REVIEW COMMENT SHEET

Return comments to: Carol Bicher (Name) 080 (Bldg.) 966-9100 (Phone) 8663 (fax) Comment Due Date: January 23, 1996

Document: RF/ER-95-0098 (Number) O (Rev) Final-Draft (Draft or Final) OU5 RFI/RI Report (Woman Creek Priority Drainage) (Title)

General (G) comments require resolution but do not require resolution acceptance. Mandatory (M) comments require resolution and resolution acceptance. 1 A03-PPG-004 provides complete definitions of General and Mandatory comments.

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		Sec. 1.0 - 5.0	1. The conclusions reached in this draft final Phase I OU5 RFI/RI report are based on data obtained from June 1992 through June 1995. However, this report only contains detailed descriptions of field investigations for work completed from August 1994 - June 1995. In addition, only data collected from August 1994-June 1995 are presented and evaluated in this report. Descriptions of field investigations and data obtained from work completed from June 1992 through August 1993, which represents the bulk of the OU5 field investigation, are omitted from this document. The report notes only that this information is provided in Technical Memorandum (TM) No. 15 (DOE 1994), an addendum to the Phase I RFI/RI Work Plan (DOE 1992). As this RFI/RI report is a	TM15 contains the detailed descriptions of the field investigations completed prior to August 1994 and is available through the Administrative Record. TM15 is a large, three-volume report included as Volumes III, IV, and V of the Phase 1 RFI/RI Work Plan for OU5 and approved by the EPA. As previously agreed to by the DOE, EPA, and CDPHE, TM15 was developed to be a reference for the RFI/RI Report. A paragraph was added referring the reader to which libraries maintain copies of the Administrative Record. Appendix A, Appendix E, and TM15 contain all the data for the RFI/RI Report.	

DOCUMENT CLASSIFICATION REVIEW WAIVER PER CLASSIFICATION OFFICE

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			document to be reviewed by the public, all pertinent information and data used to support conclusions should be included. At the very least, all data obtained before 1994 and compiled in TM15 should be included as an appendix to this report.		
		Sec. 2.0	2. Discusses the comparison of field investigation to Background Upper Tolerance Limits (BUTLs). For data obtained before 1994, BUTLs were calculated without outliers excluded. BUTLs have been recalculated using data collected since 1994 without excluding outliers. Consequently, it is unclear whether all data were compared to the BUTLs calculated from the more recent data, or if only more recent site data (1994 to 1995) were compared to these values. On page 2-2, second paragraph, the text states that Tables 2-3 through 2-10 are organized so that data collected during earlier investigations were compared to both BUTLs and to data obtained during more recent investigations. The third paragraph on page 4-2 states that the same tables present a data set compiled from both investigations compared to both background values and data collected before 1994. The text should clearly and consistently explain which data sets were compared to BUTLs.	The background UTLs were not recalculated using additional data. The recalculation merely involved treating the same background data set, from the *Background Geochemical Characterization Report* (DOE, September 30, 1993), in a manner consistent with how the OU data were treated. By identifying and excluding outliers from one data set (background data), but not from the other data set (OU5 data), the two data sets were treated inconsistently, thereby biasing the results of data comparisons. Because of recognition of this biased data treatment, the background UTLs were recalculated, following the same data-treatment protocols used for the OU5 data. Background data for groundwater, surface water, geologic materials, and sediments are contained in the *Background Geochemical Characterization Report* (DOE, 1993).	
		Sec 2.2	3. The discussion in Section 2.2 implies that the data obtained before 1994 are	Tables 2-3 through 2-10 include the statistical differences in the Summary	

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			comparable to data obtained between 1994 and 1995. These data should be statistically compared before any conclusions are reached.	Statistics, as discussed in the text.	
			4. The two data sets from the different field investigations are labeled differently in different portions of the text. A sample of some of the names follows: (1) "data obtained upon implementation of the OU5 work plan and data obtained upon implementation of TM 15"; (2) "stage 1 and stage 2 data"; and (3) "data obtained before 1994 and data obtained after 1994." Several figures also confuse the issue, as some distinguish between data obtained before 1994 and others do not. These discrepancies should be corrected to provide consistency and prevent confusion.	All data collected were obtained during the implementation of the work plan and as amended by TMs 1-10 and 15. Data collected prior to 1994 is labeled Stage 1, 2, 3, or 4. TM 15 data were collected in 1994 and 1995. Clarification to the text was included.	
		Sec. 2.0	5. The text states that only data generated from before 1994 were used for the human health risk assessment (HHRA). The purpose of additional field work at OU5 (work completed between 1994 and 1995) was to fill data gaps to assess the nature and extent of contamination and conduct the HHRA. Data obtained between 1994 and 1995 should be included in the HHRA.	The additional data collected under TM15 was required to further define the nature and extent of contamination associated with each IHSS and to collect data required for the Feasibility Study. As agreed to by the DOE, EPA, and the CDPHE, data collected prior to the collection of TM15 data were used to perform the HHRA under the assumption that the TM15 data were not substantially different from the existing data. Section 2 provides discussions and the statistical differences between the two data sets, concluding that there was not a	

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				statistically significant difference.	
		Sec. 3.0	6. Contains some information from the geotechnical evaluation of the IHSS 115 area. The text, maps, and cross sections presented indicate old landslide deposits underlying the landfill. A relatively high water table, the existence of surface seepage in this area, and the presence of deeply weathered claystone underlying the landfill are indicated also. These data indicate the area is geologically unstable and may preclude the option of in-place closure of the IHSS 115 landfill. Further geotechnical studies and stability analysis will need to be performed before an in-place closure could be approved.	Comment is noted. The purpose of this document is not to present in-place closure for the landfill. Further analysis would take place during the CMS/FS phase or during the corrective action (Title I Engineering) Phase.	
		Sec. 4.0	7. In the Nature and Extent of Contamination section, data from both field investigations were used. Data summary tables present data only as a function of greater than or less than background. There is no description of how the data from the two field investigations were combined and manipulated. A more thorough explanation is necessary.	The two data sets were not combined. TM15 discusses the nature and extent of contamination as well as the data gaps. The RFI/RI Report addresses the TM15 data and concludes that it is not statistically/significantly different from the previous data.	
		Sec. 4.0	8. This section does not indicate that the large seepage areas south of Woman Creek were sufficiently characterized (see figure 3-15 for the locations of these seepage areas). Data presented at scoping discussions several years ago indicated contaminated	The revised field sampling program (FSP) for water and sediment sampling did not include additional sampling requirements in this seep area. The FSP for the OU5 RFI/RI is documented in the agency approved Technical Memorandum No. 1,	

