draft IM/IRA Decision Document include hydrographs generated by automated water level monitoring stations at four alluvial wells in OU4. Three of the four hydrographs, particularly that of well 22-86, indicate a rapid response to precipitation events. The recharge mechanism proposed repeatedly in this document, downward flow through macropores in the vadose zone, explains why not every well would show a water table response to precipitation events. Macropores such as rodent holes, root channels, desiccation cracks, and utility trenches do not have a uniform distribution throughout the soil; therefore, wells that either do not intersect or are not located near macropores may not experience a localized water table rise after precipitation events. This document concludes on page II.6-5 that alluvial water levels measured with transducers appear to have shown a response to spring precipitation events at three monitoring locations and to a summer precipitation event at two monitoring locations. These observations lead to the conclusion that the increase in alluvial water level elevations at these monitoring locations is due in large part to macropore flow. This conclusion should be recognized in any analyses of water table fluctuations and their potential impacts, elsewhere in this document, or in future technical memoranda concerning OU4.

Response: This comment does not specifically relate to Part II, but to all documents prepared as part of the IM/IRA DD. The IM/IRA should be consistent in interpretation of the water level changes throughout all of the parts. An effort will be made to establish consistency between each section.

7. The volatile organic results of soil analyses conducted during this investigation are likely not usable because of the sampling strategy employed. Compositing soil samples dramatically increases the exposure of volatile organic compounds to the atmosphere, resulting in the loss of these compounds prior to analysis.

Response: Soil samples collected for volatile organic compound (VOC) analyses during the Phase I RFI were not composited. Soils analyzed for VOCs were collected at two-foot intervals in a 3-inch long stainless steel sleeve that was capped and sealed for shipment and analysis at the laboratory. These sampling procedures are described in the EG&G Rocky Flats EMD Operating Procedures, Volume III, Geotechnical Procedure GT2. If the text concerning VOC sampling is not clear, it will be revised to clarify the VOC sampling procedure.

8. Aerosol dispersion is cited as a potential contaminant transport mechanism repeatedly in the discussion on the nature and extent of contamination. However, this transport mechanism is not discussed adequately in Sections 4 or 5 (Contaminant Fate and Transport).

Response: Aerosol dispersion as a transport mechanism was not specifically evaluated in the Phase I RFI/RI. However, the presence of contaminants in surficial soils was evaluated and aerosol dispersion was postulated as a possible transport mechanism, but not the sole mechanism for surficial soil contamination. The references to aerosol dispersion will be reviewed and additional text will be added for clarity, as appropriate.

9. The figures describing the distribution of contamination in the vadose zone are confusing. In addition, the rationale used to contour a single point on the figure is not clear and lends to the confusion.

Response: Some of the nature and extent maps presented in Section II.4 may be confusing because of the voluminous quantity of data presented on these figures. However, these maps were prepared using chemical data from selected depth intervals to summarize both the horizontal and vertical extent of contamination on a single map for each chemical. By using a single map to describe the distribution of each contaminant found in the subsurface soils it is believed that a more concise presentation is accomplished. The maps in question will be reviewed to determine if any changes can alleviate the confusion, however, the single map approach for each contaminant will be retained. Additional maps will not be prepared.

10. The discussion of contaminant mobility is theoretically thorough and clear. However, there appears to be insufficient data collected to date to determine whether the contaminant transport theory is consistent with the trends observed in the actual chemical results. By comparing the expected contaminant behavior with actual results, it may be possible to determine the primary contaminant fate and transport process.

Response: As stated in the IAG, the Phase I RFI/RI is concerned with characterization of the operable unit sources and soils. Contaminant transport and fate is not included as part of the IAG Phase I definition. However, in keeping with the general nature of the Contaminant Transport and Fate discussion presented in Section 5.0, a brief discussion will be prepared, as appropriate, describing the general fate of PCOCs found at OU4 based on the current site conceptual model. The text will also be modified to state that fate and transport discussions presented in the Phase I RFI/RI may be superseded by the results of the Phase II RFI/RI.

11. The contaminant transport and fate discussion focuses almost entirely on the potential transport of OU4 contaminants, while the fate of these compounds is not discussed. Based on

the extent of information presented in the vadose zone conceptual model and the properties of the contaminants, general theories of the fate of these contaminants could be provided.

Response: A brief discussion will be prepared describing the general fate of the PCOCs, as appropriate. The discussion will be based on the current site conceptual model.

12. The vadose zone conceptual model discussion suggests that contaminant transport may be aided by preferential pathways in the subsurface such as fill material, subsurface channels, or macropores. Historical groundwater results from samples collected near the SEPs suggest there may be a source of chlorinated volatile organic compounds (VOCs) in the area of the SEPs. These observations suggest that the SEPs may be a source of VOC contamination to groundwater. However, the potential transport and fate of VOCs are not discussed in detail and the potential transport by preferential pathways is not described. The transport of mobile compounds by preferential pathways can result in the rapid dispersion of contaminants within an aquifer. Consequently, the potential transport and fate of VOCs should be discussed.

Response: The potential transport and fate of VOCs were not discussed in Section 5.0 because of the lack of VOC contamination found in the subsurface soils at OU4. Chemical analyses of soils collected during the Phase I RFI/RI, especially from areas adjacent to the suspected groundwater VOC contamination, did not reveal any significant presence of VOCs in the subsurface soils. Because of the lack of VOCs in the subsurface soils sampled, the VOCs found in groundwater at OU4 may be from an upgradient source. The location of the suspected VOC plume in the area of Pond 207C suggests that a VOC source may be situated upgradient of OU4. Further investigation of VOCs in groundwater will be conducted during the Phase II RFI/RI investigation.

13. Part II, Volume 2 presents all the figures for Part II, Volume I, Section 3.0. Figures illustrating chemical concentrations in surficial soil and subsurface soil samples are included. For all these figures, the sample location numbers are not presented. Instead, sample location maps for both surficial soil and boreholes are provided as Figures II.3.2-2 and II.3.4-1. In order to confirm the presented sample results, the reviewer must review the location map and results map. It is recommended that the sample location number be illustrated on every map.

Response: Sample location numbers were not posted on each of the maps to minimize clutter and possible confusion to the reader. The current map presentation format will be retained.

Specific Comments

1. Page II.1-3, First Paragraph. This paragraph describes the content of the various sections in Volume II. Section 4.0 is described as an evaluation of the lateral and vertical distribution of contaminants in surficial soils and vadose zone soils. The lateral and vertical distribution of subsurface soil contaminants are not mentioned but should be discussed in Section 4.0 and referenced in this introductory paragraph.

Response: As mentioned in a response to General Comment No. 4, Section 4.0 discussed the nature and extent of contaminants in the subsurface soils, including the vadose zone. The referenced paragraph will be changed to clarify what is discussed in Section 4.0.

2. <u>Section II.2.1, Page II.2-5, Last Paragraph (Second Bullet Item)</u>. The text states, "...identify boundaries of ponds and abandoned equipment and construction materials." The word "buried" should be added before "equipment" for clarification.

Response: Will comply.

3. <u>Section II.2.1, Page II.2-5, Last Paragraph</u>. The text states, "This survey was reduced in scope from that described in the Phase I Work Plan based upon historical data review." A discussion of the findings, from review of historical data, that resulted in a reduction of scope for the ground penetrating radar (GPR) survey should be discussed in the text to provide an explanation.

Response: Technical Memorandum No. 2 (TM2) was written to provide the rationale for modifications in the field program. The reasons for modifying the GPR survey were presented in TM2. TM2 will be referenced in the paragraph.

4. <u>Section II.2.1, Page II.2-5, Last Paragraph</u>. The text states, "The locations of the GPR survey lines are shown in Figures II.2-1 and II.2-2." Survey lines are not shown in Figure II.2-1. The text should be changed to "The location of the GPR survey area and survey lines are shown in Figure II.2-2."

Response: Will comply.

5. <u>Section II.2.1, Page II.2-8, First Paragraph (First Bullet Item)</u>. The text states that the approximate locations of the original SEPs are shown in Figure II.2-3. The locations are not shown on this figure. The text should be modified to refer the reader to Figure II.3.1-15.

Response: The locations of the original ponds will be added to Figure II.2-3 unless they add too much clutter. In that case, the reader will be referred to Figures II.1-2 and II.3.1-15.

6. <u>Section II.2.1, Pages II.2-8, II.2-15, and II.2-19 (bullet items)</u>. The text refers readers to Sections II.2.3.1 and II.2.4 for the analytical requirements and methods for surface and subsurface soil samples. Table II.2-4 would be a better reference for this information.

Response: Will comply.

7. <u>Section II.2.1, Page II.2-15, First Paragraph (Second and Fourth Bullet Items)</u>. Text should be added to refer the reader to Figure II.2-10 (12 boreholes and one deep borehole) and Figure II.2-3 (16 boreholes between ponds and around perimeter of IHSS 101).

Response: Will comply.

8. <u>Section II.2.3, Page II.2-45, Table II.2-4</u>. Under the heading "Composite Collection/ Sampling Frequency" the last entry in this column is "each sample," yet the analytical parameters and the methods are not listed. Either the parameters and methods should be listed or "each sample" deleted.

Response: The columns will be relabeled.

9. Section II.2.3, Page II.2-48, Table II.2-4. The analytical method for "Particle Size - Hydrometer" was not listed, but should be. Also, "Saturated Hydraulic" should be listed as "Saturated Hydraulic Conductivity."

Response: Will comply.

10. Section II.2.3, Page II.2-50, Paragraph 3. The text states that the results of the gamma survey were reported with "no additional modifications." This statement implies that the alpha and beta survey results were modified. If this is true, the "additional modifications" should be defined and the paragraph should be rewritten to eliminate this confusion.

Response: The paragraph will be rewritten to avoid confusion.

11. Section II.2.3, Page II.2-50, Section II.2.3.2.2, Fourth Paragraph. This paragraph describes contamination monitoring. It defines radioactive contamination as "The presence of radioactive material where it is not wanted." Whether or not the contamination is wanted is immaterial to the definition. This definition is inaccurate and should be deleted from the text.

Response: The definition for "radioactive contamination" provided in the text is the definition that is widely accepted by health physicists and other technical organizations.

12. Section II.2.3, Page II.2-50, Paragraph 4. Under the heading Contamination Monitoring the purpose of radiation contamination monitoring is to determine the amount of exposure to (specific types of) radiation. After determining exposure one can, then, determine the amount of radioactive material that can "easily" be removed from a surface. The text should be written to reflect this.

Response: In contamination monitoring, the exposure to specific types of radiation is typically not quantified, just the presence and quantity of contamination. The next step is then to determine the amount of contamination that can "easily" be removed through smear sampling. The text will be changed to clarify this information.

13. Section II.2.3, Page II.2-51, Paragraph 2. The text states, "If Strontium-90 is known to be present, this unrestricted release criterion is decreased to 200 dpm/100cm^2." Text should be added to indicate that Strontium-90 emits both gamma and beta radiation and that it is known to be present at the RFP site.

Response: Will comply.

14. Section II.2.3, Page II.2-53, Paragraph 5. The text states that the asphalt liner sample locations are shown in Figure II.2-3. The correct figure number is II.2-10. The text should be modified to provide the correct reference.

Response: Will comply.

15. Section II.2.3, Page II.2-54, First Paragraph. The text states, "The sixth borehole was originally located in the vicinity of the clarifier but was relocated during the field investigation." A brief explanation for relocation of the borehole should be added to the text.

Response: Will comply.

16. Section II.2.3.2.5, Pages II.2-54/55. In this section it appears that unconsolidated and bedrock materials were analyzed for two different sets of parameters. A list of analyses (with intervals) was provided only for unconsolidated materials. It is suggested that a similar analyses list be provided for bedrock materials.

Response: The word "soil" will be removed from the first sentence of the paragraph preceding the sample collection intervals for clarity. The first paragraph on page II.2-55 will be modified to clarify that bedrock samples were analyzed for the same chemical parameters as soil and that soil and bedrock material were not composited in samples submitted for analysis.

17. Section II.2.4, Page II.2-56, Last Paragraph. The text states, "Table II.2-5 lists specific chemical constituents...." The text should be changed to, "Table II.2-5 lists specific chemical constituents in each parameter group for contract laboratory program (CLP) methods," for clarification.

Response: Will comply.

18. Section II.2.4, Page II.2-69, Paragraph 3 and Page II.2-70, Paragraph 2. The text states, "Table II.2-5 lists the specific chemical constituents in each parameter group." The text should be changed to, "Table II.2-5 lists specific chemical constituents in each parameter group for CLP methods."

Response: Will comply.

19. Section II.2.6, Page II.2-73, Paragraph 4. The text states, "Incomplete suites of logs were obtained for this borehole...time constraints RFP requirements...." It appears that this sentence is missing words between "constraints" and "RFP." The sentence should be rewritten to eliminate confusion.

Response: Will comply.

20. Section II.2.7, Page II.2-77, First (only) Paragraph. These two sentences are confusing. The paragraph apparently states that quality control (QC) samples were not collected as per quality assurance and quality control (QA/QC) protocol. The paragraph should be rewritten to provide clarification.

Response: This paragraph will be revised to discuss the consequences associated with the collection of an insufficient field QC samples.

21. Page II.3-9, First Sentence. This sentence summarizes the previous discussion of the depth at which groundwater was encountered during drilling. It states, "The groundwater levels found during drilling are only indicative of relative permeabilities of subsurface materials at each particular borehole, and frequently have little bearing on static water levels at those locations." It is not clear why the water level encountered during drilling is not indicative of the water level at that location. Further explanation, such as whether the water levels encountered during drilling are typically higher or lower than the static water levels and a description of the relative permeabilities, should be added to this paragraph.

Response: During drilling, groundwater was encountered and noted in the more permeable zones of the Rocky Flats Alluvium. If the soils encountered in the Rocky Flats Alluvium were of low permeability, free-flowing groundwater was not typically observed during drilling. None of the borings were allowed to remain open after drilling to obtain 24-hour "static" water levels. Therefore, the groundwater levels observed do not necessarily represent true static groundwater levels. The text will be revised to clarify the sentence in question.

22. Section II.3.3.1.1, Page II.3-33, Paragraph 4. The text states, "The proposed IM/IRA project to relocate the liners and cover a portion of the existing SEPs may dramatically affect the shallow water table in the SEPs area." This situation appears to be unlikely based on Section II.3.3.5.6, which concludes that draining SEP 207-A had little or no effect on water levels in adjacent alluvial and bedrock wells. This conclusion should be removed from the text unless it can be adequately supported.

Response: No reference to this comment citation can be found in Part II. A response cannot be prepared.

23. Section II.3.2.1.2, Page II.3-55, Third Paragraph. This paragraph discusses the results of the gamma radiation survey and refers to Figure II.3.2-1. However, this figure shows only measurement station locations and not the results. An additional figure showing the (background subtracted) results should be included to accompany this discussion.