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			sediments in these areas. These data were apparently never followed up with further sampling or an explanation of the apparent anomalies. All pre-existing data on the sediments and water from seepage areas needs to be presented and evaluated in this report.	Revised Network Design, Section 5.3. However, there are two sampling locations near the large seepage areas south of Walnut Creek, SED-18 (near the apple orchard) and SED-19 (near Antelope Springs) that were sampled in support of another program, both locations were sampled quarterly beginning in February 1989 continuing through November 1991. Samples from these locations do not contain any anomalous results. The analyte list for these locations include water quality parameters, metals, radionuclides, and volatile organic analysis.	
		Sec. 4.3	9. This section discusses sediment chemistry in the C-1 and C-2 ponds. Data is also included in Appendix A, and TM15 is also referenced. It is not clear from the write up of these data that the full nature and extent of contamination in sediments of the C-series ponds has been adequately characterized. The single sediment sampling event shows several metals exceeded BUTLs. Appendix A indicates a 1974 study detected elevated plutonium concentrations. These data are not well integrated into an easily understood package. Also the single event, three location samples taken in each pond may not be sufficient for remedy selection.	The number of and frequency of sediment sampling in the C-series Ponds was agreed to as part of the Field Sampling Plan for the RFI/RI as modified in the agency approved Technical Memorandum No. 1, Revised Network Design, Section 5.3, Summary of Recommended Field Sampling Plan (FSP) Revisions of the OU5 RFI/RI.	
		Sec. 5.0	10. The Draft Final Phase I RFI/RI Report	This section has been expanded to include a	

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			for OU5 discusses the fate and transport of contaminants. This section contains a brief overview of the potential migration routes for the general categories of radionuclides, metals, and volatile organic compounds (VOCs), as suggested by EPA guidance (EPA 1988a). However, the actual chemicals of concern (COCs) are not mentioned, nor is the process used to determine COCs cited in this section. In addition, this section does not, but should discuss contaminant persistence, as outlined in guidance (EPA 1988a).	discussion of migration potentials for the various COCs.	
		Sec. 1-5	11. The text discusses resuspension of particulates caused by meteorological parameters, such as wind. Resuspension is highly dependent upon recent precipitation events. Therefore, precipitation and meteorological data collected during periods similar to events discussed should be included. Although some meteorological data is scattered throughout the RI report, this data and a summary of surface soil moisture content should be incorporated into the RI report, and discussed in relation to resuspension of particulates in air concentrations.	The resuspension of particulates in the OU5 modeling was based on the meteorological data collected for OU3. Detailed discussions within the OU3 RFI/RI Report are referenced in Section 5.0.	
		Sec. 1-5	12. Air concentrations should always be given in the units of micrograms per cubic meter ($\mu g/m^3$) for common environmental usage. The concentrations should be	Text was modified.	

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			converted to be consistent throughout the document.		
		Sec. 5.3.4	13. Within the indoor-air modeling section, the Johnson-Ettinger model is used. Recent guidance (Technical Background Document for Soil Screening Guidance, EPA, 1994b) suggests that this model cannot be reasonably incorporated into the soil screening framework at the current time. This screening level model is highly sensitive to many of the non-refined model inputs and it may grossly overestimate concentrations.	While the screening level model does overestimate concentrations, this is considered a conservative result, and revisions are not justified.	
		Sec. 6.0	14. In the HHRA, COCs selected for OU5 included radionuclides and non-radionuclide chemicals. Separate concentration/toxicity screens were correctly used for noncarcinogenic chemicals, carcinogenic chemicals, and radionuclides to select COCs. However, the risk estimates were incorrectly summed. According to EPA guidance, cancer risks should be tabulated separately for radionuclides and chemicals because the fundamental toxicity database is different for chemicals and radionuclides. EPA (1989) states: "For radionuclides, . . .human epidemiological data form the" basis of the extrapolation, while for many chemical carcinogens, laboratory experiments are the	Corrected, as requested. The risk characterization tables were revised to present chemical and radiological risks separately, as well as the total risks from all sources.	

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			primary basis for the extrapolation. Another even more fundamental difference between the two is that slope factors for chemical carcinogens generally represent an upper bound or 95th percent confidence limit value, while radionuclide slope factors are best estimate values. Although EPA guidance states that "estimates of the lifetime risk of cancer to exposed individuals resulting from radiological and chemical risk assessment may be summed in order to determine the overall potential human health hazard associated with a site," the conclusion is that, based on the limitations described above, the two sets of risk estimates should be tabulated separately. The tables should be revised to include separate risk summary tables for radionuclides and nonradionuclides.		
		Sec. 6.0	15. Several exposure parameters in the intake algorithms should be eliminated because information is insufficient to support their use. Additionally, they could result in a significant underestimation of the risk. Exposure parameters that should not be used include matrix effect (ME), respirable fraction (RF), and respiratory deposition factor (RDF). The ME factor was used to account for decreased dermal absorption and	DOE disagrees that the use of a soil matrix effect (ME) to estimate absorption of a compound through the gut wall is inappropriate. EPA-approved toxicity criteria (reference doses and cancer slope factors) are derived from studies in which the compound is administered in a readily absorbed form (e.g., food, water, corn oil). For virtually all compounds considered in RFETS risk assessment, absorption of these compounds when ingested in a soil matrix	

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			bioavailability of specific chemicals. However, before using many ME factors, soil type on which the ME is based should be compared to site-specific conditions. If soil types are dissimilar, the ME cannot be used to estimate the various intakes. Previously, EPA requested that ME factors be submitted for approval prior to use in the risk assessment. Until EPA has approved the ME, they should not be used in the exposure equation and no adjustments should be made for bioavailability. The DF and RDF parameters were used to estimate the amount of inhaled particulate that is deposited in the lungs. In general, a DF may be used to represent the amount of respirable contaminated particulate matter (PM_{10}) that is present in the air, but should not be used to decrease the exposure concentration if the concentrations in air already represent the PM_{10} fraction. It is stated that "air dispersion modeling performed for OU5 considered particle size and, therefore, the air concentrations are the respirable particulates only." Therefore, it is incorrect to adjust for the amount of inhaled particles that are deposited in the lungs. In addition, it is stated that because the air concentrations represent respirable particulates only, "the respirable fraction parameter for inhalation of airborne contaminants at OU5 is,	would be expected to be considerably less than that from a diet-based matrix. Nevertheless, assumptions concerning soil matrix effects in RFETS risk assessments have generally defaulted to 1 (100% absorption) when the data support the assumption or information is insufficient to support an assumption of lower absorption. For compounds where literature-based information indicated decreased absorption, a conservative assumption of 0.5 (50% absorption) was assumed, even when literature-based values supported estimated of much lower absorption. For example, in the OU5 HHRA, a matrix effect for several metals of 0.5 was conservatively assumed. In an EPA publication on metals bioavailability, the matrix effect for metals in the diet was between 0.01 and 0.03 (EPA, 1990). It should also be noted that use of the 0.5 matrix effects was only applied to a single compound (Aroclor 1254) that contributed significantly to overall risk. There is acceptable precedence for this assumption because the EPA assumed an "ingestion absorption fraction" from soil of 0.3 in developing its PCB spill policy (Labieniec et al., 1994). Although geochemical speciation studies would be useful for metals, speciation can generally be inferred with confidence from literature-derived data when applied to	

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			therefore, always 1.0." However, the reasonable maximum exposure (RME) value used for DF is listed as 0.36. Furthermore, if it is assumed that only a percentage of the particulates will deposit in the lungs, the remaining percentage will either be swallowed or expectorated. Therefore, the ingestion equation should be revised to account for the portion of inhaled particulates that is swallowed. However, it would be more appropriate to eliminate the factor from the RME inhalation equation for all receptors, as was stated by EPA in the April 11, 1995, letter and in previous discussions between EPA and DOE.	RFETS-specific data on soils. EPA Region VIII over several years, performed bioavailability studies on specific metals (e.g., arsenic). To undertake such studies on multiple compounds would be an enormous undertaking. DOE considers, due to the considerations summarized herein, that use of the matrix effect is both scientifically defensible and conservative. Therefore, the matrix effect values stated in the OU5 HHRA were not changed. However, additional text was added to support this approach. DOE agrees that the use of the deposition factor is inappropriate if the respirable fraction is used or if suspended particulates are expressed as PM_{10}. This parameter was originally added to the sitewide exposure factor tables in response to a request by EPA representatives at the December 12, 1994, meeting. The disposition factor was removed from the exposure factor tables and from the intake equations; the risks were recalculated for the inhalation pathways. With regard to respirable fraction, DOE changed the exposure factor table for the inhalation exposure route to 0.46 and 0.36 for the RME and CT PM_{10} values, respectively, as requested by EPA and CDPHE in correspondence dated December 13, 1995. These values were included in	

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				the exposure factors table for use in those cases in which the only available air particulate data were for total particulates. In all risk assessments using modeled PM_{10} concentrations or the PEF to calculate the air concentration, such as were done with the RFETS risk assessments, the respirable fraction in the intake equations were set to 1.	
		Sec 6.0	16. Intake equations for some exposure pathways listed as "significant" or "insignificant" in the conceptual model (CM) and for which exposure parameters have been presented in Appendix M have not been included in the text. The following pathways that were listed as significant or insignificant in the CM for which the intake equations are not presented in the text are an inhalation of indoor VOCs and dermal contact with soil. According to the CM, these pathways have been determined to be complete. Therefore, the HHRA should include intake equations and calculated RME and central tendency (CT) risks for the appropriate receptors, which are future onsite office workers for inhalation of indoor air VOCs; current and future onsite office workers; future onsite construction workers; future onsite ecological researchers; and future onsite recreational receptors for dermal contact with soil. According to the text, "both significant and insignificant	Intake factors for the inhalation of indoor VOCs were not calculated because no VOCs were identified as COCs in either groundwater or subsurface soil. In addition, the modeled air concentrations for basement air (Tables 5-37 thru 5-39) were inappropriately calculated using maximum VOC concentrations identified in the IHSS 115 soil-gas survey. Also, the agencies agreed that the office worker would not be an appropriate receptor for AOCI (IHSS 115) since the landfill would not physically support the construction of office buildings; this receptor has been removed from the risk assessment estimates for AOCI. A statement to this effect was added to Section 6.4.2 and to Table 6-27. As shown in several of the risk tables, estimates due to dermal absorption of chemicals in both surface and subsurface soils were calculated. With regard to the ingestion of fish from Woman and Walnut	

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			pathways will be evaluated quantitatively." Therefore, the calculation of total carcinogenic risk or noncarcinogenic hazard should include these pathways. In addition, the ingestion of fish from Woman and Walnut Creeks was not further evaluated in the risk assessment. Further recreational activities may include fishing; this pathway should be evaluated for open space users.	Creeks, there are currently no viable game fish populations thriving in either of these creeks. Also, indications are that future stream flow would likely be reduced due to reduce infiltration, thus further lowering the likelihood that these streams will sustain a viable game fish population. It was agreed upon by the agencies that this pathway would not be assessed; however, should stream conditions change in the future and fish are caught onsite for human consumption, DOE will re-visit this pathway.	
		Sec. 6.0	17. Some of the exposure parameters used to estimate risk are not EPA default values. Therefore, it is necessary to provide site-specific information or rationale. The following should be supported with additional information: • CT exposure duration for occupational workers (4 years instead of default value of 5 years). • CT inhalation rates (0.63 cubic meters per hour [m^3/hr] instead of default value of 0.83 m^3/hr). • CT and RME parameters for ecological researchers and future residents: - Ecological worker: RME dermal surface area (4,700 sq centimeters [cm^2] instead of default value of	With little exception, all of the exposure parameters shown in tables in Appendix M have been extensively discussed with and approved by EPA and CDPHE. Rationale for selecting each of the exposure factors is provided extensively in the footnotes to these tables. No further changes to the exposure factors will be made unless noted within these comment responses.	

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			5,300 cm^2). Exposure frequency (65 days per year instead of default value of 242 days per year). Exposure duration (2.5 years instead of default value of 19 years). - Future residents: RME dermal surface area, for surface water (18,150 cm^2 instead of default value of 19,400 cm^2). For CT exposure parameters, Superfund's Standard Default Exposure factors for the Central Tendency and Reasonable Maximum Exposure (EPA 1993) should be consulted. For ecological researchers, exposure parameters that are representative of exposures for the RFETS area have been provided in the Rocky Flats Plant Final Human Health Risk Assessment Template (EPA 1994a). The exposure parameter values presented in the OU5 HHRA have not been approved. According to Dr. Susan Griffin of EPA Region 8, meetings have been scheduled to discuss the use of these parameters, which is a risk management issue.		
		Sec. 6.0	18. The following tables do not include sums of individual chemical risks or hazards: Table 6-87 does not include total RME risk to construction workers for area of concern (AOC) 1; Table 6-112 does not include total RME hazard index (HI) for current workers for AOC 1, Table 6-114 does not include total RME HI for adult	These tables were corrected.	