Response: Figure II.3.2-1 will be revised to show the results of the gamma radiation survey.

24. Section II.3.3.5.3, Page II.3-181, Paragraph 4. The text indicates that a value calculated by dividing the total amount of change of a water level in a well by the duration of the water level decline represents the hydraulic conductivity of the soil in the interval of the water level decline. These values are referred to as "relative hydraulic conductivities" and are listed in Table II.3.3-20 and used in Figure II.3.3-47 to depict zones of relatively high hydraulic conductivity. However, hydraulic conductivity is only one variable that may affect well water levels, others being hydraulic gradient, porosity, the well's position relative to localized sources and sinks of water, and (because the measurement periods were for various lengths of time at different times of the year) the temporal pattern of precipitation, evapotranspiration, and the manipulation of water levels in the solar ponds themselves. For instance, piezometer 45793, which is one of the two wells located in the "bulls-eye" of high relative hydraulic conductivity depicted in Figure II.3.3-47, is screened in colluvium/fill material directly above a subcropping siltstone that may receive recharge from Pond 207-C or from upgradient alluvium. Proximity to sources of water may explain large fluctuations in water levels at this well, instead of hydraulic conductivity, which is likely to be low in this soil. References to "relative hydraulic conductivities" estimated in this manner should be deleted from the text, as should Figure II.3.3-47.

Response: The relative hydraulic conductivities calculated in Section II.3.3.5.3 are reasonable estimates of the local hydraulic conductivities. The results show areas of relatively high or low hydraulic conductivity. The relative hydraulic conductivities were calculated from water level hydrographs which typically showed a long period of decline between June through November; and as such, represents long term drainage data similar to an open borehole permeability test. The relative hydraulic conductivities calculated using this approach agree well with the hydraulic conductivities calculated using standard slug or pumping test methods at OU4.

25. Page II.3-224, Section II.3.4, First Paragraph. This paragraph begins the discussion of analytical results for subsurface soil and bedrock samples. It references the PCOC list provided in Table II.3.4-1. However, this table lists only PCOCs for the vadose zone. A new table listing PCOCs for subsurface soil and bedrock should be created and correctly referenced in this section.

Response: As previously stated, there is only one PCOC list for subsurface geologic materials. The associated text and tables will be clarified.

26. Figure II.3.4-17. This figure presents the soil analytical results for zinc. Two of the values presented appear to be incorrect. Location 41193 had a zinc detection of 53.2 milligrams per kilograms (mg/kg) and location 41693 had a detection of 11.8 mg/kg. The figure shows 24.20 and 56.9 mg/kg, respectively. The figures should be carefully checked and the correct values listed.

Response: The figures, tables, and text will be checked for consistency and accuracy.

27. Section II.3.6.1, Page II.3-311, Paragraph 2. This section presents the audit reports and corrective action documents associated with the Phase I remedial investigation and feasibility study (RI/FS). However, there are only two corrective action documents presented and six deficiencies listed. Documentation of corrective actions should be addressed for each deficiency listed. For example, holding times of nitrate samples were exceeded; however, no documentation of a corrective action such as resampling is presented.

Response: Only two corrective action documents were presented because they were the only ones prepared. The document will be modified to state that no corrective action documents were prepared for the other identified deficiencies.

28. Section II.3.6.2.4, Page II.3-318. The relative percent differences (RPD) were calculated using the detection limit (DL) for samples with results measured to below the DL. The normal procedure used to calculate the RPD for samples with results at the method DL is to use one-half the value of the DL. The RPDs for the samples with results measured below the DL should be recalculated.

Response: The RPDs will be recalculated using one-half the detection limit for constituent results flagged with the not detected qualifier (U). In many instances, both the real sample and the duplicate sample results were not detected, and therefore, using one-half of the detection limit will not change the RPD result.

29. Section II.3.6.3.3, Page II.3-345, Paragraph 4. This section states that no vadose zone aqueous samples were collected. However, vadose zone implies a nonaqueous soil strata. An explanation of the origin of a vadose zone aqueous sample should be provided.

Response: The "vadose zone aqueous samples" indicated in the paragraph refer to vadose zone pore water samples collected using a lysimeter. The text will be revised to read "In addition, no vadose zone pore water samples were collected during the historical investigations."

30. Page II.4-53, Paragraph 1. The distribution of calcium appears to be quite variable and may not be the result of extensive calcium contamination and high mobility. Alternatively, the observed distribution may result from the compositing samples of various geologic units and possibly construction fill material. The data should be reevaluated and the text updated.

Response: The calcium distributions that occur at OU4 may be easily explained by the sporadic occurrence of caliche horizons in the subsurface soils. Calcium was mapped because the PCOC evaluation suggested that it may be a contaminant of concern. The text will be revised to indicate the possibility that calcium is a naturally-occurring constituent at OU4 or that the observed distribution is influenced by sample compositing.

31. Section II.5, Page II.5-14, Paragraph 4. Nitrogen species are used by organisms during the formation of proteins. Often, high levels of nitrogen can lead to dramatic increases in biological populations. This biological mechanism would appear to be the dominant fate process controlling nitrogen species in ponded water and surface soil environments. In addition, large amounts of available nitrogen in near-surface soils may lead to increased rates of biodegradation or adsorption of other contaminants. The fate of nitrogen in soils should be discussed and the biological mechanisms included in the discussion.

Response: Nitrogen compounds in the subsurface soils play an important role in both microbiological processes and potentially in enhancing or reducing soil sorption. Available nitrogen species may enhance microbiological activity in the subsurface at OU4 and thus result in the biodegradation of same constituents. A brief discussion of the fate of nitrogen in soils will be prepared and included in Section II.5.

32. Section II.5.2.1, Page II.5-17, Paragraph 1. This paragraph notes that infiltration water may follow preferential pathways during migration in the vadose zone. The migration of infiltration water through these preferential pathways would affect the fate and transport of soluble VOCs and should be discussed.

Response: The migration of water through the preferential pathways would potentially affect the fate and transport of any soluble contaminant present in the subsurface, not just VOCs. As discussed in the response to General Comment No. 12, no significant occurrences of VOCs occurred within OU4 soils. As a result, a specific discussion of the transport of soluble VOCs was not included in Section II.5.2.1. No additional discussion will be provided concerning the transport of soluble VOCs.

2.4 PART III

General Comments

1. The term PCOC is used throughout the document to indicate both chemicals detected at OU4 and chemicals selected using the COC selection process. The term PCOC should be used consistently to refer to those chemicals selected using the COC selection process.

Response: The text will be modified to clarify that a PCOC is a contaminant that is detected above background but is not a COC unless its concentration exceeds the PRG.

2. In the COC selection process for inorganic chemicals, four statistical tests are used to compare site concentrations of inorganic contaminants to background levels. While the explanation of the statistical methods used is comprehensive, it is unclear which statistical test will be used to determine whether a chemical exceeds background levels if results of the four tests are conflicting. If levels of a chemical are shown to be greater than background by any of the tests, it should be retained as a PCOC.

Response: The text will be modified to indicate how the four tests were used in the analysis. It is true that if any of the four tests indicated a significant difference with respect to background, then the analyte was retained as a PCOC.

3. According to agreements made at the November 15, 1993 meeting between DOE, U.S. EPA, and the Colorado Department of Public Health and Environment (CDPHE), organic constituents detected in vadose zone soils in historical data would be retained as PCOCs if they were detected in surface soils during the (RFI/RI) program or exceeded their readjusted preliminary remediation goals (PRGs). It is unclear whether this has been done. The text should be clarified to reflect agreements made between the agencies.

Response: Organic historical data we evaluated per the above agreement. The text will be modified to include this information.

4. Appendix III.A discusses how qualified data were evaluated, but does not explain how "blank" qualified samples were evaluated or whether there were "blank" qualified samples in the data set. This should be discussed in Appendix III.A.

Response: A discussion concerning the handling of blanks will be included in the appendix.

5. The text should clearly state which soil depth interval is considered surficial soil. It should also state that remedial action for surficial soil will be based on a residential exposure scenario and on a commercial/industrial exposure for vadose zone soils. It is important to clarify this distinction because PRGs and COCs have been separately developed for surface and subsurface soils because of different exposure assumptions. If, in the future, all decisions regarding soil remediation will be based on a commercial/industrial exposure scenario then COCs and exposure concentrations will need to be revised.

Response: The text will be changed to state that the surface soil depth is 0 to 3-inches, and that both the onsite resident scenario and the industrial exposure scenario was used to calculate PRGS. The residential exposure PRGs were compared to contaminant concentrations in surficial soil were as the PRGs calculated for the industrial scenario were compared to contaminant concentrations in the vadose zone.

Specific Comments

1. Section III.2.1, Page III-4. This section indicates that silicon was eliminated as a PCOC because it is an essential human nutrient. This is incorrect. Silicon is not typically considered an essential nutrient. Essential nutrients include calcium, copper, iron, manganese, magnesium, phosphorus, potassium, sodium, and zinc. These nutrients can be eliminated as PCOCs if intakes will not exceed the recommended daily allowance or safe and adequate daily intakes (NAS 1989). Silicon should not be eliminated on this basis.

Response: The text will be amended to state that silicon (like sulfide) was eliminated because it is naturally occurring and ubiquitous in the environment.

2. Page III-6, Figure III.2-1b. This figure presents part of the COC selection process. One of the criteria is "Does a PCOC exceed PRG or background only outside OU4?" This statement is unclear and is not explained in the accompanying text. The statement should be completely explained, as some chemicals could be eliminated as COCs using this ambiguous criterion.

Response: This statement will be explained. A PCOC identified from samples outside of OU4 but not detected above the PRG inside OU4 will not be included as an OU4 COC.

3. Page III-10, First Paragraph. The text states that ingestion of fruits and vegetables was not considered in determining PRGs for the residential scenario. Although significant amounts of agricultural development may not occur, it is likely that fruits and vegetables would be grown by residents. This pathway should be included in the development of PRGs and in the baseline risk assessment.

Response: The CDPHE, EPA, and DOE agreed that the ingestion of fruits and vegetables would be insignificant and would not be included in the Phase I IM/IRA PRG calculation methodology. If required, this pathway will be evaluated in the Baseline Risk Assessment.

4. Page III-10, Second Paragraph. This paragraph states, "Longer term exposure of industrial/commercial workers was not retained in the final PRG evaluation because it was not relevant for PRG comparisons." However, on page III-8, the text states, "Commercial/industrial land use is considered to be the most probable future land use and was therefore considered in developing PRGs for OU4." These statements seem contradictory and imply that commercial and industrial PRGs would not be considered in making risk management decisions. Although CDPHE guidance requires that residential exposures and PRGs be presented in the IM/IRA, PRGs corresponding to the most likely land use are important in risk management decisions and for public information. PRGs for commercial and industrial land use should be calculated and presented along with those for the residential scenario.

Response: The contradictory statement will be corrected. The commercial/industrial scenario was used to calculate PRGs that were compared to vadose zone soils. The residential scenario was used to calculate PRGs that were compared to surficial soils. A separate analysis of risks to remediation workers is presented in Part IV, Section 10.

5A. Page III-11, Second Paragraph. The paragraph discusses the conversion of oral toxicity values to dermal toxicity values, but does not adequately describe the methodology. Oral toxicity values are usually based on the administered the dose of a chemical, not on the absorbed dose. Oral toxicity values should be adjusted, therefore, for gastrointestinal (GI) absorption before being used to estimate risk from dermal exposures, which are also expressed as absorbed doses. To adjust oral reference doses (RfDs), the RfD is multiplied by the GI absorption factor. Cancer slope factors (CSFs) are divided by the absorption factor. This procedure is outlined in Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A) (RAGS-A, EPA 1989a), and should be more thoroughly described in this paragraph.

Response: The methodology will be described in more detail.

5B. This paragraph does not discuss dermal absorption factors, which are different than GI absorption factors. Dermal absorption factors are used in estimating absorbed dose of a contaminant in soil. Both dermal and GI absorption factors should be presented and references for this information should be cited.

Response: Will comply.

6. Section III.2.2.1.3, Page II-11. This section describes how a target risk level was developed for carcinogens prior to calculation of chemical-specific PRGs. The method described involves dividing EPA's *de minimis* risk level of 1.0E-6 by the number of carcinogens in a medium that affect the same target organ. This method does not conform to EPA guidance (EPA 1989a). It is inappropriate to aggregate cancer risks based on target organs; this methodology is appropriate for noncarcinogens only. Target risk for carcinogens should be calculated by dividing 1.0E-6 by the number of carcinogenic PCOCs in a medium. This is consistent with the theory that carcinogenic risks are additive and there is no safe threshold of exposure to carcinogens.

Response: It should be noted that RAGS-Part B "Development of Risk-based Preliminary Remediation Goals" simply defines a target risk as follows:

"For carcinogenic effects, a concentration is calculated that corresponds to a 10^{-6} incremental risk of an individual developing cancer over a lifetime as a result of exposure to the potential carcinogen from all significant exposure pathways for a given medium."

The PRG guidance document gives no further direction on how to address aggregate cancer risk, including no mention of dividing the *de minimus* risk level of $1.0E^{-6}$ by the number of carcinogenic PCOCs in a medium as EPA Region VIII suggests. This type of method applies to Risk Calculations only, not PRG calculations (1989a RAGS). Therefore, the CDPHE suggested a method of dividing the risk (10^{-6}) by the number of carcinogens in a medium that affect the same target organ is more conservative than PRG guidance generic 10^{-6} risk value.

However, per the comment, refer to the attached table for a comparison between EPA Region VIII's suggested PRGs to the current identified values. The new PRGs become more conservative but generally fall within an order of magnitude of the target organ based PRGs. The list of COC from PCOCs does not change as result of the PRG modification. No additional areas will require remediation based on the new PRGs. The selection of which set of PRGs. The selection of which set of PRGs to include in the IM/IRA-EA Decision Document should be a topic of a DOE, EPA, CDPHE team meeting.

7A. Page III-12, Table III.2-2. This table presents PRGs for PCOCs in surficial and vadose zone soils. PRGs based on both carcinogenic and non-carcinogenic effects are included in the table. For chemicals that pose both carcinogenic and non-carcinogenic effects, and therefore have both carcinogenic and non-carcinogenic PRGs, a designation should be made as to which PRG was used for comparison. The lower of the two PRGs should be used to determine COCs, and the table should indicate this.

Response: Will comply.