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			open space users for AOC 1. These totals should be included in the tables to facilitate evaluation of risk or hazard.		
		Sec. 6.0	19. The toxicity values for dermal contact with soil, sediments and surface water are based on an absorbed dose. If gastrointestinal absorption factors were used to adjust toxicity values for absorption, they should be presented. If estimates of the gastrointestinal absorption fraction are unavailable, the text should indicate whether default oral toxicity factors were used to assess dermal exposure. Using unadjusted oral toxicity values can greatly underestimate risks associated with dermal exposures because oral toxicity values are based on administered, rather than absorbed, doses. Toxicity factors based on administered (rather than absorbed) dose underestimate the amount of chemical available to cause a particular adverse health effect. When dermal exposures are assessed using the unadjusted toxicity values, risk can be underestimated by a significant amount.	EPA (1989, 1992) recommends using oral toxicity factors adjusted, if possible, by a gastrointestinal absorption fraction, to evaluate toxic effects from dermal contact with potentially contaminated media. Unadjusted oral toxicity factors were used when estimating the risk from exposure to media via dermal contact. Text was added to justify and clarify the use of oral toxicity factors.	
		Sec. 6.0	20. It is unclear whether the arithmetic or geometric mean was used as the exposure point concentration to calculate the 95 upper confidence limit (UCL) for data that were lognormally distributed. The use of the geometric mean to calculate the 95 UCL	The 95% UCLs were calculated using the arithmetic means. The text was changed to clarify this.	

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			is incorrect and may underestimate exposures. The 95 UCL of the arithmetic mean should be used as the exposure point concentration for all COCs. The 95 UCL of the arithmetic mean should be used as the exposure point concentration even for lognormally distributed data, and the text should be modified to clarify that the arithmetic mean was used.		
		Sec. 6.0	21. A comparison of the maximum detected concentrations of radionuclides presented in Tables 6-3 and 6-6 to the exposure point concentrations reveals that in the same case, the exposure point concentrations are about three orders of magnitude lower than the maximum detected concentration. Examination of the data showed a small number of samples with very high concentrations. These outliers may indicate the presence of a hot spot. According to EPA guidance (1989), hot spots are areas with very high contaminant concentrations that may have a significant impact on direct contact exposures. A hot spot analysis should, therefore, be implemented using appropriate statistical methodology, and the results reported.	The high radiation concentrations were detected in surface soil samples collected in 1993. During August and September 1993, these uranium hot spots at the landfill were removed. The data remained in the database and were analyzed with the rest of the data. A note was added to Tables 6-3 and 6-6 to provide this information.	
		Sec. 7.0 ERA Figures F2-8 &	22. The exposure pathway models (Figures F2-8 and F2-9) for the drainage's assume the primary sources of contaminants in the watersheds are contaminated surface and	The authors recognize that the ultimate sources of contamination are the materials that were spilled, disposed of, or otherwise released from original contaminants.	

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		F2-9	subsurface soils in the IHSSs. The soils should be considered secondary sources, however. The IHSSs themselves, such as the trenches or landfills, should be considered the primary sources of contamination. The models should be revised to reflect this distinction.	However, for purposes of identifying exposure pathways, soils affected by the initial releases are the starting point for the pathways. The text was revised to reflect this point more clearly.	
		Sec 7.0 ERA	23. Ecological effects caused by the contaminants from OU7 do not appear to be included in the Walnut Creek assessment. Statements throughout the text indicate that the landfill pond dam controls the movement of contaminants in groundwater and surface water. The effects of that contaminated water on wildlife using the pond and the area surrounding it are not discussed or evaluated. The Walnut Creek ecological assessment should include an evaluation of contaminant effects of OU7 on the Walnut Creek drainage.	At the time the watershed risk assessments were prepared, the Present Landfill (IHSS 115) and the East Landfill Pond were to be covered under a "presumptive remedy" approach of evaluating risk. In addition, ecological risks at OU7 were being addressed by a similar, but separate risk screening. Adding these areas to the ERA will require a significant effort in revising the text, tables, and figures. The ERA for these areas will be presented in the Phase I IM/IRA Decision Document and Closure Plan for Operable Unit Seven (OU7) Present Landfill, dated March 1996.	
		Sec 7.0 ERA	24. It is not clear from the discussions and tables whether the polychlorinated biphenyl (PCB) Aroclor 1260 is an ecological chemical of concern. Most of the analysis and discussion refers to Aroclor 1254, but Figure F5-11 shows the combined mean concentrations of Aroclor 1254 and 1260 for the A- and B-series ponds, which indicates that the two compounds were evaluated	The text was revised to clarify that total PCB was assessed.	

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			together. The text should discuss the PCB evaluations in more detail.		
		Sec 7.0 ERA	26. The text states that Higley and Kuperman (1195) was the basis for calculation of radiological exposures. EPA raised significant issues regarding some of the procedures described in that document that have not been resolved. The ecological risk assessment should describe the procedures used to determine the exposure of ecological receptors to radiological contaminants in the text and should not refer to a methods document that has not been entirely accepted by the regulatory agency.	The methods used to develop radiological benchmarks will be reviewed and revised to address EPA comments. The radiological benchmark document then will be revised and the effects of revisions on interpretation of risk screening in the ERA was characterized. Unfortunately, the author of this document is unavailable to respond to these comments and complete the document until this summer. As soon as the EPA is satisfied with the radiological benchmark document, replacement pages will be issued to the ERA in Appendix N.	
		Sec 7.0 ERA	27. Considerable effort is devoted to describing the effects of the RFETS on the benthic macroinvertebrate communities of the aquatic systems. However, it is not clear from the information provided whether consistent collection methods were used at all pond locations and all stream locations, or whether samples were collected from the creeks and ponds at similar times of the year. Different sampling methods or collection dates that are staggered over a year could result in seemingly incongruous results. More information on the conditions of the sampling events themselves would be useful to identify or eliminate possible sources of the unexpected differences.	All available (and acceptable) data were used in evaluation of aquatic communities. The data resulted from several sampling efforts that occurred at different times and may have involved different methods. The text was revised to more clearly identify the possible uncertainties resulting from diverse data sets. Please note that the ecological data were used only in qualitative fashion to determine whether trends in predicted toxicity and toxicity tests were consistent with evaluation of benthic communities.	

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		Sec 7.0 ERA	28. The analysis of effects on benthic macoinvertebrates includes a brief discussion of the pollution tolerance values used to evaluate benthic community health. Those values were developed specifically as a tool to identify systems affected by organic pollutants, such as those released by wastewater treatment plants. The organisms identified as tolerant or intolerant to organic pollution should not be used to determine whether the presence of metals in the system is having an effect on the benthic community. The discussion should be eliminated or its relevance discussed in more detail.	The pollution tolerance values used in the analyses were taken from the Idaho Department of Environmental Quality (IDEQ) bioassessment methodology. The IDEQ methods include use of tolerance values and functional classifications that have been adjusted for used in situations other than industrial organic contamination.	
		Sec 7.0 ERA	29. It appears from the text that radionuclides were evaluated only from the standpoint of their radiological effects and not from the standpoint of the potential toxic effects of the metals themselves. The text should discuss the rationale behind evaluating only radiological effects.	Constituent toxic effects of metals for which radioactive isotopes were evaluated were not considered because toxicity due to radiological exposure occurs at concentrations much lower than chemical toxic effects.	
		Sec 7.0 ERA	30. Seeps do not appear to be evaluated from either a contaminant presence or benthological community standpoint.	Potential toxicity of water from persistent seeps was included in the surface portion of risk screens.	
		Sec 7.0 ERA	31. References to the ORNL database as a secondary source should be replaced wherever possible with reference to the primary scientific literature cited in the database to derive TRVs.	Benchmarks taken from the ORNL data base were derived by methods presented in that document based on original (primary) scientific literature. Therefore, the citation of ORNL as the source for the benchmark is	

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				accurate. Where the basis for the benchmark is discussed (e.g., in the risk characterization), the primary literature source is cited and discussed.	
		Sec 7.0 ERA	32. Figures F5-14 and F5-15 indicate that surface soil samples were not co-located with biota samples (terrestrial invertebrates and small mammals, respectively), - certainly not in space and perhaps not in time either. This problem with sampling design makes it difficult to draw meaningful conclusions regarding the relationship between media contamination (chemical or radionuclide) and uptake into biota, as is done in several places in this document.	Some biota and soil samples were colocated and the data used in the risk characterization for ECOCs. However, data used in the preliminary risk screening was a composite of all samples available for a given area. This was necessary to make the best use of the large amount of data collected during RFI/RI field work that was not directly associated with biota sampling	
		Data Quality Appendix O	33. In Appendix O, the text does not indicate where analytical results for quality assurance/quality control (QA/QC) samples (particularly blank samples) can be located. Knowing the location of the QA/QC sample results allows for verification of data usability. A reference to QA/QC sample results should be provided.	All data are available in the Rocky Flats Environmental Database System (RFEDS). QC data are indicated by the QC variable. A QC variable of LR (lab replicate), RNS (rinsate), FB (field blank), MS (matrix spike), MSD (matrix spike duplicate), TB (trip blank), UNKN (unknown) indicate QC sample data. A QC code of REAL or DUP indicates true sample data. The 'partner" variable indicates the QC sample partner, which is the real sample associated with the QC sample.	
		TM15	34. The presentation of the quarterly sampling program at OU5 is unclear.	The presentation of the quarterly sampling program is described in the Final Submittal of TM15, which was approved by the EPA.	

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			• Table 2-6 of the RFI/RI report lists all wells from which groundwater samples were collected for analysis between December 1994 and February 1995 (1st quarter). This table includes wells installed as part of the more recent investigation (1994 to 1995) and wells installed before 1994. However, the groundwater monitoring program conducted before December 1994 has not been fully described. Because data collected before 1994 were used for the HHRA, the quarterly monitoring program for this time period should be explained.	Analytical data for groundwater through second quarter 1995 can be found in Appendix E.	
		TM15	35. The lack of sufficient groundwater quality data downgradient of individual hazardous substance site (IHSSs) 115 (landfill) and 133 (ash pits) was commented on by PRC in reviewing TM15. • Additional boreholes, monitoring wells, and well points were installed downgradient of IHSSs 115 and 133. Samples collected from these locations would provide additional groundwater quality data downgradient of the landfill and ash pits. However, the sampling conducted at these locations is not adequately described.	Comments presented to DOE from PRC via EPA were formally addressed and agreed upon dispositions were incorporated into TM15 prior to submitting the Final TM15. TM15 is a controlled document and is available in the Administrative Record. • First quarter groundwater is included in the report. Second quarter groundwater data were collected and added to the final report, in Appendix E.	
		TM15	36. The data was presented only as a function of whether data are above or below	See response to EPA comment #2.	

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			BUTLs. • See Section 2.1, General Comment 2, first bullet, page 2 of these review comments.		
	2-3	2d para	37. The text states that data generated under the TM 15 investigation (1994 and 1995) were not used for the HHRA; instead, only data generated to 1994 were used. The text states that a comparison of pre-1994 and 1994/1995 data was necessary to evaluate any potential impacts to the conclusions of the HHRA, and that these potential impacts a discussed in Section 2.3. There is no section or discussion of potential impacts in this report. The text should be modified to provide this evaluation.	The text was modified to refer the reader to Section 6.6.3.1.	
		Sec. 2.2	38. This section discusses the results of precision based on field replicate samples. However, no discussion of qualification of sample results associated with unacceptable relative percent differences (RPDs) was included. Discussion of qualifications for sample results associated with unacceptable RPDs should be included to provide a comprehensive evaluation of precision based on replicate samples.	In general, those sample pairs exhibiting poor RPDs are qualified as "estimated" concentrations. An estimated concentration is defined as a concentration that is greater than the IDL but less than the CRDL. Such results are qualified with a B for inorganics and a J for organics. Additionally, for radionculides the size of the "error" term should be compared with the value of the result; a relatively large error term will probably be associated with relatively poor reproducibility.	
		Table 2-10	39. This table presents a summary of organic compounds detected in groundwater samples. The table heading shows	The text was corrected.	