SURFICIAL SOIL

Carcinogenic Potential Contaminant of Concern	RFI/RI 95% UCL	Background Level	New PRG Residential PRG for carcinogens (based on 10^{-6}/#of PCOCs -- 19 for for Surficial Soils)	Original PRG Residential PRG for carcinogens (based on 10^{-6}/PCOCs per Target Organ for Surficial Soils)	Carc. COC?	Target Level	Comments
Metals and Organics							
Aroclor 1254 (ug/kg)	3.25E+03	--	1.25E+00	1.19E+01	Yes/Yes	1.25E+00	New PRG
Benzo(a)anthracene (ug/kg)	8.30E+02	--	2.34E+00	7.40E+00	Yes/Yes	2.34E+00	New PRG
Benzo(a)pyrene (ug/kg)	8.81E+02	--	2.34E-01	7.40E-01	Yes/Yes	2.34E-01	New PRG
Benzo(b)fluoranthene (ug/kg)	3.71E+02	--	2.34E+00	7.40E+00	Yes/Yes	2.34E+00	New PRG
Benzo(k)fluoranthene (ug/kg)	4.23E+02	--	2.34E+01	7.40E+01	Yes/Yes	2.34E+01	New PRG
Beryllium (mg/kg)	3.98E+00	9.20E-01	2.04E-04	1.93E-03	Yes/Yes	2.04E-04	Background
Bis(2-ethylhexyl)phthalate (ug/kg)	8.13E+03	--	2.83E+02	2.69E+03	Yes/Yes	2.83E+02	New PRG
Cadmium (mg/kg)	1.72E+02	6.40E-01	2.01E+02	1.91E+03	No/No	2.01E+02	New PRG
Chrysene (ug/kg)	9.46E+02	--	4.34E+01	1.37E+02	Yes/Yes	4.34E+01	New PRG
Chloroform (ug/kg)			Not a SS COC	Not a SS COC			NA
Indeno(1,2,3-cd)pyrene (ug/kg)	7.13E+02	--	2.34E+00	7.40E+00	Yes/Yes	2.34E+00	New PRG
Methylene Chloride (ug/kg)			Not a SS COC	Not a SS COC			NA
Radionuclides							
Americium 241 (pCi/g)	2.62E+01	2.70E-02	1.25E-01	2.65E-01	Yes/Yes	1.25E-01	New PRG
Cesium 134 (pCi/g)	4.00E-02	ND	4.22E-04	8.90E-04	Yes/Yes	4.22E-04	New PRG
Cesium 137 (pCi/g)			Not a SS COC	Not a SS COC			NA
Plutonium 239 (pCi/g)	1.42E+01	6.20E-02	1.81E-01	3.83E-01	Yes/Yes	1.81E-01	New PRG
Plutonium 240 (pCi/g)	1.42E+01	6.20E-02	1.81E-01	3.83E-01	Yes/Yes	1.81E-01	New PRG
Radium 226 (pCi/g)			Not a SS COC	Not a SS COC			NA
Strontium-89 (pCi/g)			Not a SS COC	Not a SS COC			NA
Strontium-90 (pCi/g)			Not a SS COC	Not a SS COC			NA
Tritium (pCi/g)	3.88E-01	ND	7.74E+02	1.63E+03	No/No	7.74E+02	New PRG
Uranium 233 (pCi/g)	1.43E+01	1.22E+00	2.49E+00	5.25E+00	Yes/Yes	2.49E+00	New PRG
Uranium 234 (pCi/g)	1.43E+01	1.22E+00	2.52E+00	5.32E+00	Yes/Yes	2.52E+00	New PRG
Uranium 235 (pCi/g)	1.63E-01	9.00E-02	7.95E-03	1.68E-02	Yes/Yes	9.00E-02	Background
Uranium 238 (pCi/g)	9.66E+00	1.27E+00	3.65E-02	7.71E-02	Yes/Yes	1.27E+00	Background

VADOSE SOIL

Carcinogenic Potential Contaminant of Concern	RFI/RI 9.50E-01 UCL	Background Level	New PRG Construction/Maint. Worker PRG for carcinogens (base on 10^{-6}/#of PCOCs -- 17 fo Vadose Soils)	Original PRG Construction/Maint. Worker PRG for carcinogens (based on 10^{-6}/PCOCs per Target Organ -- Vadose Soils)	Carc. COC?	Target Level	Comments
Metals and Organics							
Aroclor 1254 (ug/kg)			Not a VS COC	Not a VS COC			NA
Benzo(a)anthracene (ug/kg)			Not a VS COC	Not a VS COC			NA
Benzo(a)pyrene (ug/kg)			Not a VS COC	Not a VS COC			NA
Benzo(b)fluoranthene (ug/kg)			Not a VS COC	Not a VS COC			NA
Benzo(k)fluoranthene (ug/kg)			Not a VS COC	Not a VS COC			NA
Beryllium (mg/kg)			Not a VS COC	Not a VS COC			NA
Bis(2-ethylhexyl)phthalate (ug/kg)	2.20E+02	--	**8.82E+03**	**5.00E+04**	No/No		
Cadmium (mg/kg)	1.63E+02	2.30E+00	**6.44E+03**	**1.10E+05**	No/No		
Chrysene (ug/kg)			Not a VS COC	Not a VS COC			NA
Chloroform (ug/kg)	1.25E+01	--	**1.74E+04**	**9.84E+04**	No/No		
Indeno(1,2,3-cd)pyrene (ug/kg)			Not a VS COC	Not a VS COC			NA
Methylene Chloride (ug/kg)	3.06E+01	--	**1.39E+04**	**7.89E+04**	No/No		
Radionuclides							
Americium 241 (pCi/g)	3.32E+00	1.00E-02	**8.37E-01**	**1.09E+00**	Yes/Yes	**8.37E-01**	**New PRG**
Cesium 134 (pCi/g)	9.80E-03	ND	**4.67E-02**	**6.11E-02**	No/No		
Cesium 137 (pCi/g)	5.00E-02	1.66E-01	**1.21E-01**	**1.58E-01**	No/No		
Plutonium 239 (pCi/g)	6.74E+00	2.00E-02	**8.88E-01**	**1.16E+00**	Yes/Yes	**8.88E-01**	**New PRG**
Plutonium 240 (pCi/g)	6.74E+00	2.00E-02	**8.88E-01**	**1.16E+00**	Yes/Yes	**8.88E-01**	**New PRG**
Radium 226 (pCi/g)	1.44E+00	6.50E-01	**3.99E-02**	**5.22E-02**	Yes/Yes	**6.50E-01**	**Background**
Strontium-89 (pCi/g)	4.75E-01	5.40E-01	**6.02E+01**	**7.88E+01**	No/No		
Strontium-90 (pCi/g)	4.75E-01	5.40E-01	**5.67E+00**	**7.42E+00**	No/No		
Tritium (pCi/g)	5.33E+00	2.12E+02	**3.78E+03**	**4.95E+03**	No/No		
Uranium 233 (pCi/g)	3.23E+00	5.30E-01	**1.27E+01**	**1.67E+01**	No/No		
Uranium 234 (pCi/g)	3.23E+00	5.30E-01	**1.27E+01**	**1.67E+01**	No/No		
Uranium 235 (pCi/g)	1.40E-01	1.00E-01	**6.10E-01**	**7.97E-01**	No/No		
Uranium 238 (pCi/g)	6.66E+00	6.30E-01	**2.95E+00**	**3.86E+00**	Yes/Yes	**2.95E+00**	**New PRG**

7B. Additionally, this table does not include benzo(g,h,i)perylene, bis(2-chloroethyl)ether, or phenanthrene, which were detected in surface soil according to Table III.A-6 (Appendix II.A). It is not clear why these chemicals were eliminated as PCOCs. They should be included in Table III.2-2 even if they will be evaluated qualitatively.

Response: Will comply.

8. Page III-14, Second Paragraph. The text describes the selection of COCs by comparison of PCOC concentrations to PRGs. The PCOC concentrations were either the 95 percent upper confidence limit of the mean (UCL), the 95 percent upper tolerance limit (UTL), or the maximum observation. It is not clear which value was used for comparison to PRGs. The text should describe which values were used for comparison, and the circumstances under which they were used.

Response: Will comply. The lower of the 95% UCL, 95 UTL, and the maximum value was used in the comparison.

9. Page III-14. These sections describe PRG and COC development and exposure pathways. Contaminant leaching potential is not evaluated as part of PRG development or discussed as an exposure pathway. Soil PRG (cleanup level) development should include calculations of the maximum contaminant levels in soils so that resulting groundwater contamination levels are protective and groundwater applicable or relevant and appropriate requirements (ARARs) are not exceeded. In addition, this evaluation could further define site hazards and provide a rationale for selecting appropriate remedial technologies. The text should calculate action levels based on leaching potential and compare the action levels to risk-based PRGs for soil ingestion, dermal contact, and inhalation. In addition, the text should discuss potential exposure pathways resulting from soil contaminants leaching to groundwater by means of infiltration.

Response: The soil PRGs developed as part of the Phase I IM/IRA were designed to be protective of human health considering exposure via upward pathways involving soils. The leaching models were completed as an evaluation of the expected performance of the engineered cover and liners. The potential for cross-media contamination and development of ground water PRGs were not included in the soil PRG calculations. If the level of ground water protection necessary for the IM/IRA can be defined, the soil PRGs can be adjusted to be protective of human health and ground water quality.

10. Page III-14, Last Paragraph. This paragraph states that in order to determine what PCOCs may be contributors to contamination in groundwater at OU4, the catastrophic dissolution and MYGRT models were used. This statement and information provided in Appendix III.D do not address the potential for PCOCs to contaminate groundwater through leaching caused by precipitation. They address only groundwater impacts caused by a rising water table. As stated above, the text should also discuss the potential for soil contaminants to leach into groundwater by way of infiltration and should calculate action levels based on leaching potential from infiltration. This information will assist in delineating the area of concern (AOC) and provide a rationale for remedy selection.

Response: See response to previous comment.

11. Page III-14, Last Paragraph. This paragraph states that to determine what PCOCs may be contributors to contamination in groundwater at OU4, the previously described catastrophic dissolution and MYGRT models were used. The text should reference where the catastrophic dissolution and MYGRT models were previously described.

Response: Will comply by citing where these models are discussed.

12. Page III-16, Table III.2-3. This table lists COCs for surficial and vadose zone soils based on the risk analysis. Uranium and strontium are presented in this table, along with their PRGs in mg/kg. However, the PRGs for these two chemicals are not presented in Table III.2-2. The tables should be consistent. The PRGs for uranium and strontium should be included in Table III.2-2.

Response: Will comply. Table III.2-2 includes PRGs for uranium of 1.85 mg/kg (surficial) and 61.7 mg/kg (vadose). Strontium is reported as 1.19 E+5 mg/kg (vadose). These values are also included in Table III.2-3.

13. Page III-17, Table III.2-3. This table presents radionuclide COCs and COCs without PRGs. The COCs without "target levels" listed in this table are benzo(g,h,i)perylene, lithium, sodium, and phenanthrene. These four chemicals are not listed in Table III.2-2 as PCOCs. The tables should be consistent, and these chemicals should be added to Table III.2-2.

Response: Table III.2-2 lists only those chemicals for which there is toxicity information and, therefore PRGs. Table III. 2-3 lists all the PCOCs, including those without toxicity information and PRGs.

14. Page III-18, Section III.2.4.4. The text states that soil will be excavated "to the depth of the mean historic high ground water elevation or until a level of contamination is reached that is below the vadose zone PRGs or below a concentration that is determined to be protective of groundwater." Risks from groundwater exposure have not been included in the PRG calculations nor are they planned to be assessed as part of the baseline risk assessment. It is unclear how a contaminant level in groundwater that does not endanger human health can be calculated if the risks from groundwater exposure will not be quantified. Similarly, it is unclear how a contaminant level in soil that would not leach to groundwater at significant levels can be determined if groundwater exposure is not assessed. Exposure to groundwater contaminants should be assessed, at least in the baseline risk assessment.

Response: The discussion referencing "or below a concentration that is protective of ground water" will be deleted. It is planned to excavate to the mean seasonal high water table elevation.

15. Page III-18a, Figure III.2-3. The figure illustrates the AOC; however, the AOC is discontinuous. Accompanying text should describe why this area is discontinuous. Presumably, the area below the unconsolidated material-bedrock contact projection is excluded because it is contaminated by groundwater seeps. Therefore, it is presumed that soil will not be remediated until groundwater remediation is underway. The text should clarify this matter. Furthermore, any contaminated vadose zone soils in this area not affected by groundwater seeps should be considered for inclusion.

Response: Will comply.

16. Page III-21, Last Paragraph. The text states that soil flushing was eliminated based on low soil permeabilities and high clay content. Soil permeabilities can be enhanced and clay difficulties can be overcome by using a technology commonly referred to as soil mixing. Soil mixing employs large augers to mix soil and increase permeability, and could be applicable. Therefore, in situ soil flushing should be evaluated in conjunction with soil mixing.

Response: It is doubtful that soil mixing could adequately enhance the soils permeability to eliminate the problems with inadequate contact between the soils and reagent. Soil mixing in conjunction with stabilization is a method that is preferred due to the ability to perform QC. Soil mixing in conjunction with flushing would be very difficult to QC.

17. Page III-30, Second Paragraph. The text states that the selection and design of the final cover system components will depend on the nature and concentration of the contaminants present; the level of performance required to ensure overall protection of human health and the environment; and the governing regulatory standards. The reports have identified two of the three components. However, the level of performance required for the engineered cover system to ensure overall protection of human health and the environment has not been specified. This level could be specified through modeling, column testing, and evaluating groundwater data. The text should clearly specify all performance objectives so that the most appropriate remedy can be selected.

Response: Text will be added that generally discusses the approach taken which demonstrates that an engineered cover will be protective of human health and the environment.

18. Page III-33, Fourth Paragraph. The decision document indicates that a disadvantage of slurry walls or horizontal barriers is that their integrity may be damaged by groundwater contaminants. It is not clear which groundwater contaminants at OU4 would adversely effect slurry walls and horizontal barriers. The document should clarify which contaminants could adversely affect slurry walls at OU4.

Response: This sentence will be removed because there are no OU4 contaminants that would likely degrade a slurry wall.

19. Page III-34, First Paragraph. The text states that a subsurface liner and leachate collection system (LCS) could be used to reduce the possibility of leaching and migration of contaminants from a rising water table. The text then states that a subsurface liner will prevent groundwater from contacting the waste zone, while the LCS will treat any leachate produced from infiltration. The text further states that a disadvantage of the liner and LCS is that the LCS is not passive and will be costly. The requirement for passive systems should be discussed, as other monitoring activities and groundwater treatment activities at RFP are not likely to be passive and could be used in the OU4 IM/IRA.

Response: The design performance objectives of the engineered cover system is to provide long-term isolation of contaminated materials on the order of 1000 years. Due to the long-term isolation goal and modeling results which demonstrate that leaching of contaminants to the ground water is adequately precluded with the engineered cover only, it was determined that a passive system would be the best suited remedial design for OU4. The subsurface drainage layer was added subsequent to the initial passive design decision to preclude any possibility of contact between ground water and media that could be a source of contaminants if they became saturated. Based on the above criteria developed for the IM/IRA, the use of a leachate collection system and liners were eliminated since they would be constructed from human made materials with limited long-term durability. The subsurface drain will be a passive system constructed from natural durable materials.