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			concentrations posted in micrograms per kilogram (µg/L). This discrepancy should be corrected.		
		Fig. 3-4	40. This figure is a bedrock map of OU5. The faults are not identified as such under "Map Symbols" in the legend. The word "fault" should added to the legend.	The word "fault" was added to the legend.	
	3-34	Para 2 & Fig 3-25	41. The text states that the Upper Hydrostatigraphic Unit (UHSU) potentiometric surface for water levels measured September 1994 are presented in Figure 3-25. The title block for Figure 3-25 states that the UHSU potentiometeric surface on water levels measured October 19 to 24, 1994. This discrepancy should be corrected.	This discrepancy was corrected.	
	4-5	Last para.	42. This paragraph discusses the extent of organic COCs in IHSSs 115 and 196 for surface soil and also refers to Table 4-3. The text states that the highest concentrations of organic COCs were detected at location SS510593 and were found at concentrations greater than 10 times the reporting limit. All concentrations shown on Table 4-3 for this sample are 100 times the reporting limit The text should be corrected to be consistent with the table.	The text was corrected to ". . .100 times the reporting limit."	
	5-65	Para. 6	43. Equation 5.3.3-4 for fugitive particulate emission rate calculation due to wind	The equation, as noted on the comment sheet, is correct and was a typographical	

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			erosion is incorrect. The equation is given as $E_{pm} = 6.19311E\text{-}05u^2 - 1.90684u + 1.39295E\text{-}02$. The equation should be $E_{pm} = 6.19311E\text{-}05u^2 - 1.90684E\text{-}03u + 1.39295E\text{-}02$. Insufficient data were available to recalculate the modeled particulate emission rates that are reported in the text. The equation should be corrected and the modeled particulate emission rates rechecked.	error in the text. Modeled results used the correct equations.	
	5-67	Para. 2	44. This paragraph describes the meteorological input derivations. The explanation is incomplete. It is necessary to discuss how the 1-hour meteorological averages were derived and to give more information on the estimation of mixing heights. These inputs are crucial in the calculation of accurate air concentrations. This additional information should be included to provide a comprehensive discussion of these derivations.	The text was clarified.	
	6-21	Sec. 6.6.1	45. The text states that "specific intakes are compared to the applicable chemical-specific toxicological data. . .to determine the potential CT and RME human health risks. The potential human health risks from each COC are calculated to determine potential carcinogenic effects and to determine potential noncarcinogenic effects." This	This section was expanded.	

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			statement is misleading. Quantifying risk for carcinogenic effects does not involve a comparison of chronic daily intake (CDI) to slope factors (SFs). Rather, SFs "convert estimated daily intakes averaged over a lifetime of exposure directly to incremental risk of an individual developing cancer" (EPA 1989). Risk is a unitless probability of developing cancer. Noncarcinogenic effects, however, are evaluated by calculating a ratio of the calculated dose to a reference dose. The text, which describes quantification of both risk and hazard as a comparison of the CDI to toxicological data, should include an explanation distinguishing carcinogenic risk (a probability) for noncarcinogenic hazard (a ratio).		
	6-9	Sec. 6.3.1, 3d Para.	46. The text states that future land use will likely include industrial complexes at the developed portions of the site. However, Table 6-26, Summary of Current and Future Land Uses, lists future onsite commercial/industrial use as an improbable exposure scenario. Table 6-26 should be corrected to be consistent with the text if future commercial/industrial use is a probable exposure scenario at OU5.	"The Site" in Section 6.3.1 refers to RFETS, whereas Table 6-26 lists land uses for OU5. The footnote c does state that commercial/industrial land use is improbable for OU5, but is expected in the developed portions of RFETS.	
	6-10	Sec. 6.3.2, 2d Para.	47. The text states that "because OU5 contributes only a portion of the potential exposures to this receptor, the current and	It was agreed among DOE, EPA, and CDPHE that individual OUs, except OU3, would not assess risks to offsite receptors.	

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			future site resident will not be evaluated further in the OU5 HHRA." Whether the risk to offsite residential receptors is significant cannot be determined until exposure is quantified. The exposure pathways of concern for offsite residential receptors include external radiation, inhalation of particulates, and ingestion of particles that have deposited on soils. While offsite exposure to airborne radionuclides (which then deposit on surface soil) is considered negligible, it is a major concern and should be quantified in the HHRA; this will also be useful in evaluation of remediation alternatives that may increase airborne radionuclide concentrations, therefore, deposition of radionuclides on offsite surface soil).	It was decided that offsite receptors would be addressed on a Sitewide basis, in the sitewide human health risk assessment. This will be done prior to issuance of the final CAD/ROD for RFETS. Text was added to clarify.	
	6-12	Sec. 6.4.1, 4th Para.	48. This paragraph indicates that a 95 UCL could not be calculated for seep water and seep sediments in AOC2 because sample sizes were "small." The text should be revised to specifically include the number of samples. In addition, the maximum concentrations indicated in the concentration/toxicity screen for seep sediment and seep water were not used as the chemical-specific concentrations for AOC 2 (Table 6-29). Therefore, since it was not possible to calculate a 95 UCL for contaminants in	The data used in the concentration/toxicity screen includes all OU5 samples for the specific media. This is because COCs were chosen on an OU-wide basis. After selection of the COCs was complete, the data were aggregated by areas of concern (AOCs). Therefore, maximum concentrations for a chemical in each AOC may differ from the maximum for the entire OU that was used in the concentration/toxicity screen. The number of samples for each media is given in the COC TM11 and in TM15. Text was added to clarify seep information.	

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			seep water and seep sediment samples, the maximum detected concentrations should be used as the chemically-specific concentrations.		
	6-12	Sec. 6.4.1, Last para.	49. The last two sentences that appear on page 6-12 should be deleted. They are repeated on the top of page 6-13.	The text was corrected.	
	6-15	Sec. 6.4.2.4	50. The definitions of parameters used in the equation to calculate intake from ingestion of contaminated water include an IR variable, which is defined as inhalation rate (liters/hour). This should be corrected to read ingestion rate (liters/hour).	The text was corrected.	
	6-16	Sec. 6.4.2.5	51. The definitions of parameters used in the equation to calculate dermal contact with surface water include a conversion factor (CF) of 1 liter/100 cubic centimeters (cm^3), which is defined as the volumeteric conversion factor for water. This should be corrected to read 1 liter/1000 cm^3.	The text was corrected.	
	6-17	Sec. 6.5, Last para	52. The text states that Table 6-30 provides a summary of OU5 COCs and information on their toxicity. This should be corrected to read Table 6-31.	The text was corrected.	
	6-21	Sec. 6.6.1, First para	53. According to this paragraph, chemical-specific toxicological data are presented in Table 6-41 This should be corrected to read Table 6-31.	The text was corrected.	
	6-24	Sec.	54. The total RME HI calculated for the	The text was corrected.	

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		6.6.2.1, Last para	construction worker in AOC 1 listed as 0.04E-02 should be corrected to 4.0E-2. The HI listed in the text, which is a typographical, is two orders of magnitude lower than the HI listed in Table 6-111 and should be corrected.		
	6-25	Sec. 6.6.2.2, First para	55. The total RME risk for the current worker receptor in AOC 1 listed as 3E05 should be corrected to 3.OE-5. The risk listed in the text, which is a typographical error, is ten orders of magnitude higher than the risk listed in Table 6-90 and should be corrected.	The text was corrected.	
	6-25	Sec. 6.6.2.2, 2d para	56. The RME hazard index for the current worker at AOC 1 listed as 0.07E-02 should be corrected to 7.0E-2. The CT hazard index for this receptor at AOC 1 listed as 0.01E-02 should be corrected to 1.1E-2. The total RME HI for this receptor at AOC 2 listed as 0.0005E-04 should be corrected to 5.OE-4. These hazard indices, which are typographical errors, are not consistent with Tables 6-112, 6-118, and 6-124, respectively, and should be corrected.	The text was corrected.	
	6-34	Sec. 6.6.3.3, Last para	57. The maximum lead concentration detected in groundwater (240 µg/L) was inappropriately compared to the EPA screening level for lead in solid for residential land use (400 parts per million [ppm] (EPA 194b). The federal action level for lead in water, which is 15 µg/L, should	The comparison of lead concentrations in groundwater to soil screening levels was corrected. The section in the uncertainty section that discusses lead was expanded. The exclusion of lead as a COC was extensively discussed and agreed upon at	

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			be used to evaluate lead in groundwater (EPA 1994c). In addition, the concentration of lead (935 milligrams per kilogram [mg/kg]) in subsurface soil was attributed to samples of waste materials encountered during drilling. For this reason, lead was determined to be immobile in soil and not readily available for human intake. This is not a reasonable justification for the elimination of lead as a significant contributor to the human health risk associated with OU5. If the waste material has been determined to be immobile (has no transport media), the exposure point may be contact with the waste material itself. Construction workers have been evaluated as potentially exposed human receptors at OU5. Therefore, construction activities could result in exposure to waste materials in subsurface soil. Additionally, depending on the depth of waste material, other receptors (ecological researchers, recreational users, and office workers) may potentially be exposed. Therefore, lead should not be eliminated as a COC in subsurface soil since it is present above soil screening levels and construction workers could come into contact with it.	the OU5 interagencies meeting to finalize the COC list.	
	6-18	Sec. 6.5.1, Last	58. It is stated that reference concentrations (RfCs) may be converted to a	The RfCs were converted to RfDs by the stated methods. No adjustments using	

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		Para.	corresponding inhaled dose milligrams per kilogram per day (mg/kg-day) by dividing 70 kilograms (kg), multiplying by 20 cubic meters per day (m^3/day), and adjusting by an appropriate absorption factor. This is correct; however, if RfCs are adjusted, the appropriate absorption factors should be clearly document. The HHRA should include a table of any absorption factors used in the adjustment of RfCs.	adsorption factors were made, as recommended by EPA guidance.	
	5-1, Table 5	Appendix M	59. Body weight is not included in the exposure factors table for dermal contact with surface water. All parameters used in the intake calculations should be included in the exposure factors tables.	The text was corrected.	
	6-16	Sec. 6.4.2.6	60. The exposure frequency ratio (EF_r) parameter used to calculate external radiation exposure is not consistent with the intake algorithm presented in the Rocky Flats Risk Assessment Template (EPA 1994a). The template does not list EF_r parameter should be excluded from the equation for calculation of exposure through external radiation.	The exposure frequency ratio EF_r is calculated by dividing the exposure frequency for each exposure-scenario by the number of days in a year. This allows the units to work out correctly. This is explained in footnotes to the exposure tables in Appendix M. The exposure frequency term must be included in the equation.	
	6-36	Sec. 6.7.1.1	61. The definition provided for "effective dose equivalent" (EDE) could be misleading. The text suggests that EDE could be used to estimate the health-effects risk of the exposed person. The International Commission on Radiological Protection (ICRP) has established specific tissue	Sentence 2 of the last paragraph on page 6-36 was deleted.	

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			weighting factors and quality factors which depend on the type of radiation of concern (EPA 1988b). In addition, the ICRP has developed dose versus risk estimates for different types of radiation (EPA 1988b). However, for the purposes of developing excess lifetime cancer risks, EPA has organ weighting factors and quality factors, which differ substantially from the ICRP methodology. The text should be revised to make this clarification. The EDE can be used only to compare with acceptable radiation exposure limits.		
	6-40	Sec. 6.7.2.3	62. This section indicates that dose conversion factors (DCF) for external exposure are provided in Table 6-144 in units of millirem per year per picocurie per gram (mrem/yr per pCi/g). However, Table 6-144 provided DCFs in terms of mrem/yr per picocurie per square centimeter (pCi/cm^2).	This typographical error in the table was corrected.	
	6-42	Sec. 6.7.4.3	63. With regard to external radiation from surface soil, two pathways should have been examined, yet it is not clear if they have been. It appears that photon irradiation from human proximity to contaminated media was considered. However, it is not clear if irradiation from dermal contact with soils was evaluated and summed with the first exposure. This should be clarified.	EPA guidance (RAGS) specifically states that direct dermal contact is not a significant route of exposure for radionuclides.	
	6-44	Sec. 6.8	64. According to the text, the most	Section 6.8 is a discussion of risk not dose.	