20. Page III-34, Second Paragraph. This paragraph states that a subsurface drain could be employed to divert rising groundwater into the interceptor trench system (ITS). The text should describe the fate of the water once it enters the ITS since this information may alter the feasibility and cost of the subsurface drain.

Response: Will comply. The water will be collected in the ITS system and treated prior to discharge (near term). In the long term, the water would be discharged to the surface without treatment when remediation goals for ground water are achieved.

21. Page III-73, Second Paragraph. The description of general response action (GRA) III (in situ treatment) alternative B (consolidation of contaminated debris/waste) indicates that a subsurface drainage layer would be installed above treated (stabilized) soils to protect untreated liners from potential contact with rising water. It is not clear how such a layer above the stabilized material (which is generally a solid monolith) would function. It is also not clear how the layer will function since it is located above the mean seasonal high water table elevation. The purpose for this layer should be clarified.

Response: The text will be modified to explain that the subsurface drainage layer would be installed beneath the untreated/stabilized liners, surface soils, and debris but above the *in situ* stabilize soils. The *in situ* stabilized soils may not prevent a rising water table from contacting the unstabilized consolidated materials. The subsurface drainage layer would provide a measure of protection to ensure that a future rise in the water table elevation would not contact the liners and consolidated media.

22. Section III.3.3.2, Page III-65. This section describes GRA II (containment) and states that alternatives A and C include a subsurface drain. The inclusion of a subsurface drain requires all contaminated media to be excavated and stockpiled before constructing the subsurface drain. More rationale should be provided for not installing a liner before returning contaminated media into the excavation. A liner is a standard component of disposal cells and should be considered since all wastes will be excavated. Minimizing impacts to the ITS is a stated objective of the IM/IRA and a liner could prevent leachate from entering the ITS. The document states that liners and LCS are not desirable since the system will no longer be passive. However, active groundwater treatment will likely occur at RFP and leachate collected from OU4 could be handled with little additional cost.

Response: The design performance objective of the engineered cover system is to provide long-term isolation of contaminated materials on the order of 1000 years. Due to the long-term isolation goal and modeling results which demonstrate that leaching of contaminants to the ground water is adequately precluded with the engineered cover only, it was determined that a passive system would be the best suited remedial design for OU4. The subsurface drainage layer was added subsequent to the initial passive design decision to preclude any possibility of contact between ground water and media that could be a source of contaminants if they became saturated. Based on the above criteria developed for the IM/IRA, the use of a leachate collection system and liners were eliminated since they would be constructed from man-made materials with limited long-term durability. The subsurface drain will be a passive system constructed from natural, durable materials.

23. Page III-78. The description of GRA V (contaminated media/waste removal with ex situ treatment) indicates that treated soils can be returned to OU4 as backfill. The information should specify under what circumstances treated soil would be used as backfill. The description later states that GRA V involves complete removal of all contaminated media for ex situ treatment and either on site storage or off site treatment/disposal. It should clarify whether the on site storage or off site treatment/disposal applies to all the treated media or only to treatment residues.

Response: The text will be modified to state that treated soil would be returned to OU4 as backfill if the concentrations were less than the PRGs. Liners, debris, and any contaminated treatment residuals would require onsite storage or offsite disposal.

24. Appendix III.A, Page III.A-1, Section III.A.1. This section describes data management for the OU4 RFI/RI analysis, and states, "Not all soil data used in this analysis have been validated... A fully validated data set will be used to support the baseline risk assessment." Invalidated data should not be used in the IM/IRA risk analysis. The selection of COCs and the calculation of chemical-specific exposure concentrations to compare against PRGs requires validated data. To the extent that invalidated data have been used for the risk analysis, additional uncertainty has been added to the results of the COC selection and PRG comparison results. If validation of the data reveals unusable data or changes the data set significantly, the COC selection process and PRG comparison may need to be reevaluated.

Response: It was agreed by DOE, EPA, and CDPHE that the project should move forward based on invalidated data. As of March 1994, 87 percent of the RFI/RI data had been validated and only 1.26 percent of the total validated data had been rejected.

The DOE, CDPHE, and EPA believe that enough validated data exist to assess and select a closure/remediation general response action. The parties believe that the final validated RFI/RI data base will not cause the COCs or PRGs to change such that the selected IM/IRA becomes inappropriate. Therefore, the conclusions within this document will not change significantly when the final data validation activities are complete. DOE will receive, validate, and evaluate the remaining data prior to implementation of the IM/IRA to ensure that the selected IM/IRA remains appropriate.

25. Appendix III.A, Page III.A-3, First Paragraph. The text states that data qualified with a "UJ" code was treated as a nondetect. This statement requires further clarification, because data qualified with "UJ" can indicate that a chemical was detected below the contract required detection limit (CRDL) but above the sample quantitation limit (SQL). In that case, the chemical should be considered a true detect and included in calculations at the reported value. The value should also be included in the frequency of detection count as a detect. The "UJ" qualifier should be more completely explained to ensure that the frequency of detection counts and estimated exposure concentrations are accurate. Since this is particularly important the samples should be considered true detects because chemicals were eliminated as COCs based on frequencies of detection that were less than 5 percent.

Response: Will clarify in the text.

26. Appendix III.A, Page III.A-5, Section III.A.3. This section discusses the exploratory data analysis of OU4 data. The accompanying tables do not summarize all detected chemicals, but include only those determined to be PCOCs after some COC selection criteria were applied to the data. Summary tables of all detected chemicals at OU4 should be included in this appendix and the text. It is not possible to verify COC selection without tables of all detected chemicals which include the CRDLs, SQLS, frequency of detection, minimum detected concentrations, maximum detected concentrations, and the arithmetic or geometric mean concentration of every detected chemical.

Response: Summary tables containing detection limits, frequency of detection, minimum detected concentrations, maximum detected concentrations, and the mean of the PCOCs are included in Parts II and III of the document. The purpose of the Gilbert nonparametric statistical data screening process was to eliminate the need to calculate statistics on every analyte and focus only on those that could be PCOCs. It would be an intensive and time consuming undertaking to go back through the database and summarize the requested information for every analyte detected at the site. The approved Gilbert methodology is sufficient to determine and verify COC selection without having to reevaluate every analyte detected at the site.

27A. Appendix III.A, Page III.A-6, Figure III.A-1. The figure presents the PCOC identification and quantification process used for inorganic chemicals and radionuclides. The first criterion is, "Are OU4 analyte concentrations significantly different than background data?" Neither the text nor the table indicates which of the four statistical tests will be used to determine whether a chemical exceeds background concentrations. If a chemical is found to be significantly greater than background using any of the four tests described, it should be considered a PCOC.

Response: A comparison of the maximum value to the 99%/UTL was used for an evaluation of the "hot spots". The remaining three statistical tests were used to evaluate ubiquitous contamination. Failure of any one test resulted in further PCOC evaluation.

27B. The chart also indicates that if the answer to the above question is "no," then the results will be reevaluated. A footnote refers the reader to Appendix III and the text for "further details on other comparison and statistical 'tools'." Appendix III-C provides only the toxicity profiles of the PCOCs, and the text does not describe the reevaluation. A description should be included in the text. The footnote should be corrected in this figure and in Figure III.A-2.

Response: Will comply. Text will be added to Appendix III-A.

28. Appendix III.A, Page III.A-7, Figure III.A-2. The figure presents the COC selection process for organic chemicals detected at OU4. The third step (presented in the middle of the figure) states, "Are at least 9 OU4 analyte sample results > 0.05 [Detection Limit] DL?" This criterion should be further explained, because it is not clear why this distinction needs to be made, or why it is made only for organic contaminants.

Response: Will be addressed and clarified.

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29. Appendix III.A, Page III.A-8, Second Paragraph. The paragraph states that reported values for nondetect results were used when conducting nonparametric statistical tests and distribution fitting, but that one-half the reported value for nondetect results was used in computing summary statistics. It is unclear why the same data set was not used for all procedures, or whether the inclusion of nondetect results could have invalidated the statistical tests. These issues should be clarified in the text.

Response: It is statistically necessary to use "raw" data in order to utilize all reported values versus fabricated values. Once the data distribution was determined, one-half the reported value was used for computing summary statistics per the EPA Risk Assessment Guidance.

30A. Appendix III.A, Page III.A-9, Table III.A-2. This table presents the results of the PCOC selection criteria for inorganic chemicals detected at OU4. One of the columns in this table, and in Tables III.A-3, III.A-4, and III.A-5, indicates whether a chemical was detected at a concentration greater than 10 times the background concentration. This comparison is not described in the text and is not included in the COC selection criteria outlined in Figure III.A-1. The benefit of this comparison should be described in the text.

Response: The criteria of 10 times background has previously been used by ES on other risk assessments (ecological) as a screening tool to determine if an analyte is a potential contaminant of concern (PCOC). The 10 times background criteria had been suggested in the Proposed Risk Analysis Strategy for the Solar Evaporation Ponds (OU4) IM/IRA Project (ES, September 1993) but was not actually used in the determination of PCOCs. A statistical approach as defined in Appendix A of the OU4 IM/IRA EA DD was used. Es ecological risk assessors have discontinued using this approach for more scientifically-based methods since the publication of the proposal. Any reference to the 10 times background criteria will be deleted from the tables because it is not relevant to the PCOC determination process.

30B. Additionally, Tables III.A-2 through III.A-9 include a column to indicate whether historical evidence of the chemical's use at OU4 is available. A footnote should be added to these tables stating that historical evidence will only be used qualitatively and is not a COC selection criterium. Additionally, descriptions of historical use should be clarified. For example, in Table III.A-4, this column is rarely marked "yes," but in the final column of the table, the remarks state, "Historical use evidence based on OU4-specific operations data." It is unclear whether the remark indicates that past use of the chemical is unknown; known to have been used; or known not to have been used. Historical use descriptions should clearly indicate whether documentation of use of a chemical is available.

Response: The current notation in these tables only means that there is no definitive evidence available that particular chemical is being placed in the SEPs, although site-wide data may support its presence. Detailed records of material pumped/placed into the SEPs over time have not been identified. However, the analyte list developed for Phase I was based on an historical review of possible sources.

31. Appendix III.A, Page III.A-10, Table III.A-3. The table presents a summary of evaluation criteria results for inorganic chemicals in vadose zone soil at OU4. Throughout the column titled "Remarks," the table states "max. data in Pond 20??? area." This remark should be explained in a footnote or in the text because its meaning is unclear.

Response: Will comply by deleting the ??? and stating "SEP Area."

32. Appendix III.A, Page III.A-24, Fourth Paragraph. The third sentence of this paragraph states, "This test is equivalent to the Mann-Whitney/Wilcoxon Rank Sum Test if neither data set contains no non-detects." The word "no" should be removed from the sentence. The sentence is incorrect as written.

Response: Will comply.

33. Appendix III.B, Tables III.B-1 through III.B-8. The exposure parameters used in these tables should be referenced. The equations used to calculate PRGs should also be provided on each table. The tables are incomplete as presented.

Response: The equations for the PRG calculations will be presented.

34A. Appendix III.B, Table III.B-5. The equation used to calculate PRGs should be presented in the table. Exposure factors should be referenced, particularly the ingestion rate for soil, which is expressed in units of milligrams-year-day and does not appear to be an EPA default exposure value. It seems that some exposure parameters may not have been presented in the table, including inhalation exposure parameters. This table and Table III.B-5 should be corrected.

Response: The equations and exposure factors for the calculation of PRGs will be provided.

34B. Additionally, the slope factors presented in this table for uranium-235 and -238 are incorrect. They should be corrected and risks recalculated as necessary. The slope factors presented for tritium could not be verified; they do not appear in HEAST (EPA 1993a) and the source of this information was not cited. These inaccuracies occur in Table II.B-6 as well, and it should also be corrected.

Response: The slope factors for U-235 and U-238 will be based on discussions with Milton Lammering, Branch Chief of the Denver EPA Radiation and Indoor Air Program office, and the 1994 HEAST. The slope factor for tritium is included in HEAST, under Hydrogen. The chemical formula of tritium is H_3.

35. Appendix III.B, Table III.B-7. Some toxicity values in this table were incorrect or unverifiable. For example, the RfD for 2-butanone is 5E-2 mg/kg-day, not 0.6 mg/kg-day. The RfD for Arochlor-1254 is unverifiable. The values should be corrected as necessary.

Response: Per EPA Risk Assessment Guidance, toxicity values were obtained from the latest information contained on the Integrated Risk Information System (IRIS). If values were not available from IRIS, the Health Effects Assessment Summary Tables Annual Update (USEPA 1993) was consulted. All IRIS toxicity data used was taken from the TOMES® data base (Micromedics, 1994) using the 1/31/94 updated information. The RFD for 2-Butanone as presented in IRIS is 0.6 mg/Kg - day. The RFD for Arochlor - 1254 is also from IRIS.

36. Appendix III.B, Table III.B-8. The slope factors presented in this table for uranium-235 and -238 are incorrect (EPA 1993a). They should be corrected here and in the PRG calculation tables. Additionally, for all radionuclides with available information, the slope factors

associated with the radionuclide and its radioactive decay chain should be used. These values are marked with the suffix "+D" in HEAST (EPA 1993a). According to HEAST (EPA 1993a), "in the absence of empirical data, the "+D" values for radionuclides should be used unless there are compelling reasons not to." It does not appear that "+D" values have been used. This table and the corresponding PRG calculation tables should be revised as necessary.

Response: Will comply.

37. Section III.D.2.1 through III.D.2.3, Pages III.D-16 through III.D-2. For comparison, literature values of distribution coefficients (K_d values) for metals and radionuclides should be used to evaluate the conservativeness of the approach presented in these sections. The comparison should help determine if the model presents realistic results.

Response: Will comply.

38. Appendix III.G, Page, III.G-1, Third Paragraph. The paragraph states that the analysis does not consider a reclamation-type cover because "the engineered cover will have to isolate contaminated soils that exceed PRG concentrations. In addition, the engineered cover may also provide closure for waste that may not be fully characterized. Therefore, the reclamation cover may not adequately meet the closure requirements of the Colorado Hazardous Waste Management Regulations." It is not clear how the exceedance of risk-based PRGs and the presence of uncharacterized waste influence the reclamation-type cover's ability to meet closure requirements. This matter should be clarified and the covers should be evaluated with respect to clearly specified closure requirements and performance objectives.

Response: The text will be modified to state that the reclamation cover may not adequately protect human health and the environment as required under RCRA for the closure of a hazardous waste surface impoundment. The placement of 6 inches of soils and seed would not adequately block the upward exposure pathways to potential receptors and would not prevent burrowing animals from contacting the consolidated materials. The key performance objectives will be listed in the introduction and will be carried through the analysis.

39. Appendix III.G, Page III.G-5, Second Paragraph. The paragraph states that contaminated liners, utilities, and Building 788 debris cannot be consolidated under the capillary-break cover unless they are below risk-based PRGs. The basis for this requirement should be clarified, since no action is required for OU4 contaminated soils that are below risk-based PRGs. The document should also clarify why this requirement does not apply to the 1,000-year cap.

Response: The requirements of 6 CCR 1007-2, Part II, Section 2.5.3 has been invoked as an ARAR and specifically states that, "the geological and hydrological conditions of a site in which hazardous wastes are to be disposed shall be such that reasonable assurance is provided that such wastes are isolated within the designated disposal area of the site and away from natural environmental pathways that could expose the public for 1,000 years, or some demonstrated shorter period in which the wastes are transformed to innocuous condition". CDPHE has stated that if the concentration within the hazardous waste materials (i.e. liners, utilities, and debris) are less than the PRGs, then the materials would be considered innocuous. Since the concentrations of these materials have not been shown to be less than the PRGs, the engineered cover is being designated to meet the 1,000 year criteria. Since the contaminated soils are not hazardous waste, the 1,000 year criteria does not apply to an engineered cover that is used to only isolate these soils. The statement to not allow liners, utilities, and debris to be consolidated under the capillary break cover is predicated on 1) the materials are hazardous waste and 2) the capillary break cover can not meet the 1,000 year design criteria. The text will be clarified to reflect the above.

40. Appendix III.G, Page III.G-11, Second Bullet. This bullet states that a disadvantage to the capillary-break engineered cover is that it is least effective in limiting infiltration. Modeling has indicated that groundwater impacts resulting from infiltration would be insignificant, which implies that limiting infiltration beyond evapotranspiration's capability may not be warranted. The text should clarify this inconsistency.

Response: The text as written is correct. The capillary break engineered cover would be expected to allow the highest volume of precipitation to contact the consolidated materials. However, a note will be added to state that infiltration modeling demonstrates that leachate produced by infiltrating precipitation is expected to have concentrations that do not exceed the ground water comparison concentrations.

41. Appendix III.G, Page III.G-11, Third Bullet. This bullet states that the capillary-break cover may not meet state closure requirements because soils beneath the SEPs have low hydraulic conductivities (1x10-03 cm/day [1.1x10-8 cm/sec] to 1x10-09 cm/day [1.1x10-14 cm/sec]) and the cover materials may not be able to be constructed with an equal or lower permeability. The soils beneath the SEP waste are the sands and gavels associated with the subsurface drainage layer. The capillary-break cover will likely have a lower hydraulic conductivity than the subsurface drainage layer.

Response: According to 40 CFR 265.228(a), the cover system must; "Have a permeability less than or equal to the permeability of any bottom liner system or natural subsurface soils present". The subsurface drainage layer is not natural subsurface soil or a liner system. Therefore, the permeability target would be the range mentioned in the document and it is possible that the capillary break engineered cover alternative could have difficulties meeting this criteria. It is considered that the capillary break cover would function adequately during summer and fall periods but could fail during the Winter/Spring when snow melt could result in slug movement of infiltration through the engineered cover. ES will enhance the text to indicate that the subsurface drain will prevent the "bath tub" effect because infiltration will flow out of the system through the subsurface drain.

42. Appendix III.G, Attachment A. The cost estimates do not account for some of the differences among options. The only significant difference in costs among the three alternatives appears in indirect field costs and cover installation costs. It does not appear that costs for radiation surveys, security, hillside stabilization, and off-site disposal reflect the differences in volumes of material required for each option and the length of time required for each option. The estimates should reflect differences in options so they can be accurately compared.

Response: The cost estimates will be reviewed to access the differences between the options. The following items will be modified as appropriate:

a) Radiation Surveys;
b) Security;
c) Equipment rates and durations of use;
d) Schedule adjustments and subsequent changes to construction management, offsite, disposal and hillside stability measures were not modified in the estimates because the amount of material for offsite disposal would not change and hillside stability measures were not included in any of the estimates. The cost will be changed as follows:

a)	1000 year cover	$29.3 million
b)	RCRA Cover	$26.0 million
c)	Capillary break	$25.4 million

43. <u>Appendix III.G, Attachment A</u>. Several aspects of the cost estimate should be clarified. Thirty million dollars for a engineered cover may appear excessive without supporting rationale. Examples of additional rationale that could be provided are listed below.

43A Approximately $6 million are required for indirect field costs. Approximately $4 million out of the $6 million is for three trucks and drivers. This appears excessive and should be verified.

Response: This number is an error and will be corrected.

43B The estimate includes $2.5 million for engineering costs. This seems excessive for a design that basically consists of earthwork. No electrical, mechanical, or control system designs are required. It also seems excessive since the design is based on a previously prepared design for the Hanford Reservation in Washington. These engineering costs seem excessive and should be verified.

Response: This number includes the cost of engineering design for the engineered cover and the post-closure monitoring system in addition to the cost of design oversight/coordination from DOE and the site M&O contractor. Even through much of the design concept is based on Hanford's research, the cover must be designed on the Rocky Flats site.

43C The estimate includes more than $5.5 million for construction management, project management, and contractor construction management. For a relatively simple construction project, this estimates seem excessive and more rationale should be provided.

Response: This number is based on a percentage that has been calculated from historical information for construction projects at the RFETS.

- The $7 million contingency should be more fully justified. Given the amount of detail provided in the estimate and the straightforward nature of the project, this large contingency seems excessive.

Response: The use of a 30% contingency is standard for a conceptual design.

2.5 PART IV

General Comments

1. The OU4 IM/IRA decision document is very short-sighted, and narrow in focus. Decisions made in the document do not consider integrating OU4 actions with other remedial actions that will be required at other RFP OUs. For example, the remediation proposed could be altered with minimal effort to address similar wastes from other OUs. In addition, any leachate collected from OU4 could be easily integrated with other groundwater treatment systems.

   While a more broad, plant-wide perspective may delay OU4 actions temporarily, the environmental restoration process for all of RFP could be expedited significantly. Furthermore, significant savings of money and resources could potentially be realized with protection of human health and the environment still remaining a principal goal.

Response: DOE disagrees that the decision document is very short-sighted and narrow in focus. As agreed by all parties early in the scoping for the IM/IRA and alternative development process, the primary goal of the OU4 IM/IRA was to close the SEPs as quickly as possible to eliminate one of the "highest remediation concerns" at the RFP. This commitment to close the SEPs as quickly as possible was reiterated in the August/September 1993 dispute resolution signed between DOE, EPA, and CDPHE. This dispute resolution obligated DOE to accelerate the completion date for the closure of the SEPs. Although DOE agrees that integration of remedial activities could lead to significant cost savings, shorten overall RFP remediation schedules, or provide more effective use of site-wide resources, options that integrate OU4 with other remedial actions were not included in the OU4 IM/IRA decision document since the development of an integrated disposal facility at the RFETS would likely take from 5 to 10 years which is not consistent with DOE's obligation to expedite the OU4 IM/IRA per DOE/EPA/CDPHE written agreements.

DOE remains committed to proceed with the early closure of the SEPs as originally outlined in the dispute resolution. However, DOE is also willing to discuss future integration plans with EPA and CDPHE separate from the OU4 IM/IRA process. If all parties agree that a new integrated course of action of OU4 is required to be implemented, then the OU4 IM/IRA can be modified at that time to include a temporary closure of the SEPs until a new facility is available.

2A. Adequate rationale has not been provided for the selection of the 1,000-year cap. The main objectives of the proposed OU4 IM/IRA remedial alternative are, presumably, to (1) isolate OU4 wastes by eliminating upward exposure pathways, and (2) protect groundwater from OU4 contaminants. The proposed 1,000-year cap should effectively eliminate upward exposure pathways by isolating contaminants, preventing direct contact with wastes, and minimizing contaminant migration from erosional forces. However, a simpler soil cover would also function equally as well to eliminate upward exposure pathways.

   The 1,000-year cap/subsurface drain is also proposed to protect groundwater. Although the 1,000-year cap will reduce infiltration, the role of the 1,000-year cap in protecting groundwater is not clear. Modeling results discussed in Part IV and in previous submittals indicate that groundwater impacts resulting from precipitation infiltrating through the OU4 contaminants are not significant. However, a 1,000-year cap designed specifically to reduce infiltration is proposed in conjunction with sophisticated vadose monitoring. More rationale is required to justify the selection of this strategy, along with a discussion of the benefits of using such an extensive cap and monitoring system. Some attempts have been made to justify selecting the cap and are discussed in detail below.

Throughout Parts III and IV, the document implies that the regulations require the cap to last 1,000 years. For example, on page IV-3, the document states that "the engineered cover system, in conjunction with the physical site characteristics, must protect human health and the environment for 1,000 years as required by the State of Colorado hazardous waste landfill sighting criteria (6 CCR 1007-2)." This statement is misleading and the document's general interpretation of the regulation is questionable. The sighting criteria states that the geological and hydrogeological conditions of a site where hazardous wastes are to be disposed of should isolate wastes from natural environmental pathways that could result in exposure to the public for 1,000 years. This requirement is for hydrogeological and geological conditions for a site in which hazardous wastes will be disposed, and is not a closure requirement for final covers. It seems that the requirement is incorrectly being used as a design criterion for engineered covers to justify the use of the Hanford design.

The sighting requirement could more appropriately be used to justify relocating the disposal cell to an area where groundwater elevation rise and slope stability are not concerns.

Response: The justification of the selection of the 1000-year engineered cover will be expanded in the IM/IRA-EA Decision Document. The expanded justification will be incorporated into Appendix III.G.

During the initial team meetings the working group established the functional and design criteria. The key functional criteria included:

1) Infiltration abatement
2) Protection against ground water rise
3) Animal intrusion prevention
4) Long term durability
5) Protection of human health and the environment
6) Passive system operation

The key design requirements included:

1) RCRA regulations
2) State of Colorado Part 2 siting requirements for hazardous waste landfills
3) Protectiveness of human health and the environment to accepted regulatory standards or a level of risk not to exceed 1.0×10^{-6} per organ.

The DOE considers that the design presented in the IM/IRA meets these functional criteria and the key design requirements. One of the main objectives of the proposed OU4 IM/IRA remedial alternative is to comply with all Federal and State identified ARARs (see Section III.1). Compliance with ARARs is a threshold criteria that must be satisfied in order for a remedial alternative to be selected. One of the ARARs identified by the State was the need for the engineering cover to comply with the substantive requirements of the Siting Requirements for Hazardous Waste Disposal Sites contained within 6 CCR 1007-2, Part 2 (see Section III.5.2). A summary of the requirements for this regulation are provided in Appendix III.E. It was decided that the full text of the regulation should not be provided in that the reader would be able to obtain individual copies if required.

One provision of the Siting Requirements (see 6 CCR 1007-2, Part 2.5.3) is to provide reasonable assurance that the geological and hydrological conditions of the site are adequate to isolate the hazardous waste away from the natural environmental pathways that could exposure the public for 1,000 years, or some demonstrated shorter period of time in which the wastes are transformed to an innocuous condition. In addition, 6 CCR 1007-2, Part 2.4.8 states that a landfill design must include a method of closure that will provide reasonable assurance of long-term compliance with respect to protection of human health and the environment, protection to ground water, protection of air quality, protection from leachate and runoff. The closure design must consider:

1. Types of waste
2. Mobility of wastes
3. Site location
4. Climatic conditions
5. Thickness, porosity, and permeability of the cover
6. Site geology
7. Post-closure maintenance and monitoring.

DOE agrees that the interpretation of the regulation is questionable and has sought additional guidance from EPA and CDPHE regarding what is necessary to demonstrate compliance with these regulations. As stated in the response to Specific Comment #39 for Part III, CDPHE has indicated that if the hazardous waste concentrations are less than the PRGs, then the materials would be considered innocuous. Since the SEP materials have not been shown to be less than the PRGs, the 1,000 year criteria for waste isolation was determined to be appropriate. DOE also agrees that the regulation appears to be better suited to the selection of a new hazardous waste disposal facility as opposed to the closure of an existing facility. However, DOE has with CDPHE/EPA concurrence accepted that the engineered cover would be designed to provide reasonable assurance that it provide isolation of the hazardous waste for a 1,000 year period regardless of whether the 1,000 year time period provided an overly conservative design. DOE determined that it is was not cost-beneficial to try to change the design basis from the 1,000 year criterion to a shorter time period given;

1) the level of design already completed;
2) the level of effort that may be required to demonstrate compliance with the CDPHE requirement and/or obtain a waiver for the shorter time period.

The proposed design offers a margin of tolerance for the acceptance of uncharacterized wastes. If a less robust design is used, then it is more important for the DOE to sample and analyze uncharacterized waste materials to ensure that the concentrations of these materials could not result in the production of leachate that exceeds the design criteria. The attached table shows the wastes that are currently uncharacterized. The direct costs of additional sampling and analysis have been estimated to be very close to the estimated direct cost savings associated with removing the low-permeability layer in a less robust design. In addition, any materials that could not be consolidated beneath the less robust engineered cover (due to high concentrations) would need to be stored or disposed which is very expensive. DOE may chose to install the 1000-year design which is less dependant on the concentrations of consolidated wastes so that the project schedule will not have to be extended to characterize materials to provide satisfaction that the design criteria will not be exceeded.

DOE also wishes to point out that although the 1,000 year engineered cover may not exactly conform with standard RCRA/CERCLA guidance documents, the 1,000 year cover provides a level of protection that exceeds the standard RCRA/CERCLA cover design. Although the construction costs for the 1,000 year cover may be more costly, DOE believes that the cost is justifiable to protect the public with additional assurances for the long-term protection of human health and the environment and the added construction cost is offset by cost savings resulting from not having to perform additional sampling and analysis to redesign the engineered cover, and to make extensive revisions to the IM/IRA decision document.

DOE also wishes to set the record straight in that the 1,000 year design criterion is not being used to justify the use of the Hanford design. The Hanford design is being used as a <u>demonstration</u> of complying with the 1,000 year requirement. DOE believes that to ignore the research that has been performed at Hanford and Los Alamos would be negligent. The proposed engineered cover is a RCRA-Compliant design that is appropriate to western U.S. semi arid regions.

2B. Appendix III.G evaluates three engineered cover alternatives including a 1,000-year cap, a RCRA-compliant cover, and a capillary-break engineered cover. The evaluation concludes that the 1,000-year cap is the most suitable. However, several aspects of the analysis are inadequate, as enumerated below.

(1) The appendix states that contaminated liners, utilities, and Building 788 debris cannot be consolidated under the RCRA or capillary-break cover unless they are below risk-based PRGs. The basis for this requirement should be clarified, since no action is required for OU4-contaminated soils that are below risk-based PRGs. The document should also clarify why this requirement does not apply to the 1,000-year cap.

Response: The rationale for why the liners, utilities, and Building 788 debris cannot be consolidated under the RCRA-compliant and capillary-break engineered covers is provide as a response to Part III, comment #39. The statement to not allow liners, utilities, and debris to be consolidated under the RCRA-compliant or capillary-break covers is predicated on 1) the materials are hazardous waste and 2) the RCRA-compliant and capillary-break cover can not meet the 1,000 year design criteria.

The 1,000 year criteria does not apply to the contaminated soils since contaminated soils are not considered to be hazardous waste by definition; the contaminated soils are be managed as a hazardous waste as a result of EPA's "contained-in" policy (see

SUMMARY OF COC CHARACTERIZATION DATA

CONTAMINANTS OF CONCERN (COCs)	COC Surficial Soils	COC Vadose Soils	Surficial Soil Target Level	Vadose Soil Target Level	RFI/RI Surficial Soil 95% UCL/UTL	RFI/RI Vadose Soil 95% UCL/UTL	Max. Liner Conc. (All Ponds)	Weighted Sludge by Mass c/	Debris	Sand Bags
Radionuclides										
Americium-241(pCi/g)	YES	YES	0.27 (PRG)	1.09(PRG)	26.24	3.32	4.03(BN)	4.74E+00	-	-
Cesium-134 (pCi/g)	YES	NO	0.001(PRG)	Not a COC	0.04	0.0098	ND g/	-	-	-
Gross Alpha (pCi/g) a/	NO	NO	Not a COC d/	Not a COC d/	-	-	-	-		
Gross Beta (pCi/g) a/	NO	NO	Not a COC d/	Not a COC d/	-	-	-	-		
Plutonium-239,240 (pCi/g)	YES	YES	0.38(PRG)	1.16(PRG)	14.22	6.74	3.12(BN)	1.91E+01	-	-
Radium-226 (pCi/g)	NO	YES	Not a COC d/	0.65(BCKGRND)	NA	1.44	NA	-	-	-
Uranium-233 (pCi/g)	YES	NO	5.25(PRG)	Not a COC	14.29	3.23	NA	-	-	-
Uranium-234 (pCi/g)	YES	NO	5.32(PRG)	Not a COC	14.29	3.23	4.66(A)	3.13E+01	-	-
Uranium-235 (pCi/g)	YES	YES	0.09(BCKGRND)	0.80(PRG)	0.163	0.14	0.11(BC)	1.49E+00	-	-
Uranium-238 (pCi/g)	YES	YES	1.27(BCKGRND)	3.86(BCKGRND)	9.66	6.66	2.68(A)	4.27E+01	-	-
Metals/Inorganics								-		
Beryllium (mg/kg)	YES	NO	0.92(BCKGRND)	Not a COC	3.98	NA	0.70(BN)	-	-	-
Cadmium (mg/kg)	YES	YES	0.64(BCKGRND)	18.80(PRG)	172.1	163.06	69.7(BN)	6.43E+02	-	-
Uranium (mg/kg) b/	YES	NO	3.8(BCKGRND)	Not a COC	29	20.0	- h/	-	-	-
Organics										
Benzo(a)anthracene (ug/kg)	YES	NO	7.4(PRG)	NA e/	830.29	NA	NA		-	-
Benzo(a)pyrene (ug/kg)	YES	NO	0.74(PRG)	NA	881.44	NA	NA		-	-
Benzo(b)fluoranthene (ug/kg)	YES	NO	7.40(PRG)	NA	371.31	NA	NA		-	-
Benzo(k)fluoranthene (ug/kg)	YES	NO	74.02(PRG)	NA	422.5	NA	NA		-	-
Bis(2-ethylhexyl)phthalate (ug/kg)	YES	NO	2686.37	NA	8129.91	NA	NA		-	-
Chrysene (ug/kg)	YES	NO	137.39(PRG)	NA	946.1	NA	NA		-	-
Indeno (1,2,3-cd)pyrene (ug/kg)	YES	NO	7.40(PRG)	NA	712.54	NA	NA		-	-
Other										
Aroclor-1254 (ug/kg)	YES	NO	11.87(PRG)	NA	3251.4	NA	NA		-	-
COCs Without Target Levels										
Benzo(ghi)perylene ug/kg	YES	NO	---- f/	----	657.34	NA	NA		-	-
Lithium (mg/kg)	NO	YES	----	----	NA	14.26	13.4(A)		-	-
Sodium (mg/kg)	YES	YES	----	----	1274.36	1863.7	1050(BC)	1.07E+05	-	-
Phenanthrene (ug/kg)	YES	NO	----	----	381.55	NA	NA		-	-

Footnotes:

a/ Only radioactive analyses performed during Halliburton Solidification Feasibility Study; not a COC

b/ Values represent U-238 which encompasses essentially all of the natural occurring uranium and has been converted from pCi/g to mg/kg.

c/ Assumption: All sludge will be washed, and therefore, the concentration remaining in the sludge is based on the concentration in the dry sludge given the void space is filled with clean water. Weighted sludge concentration was calculated on a percent by dry weight basis.

d/ "Not a COC" Target Level no exceeded

e/ NA Not Applicable

f/ --- No Target Level due to lack of available toxicity information

g/ ND Not detected during analyses

h/ - analyte not tested for in characterization study

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Section III.5.2). Since the 1,000 year criterion only applies to the disposal of hazardous wastes, the consolidation of contaminated soils are not required to be isolated for 1,000 years. The text will be clarified to reflect the information noted above.

2C. The appendix states several times that the capillary-break engineered cover is least effective in limiting infiltration. However, modeling has indicated that groundwater impacts resulting from infiltration would be insignificant, which implies that designing a cap that minimizes infiltration beyond evapotranspiration's capability may not be necessary.

Response: DOE agrees that infiltration is not expected to be a problem (without sludge incorporation). However, the statement that the capillary-break cover is the least effective of the cover designs in minimizing infiltration is a true statement. As stated in responses to other comments, the capillary-break cover was not selected since it is determined that is would not comply with the 1,000 year isolation requirement. In addition, DOE opted to select an overly-conservative design to overcome any uncertainty that may exist with the characterization information for some of the waste streams intended to be consolidated within the CAMU. It should be noted that consolidation of minimally treated (dewatered) sludges beneath the engineered barrier would require a low-permeability layer for infiltration abatement.

2D. The appendix states that a capillary-break cover may not meet state closure requirements because soils beneath the SEPs have low hydraulic conductivities (1x10-03 centimeters per day [cm/day] [1.1x10-8 centimeters per second [cm/sec]] to 1x10-09 cm/day [1.1x10-14 cm/sec]) and the cover materials may not be able to be constructed with an equal or lower permeability. The soils beneath the SEP waste are the sands and gavels associated with the subsurface drainage layer. The capillary-break cover will likely have a lower hydraulic conductivity than the subsurface drainage layer.

Response: Please see the response to comment #41 in Part III.

2E. The appendix states that the cost of the 1,000-year cap is similar to the other covers because of the additional sampling required for the other two options evaluated. However, it is not clear why this additional sampling is required for two of the options and not for the 1,000-year cap. In addition, the estimate for the cost of construction for the 1,000-year cap is actually twice the RCRA cap and the capillary-break cap. To state that costs are essentially the same for all the caps is misleading, as the inflated management, contingency, and preparation costs mask the differences in actual capping costs.

Response: The document will be revised based on the response to comment 2B. The cost estimate information will also be re-evaluated.

2F. The appendix states that the analysis does not consider certain covers because "the engineered cover will have to isolate contaminated soils that exceed PRG concentrations. In addition, the engineered cover may also provide closure for waste that may not be fully characterized. Therefore, the reclamation cover may not adequately meet the closure requirements of the Colorado Hazardous Waste Management Regulations." It is not clear how the exceedance of risk-based PRGs and the presence of uncharacterized waste influence a cover's ability to meet closure requirements. The disposal of uncharacterized waste should be evaluated in more detail.

Response: See the response to comment 2A. The document will be revised to state that the reclamation cover will not be considered because it does not meet the ARARs identified in Part III Section 6 of the IM/IRA-EA Decision Document. The text will be modified to state that the reclamation cover will be used to reclaim areas that will be clean closed. Therefore this cover type is not applicable for closing areas where wastes will be left in place with concentrations exceeding the PRGs.

3. The proposed design should be evaluated for its effectiveness meeting the closure requirements for hazardous waste landfills relative to other capping strategies. State closure objectives for hazardous waste landfill final covers are:

- Promote long-term minimization of liquid migration through the closed landfill.
- Function with minimal maintenance.
- Promote drainage and minimize erosion or abrasion of the cover.
- Accommodate settlement and subsidence to the maximum extent possible to maintain integrity of the cover.
- Have a permeability less than or equal to the permeability of the underlying natural soils present.

Comparing these objectives to the 1,000-year cap design, the resulting weight of the cover could result in slope stability problems, and the integrity of the cover may be difficult to maintain. In addition, the pyramid-shaped disposal area will be 55 feet high with 20 percent slopes. This cover profile may be more susceptible to erosion and abrasion and may not function with minimal maintenance relative to other options. A cap with lesser material requirements and a resulting lower profile and more gradual slopes may not be as prone to erosional forces and may function with less maintenance. These considerations should be evaluated in the document.

Response: Rather than reduce the amount of wastes for consolidation, the DOE will propose (as a function of title design) to expand the footprint of the engineered cover to reduce the slope and height of the conceptional cover. This should reduce the erosion and therefore reduce the maintenance requirements. It should be noted that there are potential slope stability concerns associated with the expanded footprint. Geotechnical analyses will be performed to determine the potential for hillside instability.

4. Sighting requirements (6 Colorado Code of Regulations [CCR] 1007-2) require a bottom liner unless it can be demonstrated that it is not necessary. The design document cites vadose zone leaching (VLEACH) model results as the rationale for not including a bottom liner. If uncharacterized waste will be disposed of under the cover, VLEACH results are not adequate to justify not constructing a bottom liner and a leachate collection system. The document should evaluate whether uncharacterized waste should be disposed of as part of the IM/IRA and describe ramifications from its disposal on sighting requirements and closure requirements.

Response: As discussed in the responses to specific Part IV, comments #4 and #10, the subsurface drainage layer is the preferred method of ground water control due to its passive nature and better ability to perform over the long-term. The document will be modified to enhance the justification for the subsurface drain by stating that a liner and leachate collection system would be required to function over the period of performance to prevent water from accumulating above the liner and saturating the consolidated materials. The VLEACH modeling indicates that the leachate from saturated conditions could be harmful to human health and the environment. Collection of leachate over the long term would be difficult and the construction would be costly. The system would have to be actively operated and maintained. Therefore, the objective of having a "passive" system would not be realized. In addition an impermeable liner in the subsurface may be damaged by uplifting forces and heaving caused by a rising water table.

The document will be modified to address why uncharacterized wastes are appropriate for consolidation beneath the engineered cover. The concentrations in the uncharacterized wastes are anticipated to be similar to the concentrations in characterized waste. The contaminants will be the same. The proposed design is conservative in that infiltration of precipitation is minimized to prevent the production of leachate. In addition, the subsurface drain will be designed to passively remove rising ground water to prevent the ground water from contacting the consolidated materials. Therefore, DOE considers that the characterized and uncharacterized wastes will remain isolated from surface and ground water exposure pathways.

5. The document appears to be biased toward a 1,000-year cap, similar to the cover implemented at Hanford. This type of cover would be better justified if the disposal cell is relocated to a more suitable area that meets the intent of the sighting requirements; that is, not near shallow groundwater, and in an area that does not exhibit potential slope instabilities. The document should evaluate increasing the size of the relocated disposal cell to accept waste from other RFP environmental restoration activities.

Response: The bias towards the Hanford cover is to take advantage of the research that has been conducted by DOE on this cover design that is specifically focused on semi-arid regions like the RFETS. DOE acknowledges that the intent of the siting requirements may be better served if the SEPs were at a different location. However, it is neither DOE's intent to develop a new disposal facility nor was it DOE's understanding that EPA/CDPHE intended to use the siting requirements to preclude the implementation of a reasonable remedial alternative. It is DOE's understanding that although the siting requirements may not be totally appropriate to the closure of an existing hazardous waste facility, that DOE would incorporate the substantive provisions of the siting requirements to ensure that the remedial alternative is protective of human health and the environment. DOE believes that it has adequately demonstrated that the recommended remedial alternative is protective of human health and the environment. [To which EPA is on record that the design of the engineered cover is overly conservative.] As such, DOE believes that it has meet the intent of all of the substantive provisions contained within the siting requirements as they relate to the closure of the SEPs.

The shallow groundwater and slope stability concerns have already been addressed. The subsurface drain is designed to prevent contact between shallow groundwater and the contaminated media and DOE is considering increasing the footprint of the engineered cover to address potential slope stability concerns. With respect to the integration concerns, DOE believes that the integration of the OU4 IM/IRA with other site remediation projects should be discussed outside the scope of the OU4 IM/IRA since provisions to consider integration are not consistent with the IAG and dispute resolution provisions governing the closure of the SEPs. It was discussed during the July 1994 dispute resolution that the implementation of an integrated RFETS disposal facility would take between 5 to 10 years to design, permit, and construct. Therefore, DOE decided to move ahead with a site specific CAMU for the OU4 SEP IM/IRA.

6. The document states that the subsurface drain/control system will be selected and designed during the conceptual and title design stages based on the selected engineered cover design, hydraulic calculations, and performance monitoring. However, several options are available to address rises in groundwater elevation and each has different advantages and disadvantages. For example, a subsurface drain requires all soil to be excavated and an artificial vadose zone to be constructed prior to drainage layer placement. Other options, such as relocating the disposal cell or an upgradient interceptor trench, may have advantages over the subsurface drain strategy. Furthermore, the document does not show whether the subsurface drain will be effective under assumed hydraulic conditions for 1,000 years. The document should evaluate whether a potential solution will be effective before the decision is made to use it. Therefore, this document should evaluate options to solve the rising groundwater problem, rather than deferring it to the design stage.

Response: An Appendix will be added to the document that compares the proposed subsurface drain to a slurry wall/upgradient collection french system. The appendix will be structured as a feasibility/constructability analysis and will recommend the best approach for protecting the consolidated wastes from a ground water rise. DOE believes that the issue of optimizing the design is not pertinent to the selection of the GRA but is appropriately identified as a detailed design activity.

Specific Comments

1. Page IV-4, First Paragraph. This paragraph states that the excavation can be terminated when the mean historical high groundwater table elevation is encountered or when soil concentrations for all the COCs are less than PRG concentrations established to be protective of groundwater. DOE is proposing to model catastrophic dissolution of contaminants followed by transport using the computer model MYGRT to develop PRGs that protect groundwater. The text then states that the volume of soils that require excavation may be reduced. This strategy can only reduce soil volume for excavation areas that are located below the footprint of the final cover. For areas located outside the cap footprint that are to be consolidated, this strategy could mean that soils will be left in place even though they contain contaminant levels that are above risk-based PRGs. The text should be revised to reflect the limitations of the proposed strategy.

Response: The statement "... or when soil concentrations for all the COCs are less than PRG concentrations established to be protective of groundwater." will be deleted. The DOE will excavate soils within IHSS 101 to the mean seasonal high water table elevation because analysis of the RFI/RI and groundwater data indicate that nitrate groundwater concentrations rise during periods when the water table rises. In addition there is a similar gross alpha and uranium response to a rising water table. DOE will therefore excavate beneath the IHSS to be protective of human health and to remove a potential source of future groundwater contamination. This should promote consistency with the final remedy. Soils outside the IHSS will be remediated based on the Phase I developed PRGs. The calculation of soil concentrations that are protective of groundwater will be reserved for the Phase II program that will obtain geochemical data which will allow for the development of more reliable models. If the Phase II program determines that soils outside of he IHSS require remediation then the soils will be able to be remediated without impacting the engineered cover.

2. Page IV-23, Third Paragraph. The paragraph states that leachate produced under unsaturated conditions is innocuous and that therefore it is best to allow infiltrated precipitation to drain through the subsurface drainage system rather than to allow it to accumulate on a liner and create saturated conditions. The document should clarify that if a liner were employed in conjunction with a leachate collection system, accumulation would not occur. The document should then describe why a collection system is not warranted and consider that the proposed monitoring system is not completely passive and any groundwater treatment required at RFP will not be passive. Any water collected by a LCS could be treated by another OU with little additional cost.

Response: The document will be expanded to state that the subsurface drainage layer was selected over a double liner/leachate collection system because leachate will be able to drain from the system over long periods of time passively. A liner and leachate collection system would be required to function over the period of performance to prevent water from accumulating above the liner and saturating the consolidated materials. Collection of leachate over the long term would be difficult. The construction of the system would be costly: The system would have to be actively operated and maintained. Therefore, the objective of having a "passive" system would not be realized. The document will be modified to clarify that the design goal is to promote long-term passive operation. The document will also be modified to indicate that an impermeable liner in the subsurface may be damaged by uplift forces and heaving caused by a rising water table that could cause heaving.

3. Page IV-23, Fifth Paragraph. This paragraph states that excavation will be terminated when the historical mean seasonal high water table elevation is reached. The document should consider further excavation if this mean seasonal high water table elevation is reached and contaminated soil (above groundwater-protection PRGs) is still unsaturated. This strategy could reduce leachate generation and migration from high seasonal groundwater elevations.

Response: The depth excavation has been the subject of numerous discussions between DOE, EPA, and CDPHE. It is DOE's understanding that all parties agreed with the selected excavation depth based on the following reasons:

- The amount of additional soils that may need to be excavated to reach the saturated zone appears to be minimal, on the order of 1 foot.

- Any contaminants that are located below the mean seasonal high water table elevation but above the mean water table elevation would be subjected to saturated conditions during the spring of most years. Since these soils would become saturated, contaminants would be flushed out of the soils and be collected as part of a groundwater remediation system. One of the goals of the Phase I IM/IRA is to prevent unsaturated soils to be a continual source of contaminant migration to the groundwater via transport through infiltration.

- DOE is unwilling to commit to excavation below the mean seasonal high water table, since the excavation would be difficult in that dewatering may be required. This additional excavation would be very expensive.

- Additional clean soils would be required as backfill material.

- Removal of additional unsaturated soils does not appear to provide a significant reduction in risks to justify the additional expense.

4. Page IV-37, Figure IV.3-9, Page IV-41, and Drawing 123. The figure depicts the final engineered cover and shows a sand layer below the gravel subsurface drainage layer. The purpose of this sand layer is not evident. The document should clarify the purpose of this bottom layer of sand.

Response: Will comply. This sand layer will act as a filter so that any solids carried by rising ground water will not be allowed to migrate into the subsurface drainage layer and cause a reduction in its efficiency due to plugging.

5. Page IV-37, Figure IV.3-9. The figure depicts the final engineered cover and shows existing soils or contaminated media located below the subsurface drain. The document should clarify whether contaminated media will be located below the subsurface drain.

Response: The phrase "and/or contaminated media" will be deleted.

6. Page IV-39, Sixth Paragraph. The text states that sand and gravel filters below the general backfill will prevent overlying soils from migrating into the biotic barrier. However, the document does not state that filtering is required for the capillary break. The document should clarify the purpose of this filter layer, as it is not clear why biotic barrier effectiveness would be influenced by clogging voids.

Response: Will Comply. The document will be modified to clarify that the filter layer is required to maintain pore space within the biotic barrier to sustain the design capillary break function.

7. Page IV-39. This page discusses general backfill for the cover. The effects of subsidence on cover material requirements are not provided. The text should provide calculations that predict settlement due to the weight of the cover. Settlement should be predicted to evaluate the need to surcharge the area before the asphaltic layer is constructed and to assist in setting the elevation of the subsurface drain.

Response: It is agreed that the results of this analysis could be important. However, it is not appropriate to include these calculations in the IM/IRA conceptual design. This activity is a title design function. A Geotechnical field investigation was commenced at the end of July to investigate these issues. The results will be incorporated into the detailed design documents.

8. Page IV-54, Last Paragraph. This paragraph states that HELP model results indicate that the engineered cover will significantly reduce infiltration to levels below 0.1 inches per year. The document should specify what infiltration rate is required to be protective since modeling indicates contaminants present are not mobile.

Response: New leaching estimates show that an infiltration rate of 10^{-7} cm/sec is sufficient to protect ground water.

9. Section IV.3.1.4, Page IV-57, Drawings. The document provides information about the subsurface drain design. The drawings depicts the subsurface drain as emptying into the ITS. The drawings should provide details about the location where the ITS discharges. Drawings and calculations should also verify that the drain will not be submerged under elevated water table conditions. Submergence would render the drainage system ineffective. The drawings should show a profile of the subsurface drain/ITS ditches and trenches and a provide a hydraulic energy grade line which illustrates that the drain will function as intended under assumed hydraulic conditions.

Response: A drawing will be included that conceptually depicts the method to drain the subsurface drain to the ITS. The requested calculations and final drawings will not be included in the IM/IRA conceptual design. They will be a part of the detailed design package.

10. Section IV.3.1.4, Page IV-58. This section states that DOE may install a groundwater trench upgradient to prevent lateral groundwater flow from contacting contaminated materials. The text then states that this trench may not be necessary, because the subsurface drain may alone be adequate. Although this assumption may be accurate, it may also be possible that an upgradient diversion trench may alone be sufficient to prevent the water table from rising into waste. As stated in general comments, other strategies such as diverting groundwater flow or waste relocation should be evaluated in more detail at the x stage, as they may offer significant advantages over the subsurface drain (such as reducing the amount of excavated material or isolating waste from the water table more effectively).

Response: An evaluation of upgradient ground water control is being investigated in a feasibility analysis that will be included as a new appendix in Part III. It is possible that upgradient control alone may be adequate; however, there are some disadvantages associated with this concept.

1) The system would have to operate continuously over the 1,000 year-period of performance since the system would extend below the top of the water table.

2) There are numerous RFETS buried utility lines that run along the south and west side of the SEPs that may be impacted by the installation of the upgradient system but would not be impacted by the lateral subsurface drainage layer.

3) The depth to competent bedrock may limit the methods of construction.

4) The vertical ground water collection trench would not have sand filter layers to prevent fine grain materials from clogging the system.

5) The construction activities could be complicated due to the need to dewater the saturated zone in the construction area.

6) Demonstrating that the system is effective for the 1,000-year period would be dependent upon ground water flow modeling. There is not enough existing

hydrogeological information in the vicinity of the OU4 SEPs to construct an appropriate ground water flow model since the Phase II RFI/RI field work has not been completed. Therefore, the OU4 closure would be delayed until the hydrogeological data could be collected, analyzed, and used to create and calibrate a ground water flow model to demonstrate the system's effectiveness.

7) Construction QA/QC could be difficult to ensure if slurry trenching techniques were used because these techniques are essentially *in situ* construction methods.

8) The construction of the system could potentially interfere with future upgradient or downgradient ground water corrective action programs.

11. Section V.10.3, Page IV-109, Paragraph 3 and Page IV-110, Paragraph 1. The text states, "For the purposes of atmospheric dispersion, the building's fixed contamination does not pose a threat, but any removable contamination can potentially be released during removal operations." Evidence supporting this statement is not clearly apparent, but should be presented. This is a broad statement and the text should provide evidence of its validity.

Response: Will comply. The definition and physical characteristics of removable and fixed contamination will be clarified.

12. Page IV-110, First Paragraph. The text discusses the quantification of risk as a result of the remedial action at OU4. It does not indicate whether the analysis will quantify short-term effects, long-term effects, or both. A statement clarifying this should be added to the text.

Response: Will comply.

13. Section V.10.3, Page IV-110, Paragraph 2. The text states, "Applicable dispersion factors for the 100 meters (m) and 2000 m receptors were identified so the diffusion of the dust plume could be quantified." The text does not clearly state why the 100 m and 2,000 m distances were chosen as the receptors for the dispersion model. Although on page IV-114 the text does state that 2,000 m was chosen as the distance to the closest fence line, the text does not conclusively justify the choice of these two distances. The text should present convincing evidence to justify these statements. These distances can be critical parameters in computing cancer risks. Clear justification is needed when determining the distance between the airborne emission source and the receptors.

Response: Will Comply. The rationale for selecting the 100m and 2000m distances will be clarified.

14. Page IV-113, Table IV.10-1. This table presents exposure factors used to quantify risks from exposure to airborne contamination from remedial action at OU4. A receptor lifetime of 50 years is listed for workers, on-site adults, and off-site adults. Typically, a value of 70 years is used as lifetime duration. The value of 70 years should be used to conform to EPA guidance (EPA 1989a). Also, a body weight of 19.7 kilograms (kg) is listed for the off-site child receptor. Typically, a value of 15 kg is used for this parameter. The body weight should be 15 kg to conform to EPA recommendations (EPA 1989a).

Response: The EPA guidance values for these parameters were not used as they were deemed inappropriate for the analysis. By using a lifetime for an adult (age 20-30 years) of 70 years suggests that the adult will live to be 90-100 years of age. The average lifespan of a human being is typically 70-75 years. Therefore a 50 year lifetime is more appropriate to the real life situation. Also the use of 19.7 kg body weight represents a 6 year old child (per EPA's Exposure Factors Handbook). The EPA body weight of 15 kg is for a child that spends a significant amount of his/her childhood at the site and therefore the 15 kg number is an average body weight for that time frame. A 6 year old was chosen as this was believed to be the youngest age that may be near the site boundary with a parent to inhale any contaminates, it is also the most conservative approach. Within RAGS (EPA 1989a) the underlying philosophy is the use of site specific or the most appropriate values for the situation that is being modeled. The above parameters represent the most appropriate for this situation based on professional judgement and experience. These parameters will not be changed, but the rationale for the selection of the parameters will be clarified.

15. Part IV, Section V.10.3, Page IV-114, Paragraph 4. The text states, "To determine the dispersion factors the CAP88-PC model was used." Results from this model are not but should be presented in the document. Documents that discuss the results from computer dispersion models should include the output from these models as supporting evidence.

Response: The results of the model are presented as dispersion factors. The text will be modified to clarify that the CAP88-PC model calculated the dispersion factors. The total computer output will be included in an appendix.

16. Page IV-116, First Paragraph. The text states that some toxicity values were collected from a source other than the Integrated Risk Information System (IRIS; EPA 1994) or the Health Effects Assessment Summary Tables (HEAST; EPA 1993a). Only EPA sources of toxicity information should be used in quantifying risks. If a toxicity value is unavailable from IRIS, HEAST, or the Superfund Health Risk Technical Support Center, the toxicity of the chemical should be qualitatively evaluated.

Response: The other source for toxicity data that was used was a chemical database called MEPAS. The sources for the toxicity information within MEPAS are EPA Health Effects Assessments. Although the toxicity information is older (circa 1984), the information in many cases is still valid. The Superfund Health Risk Technical Support Center will be contacted to validate the numbers. The MEPAS values will still be used even if there is no additional information to validate the numbers. By using the MEPAS values the toxicity can be quantified and this is better than a qualitative evaluation.

17. Pages IV-117 through IV-128, Tables IV.10-2 through IV.10-5. These tables present risks associated with inhalation exposures to contaminants during remediation of OU4 for workers, on-site adult receptors, off-site adult receptors, and off-site child receptors. The second column of each table presents the intake value. It is unclear whether this value is actually the exposure concentration or the daily intake of the chemical. When the intakes are divided by the RfDs presented in the third column of each table, the results do not match the hazard quotients presented in the fourth column. Similarly, when the intakes are multiplied by the slope factors presented in the table, the result does not match the incremental cancer risk

presented in the final column of each table. It should be noted that daily intakes for carcinogenic and non-carcinogenic chemicals are not the same because the averaging time used in the exposure equations are different. Only one intake equation is presented in the text (page IV-115) and it does not include averaging time. This evaluation is poorly explained and the results are unverifiable. Furthermore, toxicity values for some chemicals are not from EPA sources and are not verifiable (for example, potassium and sodium). The evaluation and toxicity values should be reexamined for accuracy and corrected as necessary.

Response: The intake value that is presented in the tables is the total subchronic intake that is inhaled by the receptor during the removal, not the exposure concentration or the daily intake of the chemical. Simply dividing these values by the RfDs gives a value that is in units of kg*days, which has no meaning. The normalization of these subchronic intakes to subchronic daily intakes was not included in the tables and was not discussed in the writeup. The tables will be amended to provide the subchronic daily intakes and the writeup will include a discussion of how this is done. This is also the case for the incremental cancer risks. These will be revised and an additional column will be added for the subchronic intakes of the carcinogenic materials as the intakes are based on different averaging times (lifetime vs. exposure time frame). The presentation of the information will be modified for clarification.

18. Page IV-130, Table IV.10-6. The table presents risks associated with exposure to airborne radionuclide contamination during remedial activities. The citation for the source of the dose conversions and toxicity values is not provided. Additionally, the calculation to convert the dose conversion factors from units of sieverts per becquerel (Sv/Bq) to millirem per picocurie (mrem/pCi) is not provided. EPA guidance presents dose conversion factors in units of Sv/Bq; these values should have been converted. The dose conversion factors presented in the table are slightly higher than those calculated from the values presented in EPA guidance (EPA 1988). The source of the dose conversion factors should be cited and the units should be converted to mrem/pCi for verification. This comment also applies to Tables IV.10-7, IV.10-8, and IV.10-9.

Additionally, the inhalation slope factor for tritium could not be verified. It does not appear in HEAST (EPA 1993a). The slope factor should be referenced and only EPA-approved values should be used.

Response: The source of the DCFs was provided on Page IV-129, Para. 4 as "Argonne 1989". The text will be revised to clarify this point. The "Argonne 1989" document presents the DCFs in mrem/pCi so a conversion factor is not required. This document has recently been updated and any new values will be included in the calculations. These DCFs are based on ICRP 30 and 90 which are the basis for the EPA Federal Reg. Guide #11 (EPA 1988). The conversion can be done by multiplying the Sv/Bq DCF by $3.7 x 10^3$ to yield mrem/pCi. A slight difference in the dose conversion factors may result due to rounding the values. However, rounding will not significantly affect the overall result. There is no need to include this conversion factor in the writeup.

The tritium slope factor is included in HEAST, under Hydrogen as the chemical formula H^3.

19. Pages IV-131 through IV-133, Tables IV.10-7 through IV.10-9. These tables present the radionuclide risk assessment of inhalation exposures for on-site adult residents, off-site adult

residents, and off-site child residents. The slope factor for tritium could not be verified and does not appear in HEAST (EPA 1993a). Additionally, the slope factors for uranium-235 and -238 are incorrect. The slope factors should be verified for accuracy and corrected as necessary.

These tables also present dose equivalents for each receptor. Calculation of dose equivalents, as opposed to cancer risks, is not appropriate for child receptors and may not be appropriate for off-site or on-site adults who are not workers. EPA guidance states, "[Coefficients of dose conversion] are intended for general use in assessing average individual committed doses in any population that can be characterized adequately by Reference Man" (EPA 1988). Reference Man is a hypothetical receptor who is conceptualized as having the anatomical and physiological characteristics of a healthy 20- to 30-year-old male with a total body mass of 70 kg. The adult receptor populations may not correspond to this description, and child receptors certainly are not characterized by Reference Man. Only cancer risks from exposure to radionuclides should be calculated for these three receptor populations.

Response: The slope factor for tritium is included in HEAST, under Hydrogen as the chemical formula is H^3. The slope factors for U-235 and U-238 will be based upon discussions with Milton Lammering, Branch Chief of the Denver EPA Radiation and Indoor Air Program office, and the 1994 HEAST.

Even though the EPA guidance makes the statement that DCFs can only be applied to populations that are representative of Reference Man this is not a concern. DCFs are not based on the age or weight of the receptor but on the dose to tissues and the specific tissue weighing factors. (See the discussion in EPA 1988, Page 6 "Primary Guides for Assessed Dose to Individual Workers."). The differences in the physiology are accounted for in the breathing rate and other physical intake parameters. Therefore the dose equivalents presented in the decision document to all of the receptor populations (worker, on-site adult, and off-site adult and child) are appropriate. According to ICRP 23; "It is expected that The Reference Man as defined here will suffice for most purposes of planning or for exposures at low levels".

20. Page-134, Section IV.10.3.2. The text lists the various assumptions made for the air dispersion modeling, including body weight for children. The value presented is 19.7 kg; the typical value is 15 kg. A body weight of 15 kg should be used to conform with EPA recommendations (EPA 1989a and 1989b). An airborne release fraction is also listed, but the source of the fraction is not EPA guidance. If EPA guidance recommends an airborne release fraction, it should be used in the model.

Response: See response to Specific Comment 14. The reference for the airborne release fraction (ARF) was provided as Mishima 1993. DOE considers that it is appropriate to utilize the most current and valid data available.

21. Page IV-137 through IV-148, Tables IV.10-11 through IV.10-14. Several RfDs and CSFs presented in these tables could not be verified; they do not appear in HEAST or IRIS and a reference for the values is not provided. The toxicity values should be corrected as necessary. Additionally, the calculated hazard quotients and incremental cancer risks appear to be incorrect. As described in specific comment 14, they appear to have improperly calculated. References should be provided for all toxicity information.

Response: The toxicity values, RfDs and CSFs came from the same sources as those given in Tables IV.10-2 through IV.10-4. Please refer to the response to Specific Part IV Comment 14 regarding calculation of cancer risks.

22. Page IV-149, Table IV.10-15. The table presents the incremental cancer risk and dose equivalent for on-site workers remediating Building 788. The slope factor for tritium does not appear in HEAST (EPA 1993a) and references for the slope factors and dose conversion factors are not cited. References for this information should be provided.

Additionally, as described in Specific Comment 15, dose conversion factors in EPA guidance (EPA 1988) are presented in units of Sv/Bq. A conversion is necessary to change the units to mrem/pCi. The dose conversion factors presented in Table IV.10-15 are slightly higher than those calculated from EPA guidance. Dose conversion factors should be presented in Sv/Bq and the unit conversion should be presented in the document for verification.

Response: Tritium is in HEAST, under Hydrogen and has a chemical formula of H^3. This information was already referenced in Section IV.3.1.

See response to Specific Part IV Comment 15

23. Page IV-150, Table IV.10-16. The table presents a summary of the estimates of radiation dose from Building 788 to receptors. Results for on-site adults, off-site adults, and off-site children are listed. The table does not, however, provide slope factors, intake values, or modeled contaminant concentrations. These values should be presented in the table.

Furthermore, dose equivalents are inappropriately presented for each receptor. Calculation of dose equivalents, as opposed to cancer risks, is not appropriate for child receptors and may not be appropriate for off-site or on-site adults who are not workers. EPA guidance states, "[Coefficients of dose conversion] are intended for general use in assessing average individual committed doses in any population that can be characterized adequately by Reference Man" (EPA 1988). Reference Man is a hypothetical receptor who is conceptualized as having the anatomical and physiological characteristics of a healthy 20- to 30-year-old male with a total body mass of 70 kg. The adult receptor populations may not correspond to this description, and child receptors certainly are not characterized by Reference Man. Only cancer risks from exposure to radionuclides should be calculated for these three receptor populations.

Tables IV.10-17 and IV.10-18 summarize the tables discussed above. They will require revisions based on these comments.

Response: These values (slope factors, intake values, and contaminant concentrations) were not included as they were not directly calculated. The CAP88-PC code was used to find the CEDEs for these receptors as stated in the text pg. IV-136 Para. 2. The computer output will be included as an appendix.

See response to Specific Part IV Comment 19.

Revision of the tables is not required.

24. Pages IV-153 through IV-164, Section IV.10.4.1. This section describes the selected VLEACH. The selected model is acceptable for this analysis, but several assumptions used in

the modeling do not appear to be conservative and should be more fully described. For example, the text refers to "an assumed chemical species" but does not identify the species. If assumptions were made regarding chemical properties on a chemical-species basis as opposed to being chemical-specific, the species and assumptions should be presented in the text. Other parameters that were not specified and that could affect the results of the model are the pH and redox potential of the soil. The distribution coefficients for soil-water partitioning (K_d) were not specified; K_d of a chemical can be affected by the mineralogy of the soil. K_d values should be specified for each chemical. The most conservative assumption of physical parameters would be preferential flow; it is not clear whether this assumption was made. Chemical equilibrium was also assumed, which is not a conservative assumption. Overall, the assumptions made for the leaching model do not appear to be conservative and should be justified. Additionally, more chemical-specific data should be provided.

Response: The text contains a table that identifies the assumed solid chemical species for each of the contaminants included in the VLEACH model. In general, the most soluble species were selected as a conservative assumption. The solubility limit was in many cases used to determine the maximum concentration that could partition from the solid phase into the downward percolating liquid phase. We agree that redox and pH could affect the simulations. However, in the absence of site-specific data, this level of detail could not be factored reasonably into the simple model. The partition coefficients for soil/water used in the simulations was described in the text. A K_D of 1 was used for metals and radionuclides to effectively simulate that these contaminants would not be retarded by sorption. This value was selected because of the lack of site-specific K_D values and because ground water data indicates that metals and radionuclides may be mobilized by rising ground water even though metals and radionuclides are generally believed to be immobile as they sorb readily to soil media. The ground water data over successive flush cycles (see Appendix III.D) suggests that these contaminants may not be retarded under saturated conditions, possibly because they are bound to mobile colloidal material. In the absence of site-specific data and the lack of direction on which K_D values to use in these simulations, it was conservatively assumed that these constituents would not be retarded significantly by the solid matrix. It is DOE's understanding that EPA and CDPHE previously concurred with the modelling approach and the conservative assumptions that were made given the yet unconfirmed potential for the soils to leach contaminants. However, assuming that the maximum concentration of the constituents was limited by the solubility of the assumed solid chemical species may not be conservative as the behavior of metal/colloid particles may be governed by the chemical and physical properties of the colloid. The K_D value used for the modeled organic constituents were derived from literature K_{OC} values, and site-specific F_{OC} values, as described in the text. Chemical equilibrium had to be assumed and is indeed a conservative assumption. There is no mechanism to account for kinetic effects in VLEACH, and data on kinetic effects on sorption is not readily available. Defaulting to the maximum solubility as a "worst case" possibility for each vertical cell as the water percolates through the liners/waste/soils is conservative. Although kinetic limitations may decrease the amount of contaminant that can partition within the percolating pore waters, use of the local equilibrium assumption is standard in modeling simulations. Preferential flow was not considered as part of the HELP modeling exercise since data on the flux rate of percolating water through preferential pathways (e.g., cracks, acropores) is not available. The document will be modified to justify the assumptions used in the modeling and enhance the discussion on what assumptions are conservative.

25. Page IV-196, Section IV.11.5. This section evaluates the proposed remedy for its consistency with final remedies. The section should evaluate the effects of potential groundwater extraction on cap subsidence and slope stability. Extracting groundwater could cause subsidence and consequently lower the subsurface drain location or make slopes potentially unstable.

Response: The IM/IRA-EA decision document will be revised to address the effects of ground water removal qualitatively. Quantitative analysis is not planned to be provided at this time, since the results of the analysis would be highly suspect until the Phase II pumping tests are completed and the Phase I geotechnical results are received. In general, the extraction of ground water will likely increase the stability of the slopes if the upper hydrostatigraphic unit is largely de-watered causing the friction to increase at the alluvium-bedrock interface. The shallow aquifer yields are very low which will not likely cause excessive subsidence.

attachment 3

Overview of the Changes Associated with the Inclusion of Pond Sludge into the IM/IRA

DOE will revise the IM/IRA-EA decision document to include the disposition of sludge beneath the engineered cover. The following discussion provides an assessment of the modifications that will be required to the IM/IRA-EA decision document to incorporate sludge disposition beneath the engineered cover. The following discussion lists the major sections (of the various parts of the IM/IRA-EA Decision Document) and identifies the changes that will be required.

Part I

Introduction. Will require minor text changes to mention sludge as a component of the IM/IRA and delete statements that sludge will be disposed separately outside of the IM/IRA.

Objectives and Purpose. Will require minor changes to mention sludge as a component of the IM/IRA.

Site History. Changes will be made to include additional history concerning the sludge and identify the SEPs that contained sludge when the IM/IRA project was initiated.

Scope and Assumptions. Will require minor text changes to identify sludge as a component of the IM/IRA and to delete the assumption that the sludge will be disposed separately outside the IM/IRA.

Site Characteristics. No changes anticipated.

Part II. Information will be added to Part II specifying the chemical characteristics of the sludge. A description of the sampling programs will be presented, and the results of the analysis will be provided. DOE proposes to add a new stand alone section (II.7) concerning sludge characterization because the characterization investigations for the Phase I RFI/RI and the sludge were very different with respect to the time of the analysis, the investigation approach, and methodologies. A proposed table of contents for this new section is as follows:

This section will provide the information from the Haliburton and Weston sampling programs which has been shared with the CDPHE/EPA and used in the performance modeling.

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Part III

Remedial Action Objectives. No changes anticipated because these objectives are very general in nature and will also apply to the inclusion of sludge.

Risk Analysis. No changes anticipated because the Preliminary Remediation Goals were specifically calculated to determine the extent of surface and vadose zone soils that required remediation.

Technology Identification and Screening. Will be modified to identify sludge as a waste stream. Since sludge is potentially a controversial issue, a full detailed analysis of alternatives based on the CERCLA nine evaluation criteria will be used to justify that consolidating the sludge within the CAMU is an appropriate strategy which enhances the remediation. This evaluation will be a significant modification to the IM/IRA-EA decision document in that various alternatives for treated sludge disposition will be identified and described. DOE proposes to assess the disposition of sludge within each of the five existing General Response Actions. Alternatives for sludge disposition will include leaving it in the tanks (No Acion), dispositioning dewatered sludge beneath an engineered cover, dispositioning solidified sludge beneath an engineered cover, dispositioning the sludge at an offsite storage/disposal facility. Magnitude of cost estimates will be completed for the alternatives. Additional ARARs will be evaluated for the disposition of sludge.

Evaluation Criteria. No changes anticipated.

Detailed Analysis. See the discussion for identification and screening. The sludge alternatives will be integrated into the analysis of the General Response Actions.

Evaluation Summary. Will be changed to identify the selected alternative for sludge disposition as a component of the General Response Action selected for the SEP closure.

Part IV

General Description. Will require modification to address sludge disposition beneath the engineered cover.

Design Basis. Will be updated to identify the treatment QA/QC requirements for the sludge, and specify the disposal acceptance requirements (physical and chemical).

Conceptual Design. Will be updated to assess the new volume of solidified sludge. The modified footprint of the engineered cover will be presented in the Part IV conceptual design, and will result in substantial changes to most of the drawings. This revised footprint has already been shared with the CDPHE and the EPA. The Haliburton treatment process will be described in sufficient detail to meet the substantive requirements for a RCRA Part B permit.

Waste Management Plan. Will need a minor update to include the sludge and to address any secondary waste streams from the selected treatment process.

Required Specifications. A specification addressing "sludge acceptance" for disposal beneath the engineered cover will be required.

Implementation Plan and Proposed Schedule. The schedule for sludge treatment will be assessed and incorporated into the construction sequence discussion and the construction schedule.

Cost Estimate. Will be updated to incorporate the cost of dispositioning the sludge beneath the engineered cover. The cost of sludge treatment will be factored into the estimate.

QA/QC. These plans will require minor modification.

Health and Safety. No change anticipated.

Risk Analysis and Impact Assessment. The VLEACH analysis will be updated for sludge dispositioned beneath the engineered cover. These results have been shared with the CDPHE and the EPA. Worker health impacts will be assessed for the inclusion of sludge beneath the engineered cover (primarily from the airborne exposure pathway. These impacts are already assessed for the SEP excavations and the removal of Building 788. The completion of these exercises will be important to demonstrate that the disposition of treated sludge beneath the engineered cover is protective of human health and the environment.

Regulatory Requirements. This section will be modified to include any new ARARs or regulatory requirements associated with sludge treatment.