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			significant pathway in AOC 1 for the current worker is exposure to external radiation. However, based on the exposure point concentration of uranium-238 in surface soil and exposure factors in Table 1 of Appendix M, the most significant exposure pathway for the current worker is ingestion of soil. Using the DCF in Table 6-144 for ingestion, the reasonable maximum from ingestion of uranium-238 in soil equates to about 0.258 mrem/yr. Since this value is larger than the combined external dose from all other radionuclides, the text should be corrected.	Risk results shown in Table 6-88 confirm the statement. It should be noted that this assumes a security worker spends 100% of his work time in the AOC. This is extremely unlikely and greatly overestimates probable risk.	
	6-44	Sec. 6.8	65. It is not explicitly clear how external radiation exposures were calculated. Without considering daughter contribution, the low energy gamma emissions from the uranium isotopes would suggest that external exposure would be minimal. Furthermore, alpha emitters taken into the human body result in substantial doses when considering the high linear energy transfer of the incident radiation. Therefore, it could be concluded that the dose from external radiation of uranium-238 would be considerable lower than the dose from internal deposition. Additional information regarding calculation of external exposures should be provided.	Appropriate radiological slope factors were not used in the assessment. They were corrected.	
		Sec. 6,	66. The inhalation cancer slope factor	The inhalation CSF for 1,1-DCE used in the	

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		Table 6-31	(CSF) for 1,1-Dichloroethene (1,1-DCE) is listed as 1.20 (mg/kg-day)$^{-1}$. According to the Integrated Risk Information System (IRIS) (EPA 1995), the inhalation CSF is 1.8E-1 (mg/kg-day)$^{-1}$. This slope factor should be used to calculate carcinogenic risk.	risk assessment appears in the current HEAST. The value of 0.18 (mg/kg-day)$^{-1}$ was calculated from the unit risk given in IRIS. EPA Region VIII confirmed that the HEAST value takes precedence.	
	F2-13	Sec. F2.4.2	67. For the purpose of assessing exposure to terrestrial receptors, surface soils are usually defined as 0 to 2 or 3 inches deep (or 0 5 cm), not 0 to 15 cm as was apparently done during soil sampling to determine contaminant concentrations at this site. Use of the deeper core samples to represent surface soil concentrations may result in the under-estimation of risk from exposure to surficial soils if contaminant concentration decreases with depth.	Section 2.4.2 describes the abiotic exposure points, which are locations where biota may contact contaminants in abiotic media. The 0-15 centimeter (0-6 inches) depth interval was selected because it includes most of the adventitious roots of grassland plant species. This depth interval is also more appropriate for assessing exposure to animal receptors that forage in shallow soils for foods such as roots and insects. Such activity usually involves shallow digging and may extend beyond the upper 5 centimeters (2 inches). Although the 0-15 centimeter depth was selected, a majority of the surface soil sampling was conducted to a depth of 0-2 centimeters. Where possible and appropriate, borehole samples collected on a depth of 0-15 centimeters were used to evaluate this exposure point.	
	F3-8	Sec. F3.2.4.1, 5th para.	68. "However, where the UCL_{95} was greater than the mean, . . ." "Mean" is incorrect. Delete and replace with "maximum".	This sentence was corrected to read "maximum."	

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	F3-9	Sec. F3.2.4.1	69. The equation used to calculate BCFs when experimental data were not available was adapted from Lyman et al. (1982). This is apparently a reference to a book, and as such may not have undergone the same level of peer-review that journal publications usually receive. Has this same equation been published (and used or cited) elsewhere, to establish the validity of the model?	The equation in Section 3 and Lyman et al. 1982, is commonly cited in aquatic toxicology texts. The equation was generated by Veith et al (1979) and is based on the correlation between octanol-water partition coefficient (log Kow [or log P in Veith et al.]) and the BCF for 84 organic chemicals. The text of Appendix F was revised to include a citation of Veith et al. (1979).	
	F3-11	Sec. F3.2.4.1	70. As with the previous comment, the equation used to estimate the concentration of volatile contaminants in an animal burrow was adapted from Maughan (1993), another reference to a book that may not have undergone significant peer-review. Has this same equation been published (and used or cited) elsewhere? It is essential that we have confidence in the validity and veracity of these models, since their outputs form the basis for conclusions regarding potential risks associated with some media and sources.	The estimation of burrow air concentrations in Appendix F and Maughan (1993) is merely an application of the Ideal Gas Law and Raoult's Law. These laws describe physical properties of gases with regard to the effects of temperature and volatility (vapor pressure) on the partitioning of chemical between gas and liquid phases. (see Moncrief and Jones 1977 or another physical chemistry textbook.) The use of these properties in Appendix F is limited to estimating the concentrations in burrow air assuming the burrow is a closed system and the partitioning between soil and air reaches equilibrium. The screening-level estimates included no assumptions about burrow use, bioavailability, or respiration rates that may be affected by biological variability.	
	F3-16,	Sec.	71. Add the following sentence (or its	This sentence was added.	

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	3rd Para.	F3.2.7.2	equivalent) to this paragraph: "There are often significant and unpredictable differences in the relative abilities of different species to absorb, metabolize and excrete xenobiotic compounds, such that NOAELs can vary by orders of magnitude even between closely related taxa. This source of uncertainty usually must be accepted given the lack of information on toxicity of anthropogenic chemical contaminants in most wildlife species".		
	F3-24	Sec. F3.3	72. Classification as an essential nutrient is not in itself sufficient justification for excluding a contaminant from the list of potential ECOCs, since essential nutrients (e.g., iron, copper, zinc) can be toxic at concentrations in excess of dietary requirements. Essential nutrients are usually screened out as such, but there can be exceptions if the exposure is enough to cause saturation of normal regulatory mechanisms, allowing concentrations in target organs to increase to toxic levels. This statement needs to be qualified to reflect this.	A statement regarding the potential toxicity of essential nutrients was included in the text. Please note that copper, zinc, or other heavy metals were not included in essential nutrients because of their potential toxicity.	
	F4-15	Table F4-1	73. The Terrestrial Raptor receptor type is missing from this table.	Terrestrial Raptors were incorrectly excluded from Table 4-1. This mistake was corrected.	
	F5-19	Sec. F5.3.1	74. Use of the $UTL_{99/99}$ concentration of chemical contaminants in the background to compare to site concentrations is not an	In fact, the value of the UTL approaches the value of the background mean plus two standard deviations when the sample size	

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			appropriate means to determine if soil concentrations exceed background, since the UTL is a rather inflated estimate of the background condition.	(n) is large. That is, the tolerance factor *decreases* as sample size increases, with the UTL = mean + (std. dev * tol. factor). Because the sample populations for background media are generally large (some have n > 300 samples), the UTL generally gives a fair estimate of background concentrations. In addition, as noted in the Groundwater Geochemistry Report (EG&G, 1995), the concentrations and activities of constituents appear to show an increase as groundwater moves downgradient through entirely background areas (i.e., the geochemical evolution of background groundwater). In short, the value of the UTL is believed to be a fair estimate of the upper bound of background concentrations. If the normal UTL is skewed by a high-value outlier, then lognormal or nonparametric UTL can be calculated. Of course, any use of statistics requires the application of professional judgment.	
	8-1	Appendix M, Table 8	75. Body weight for future onsite residents is listed as 7070 in this table. It should be corrected to be 70 kg for the RME and 70 kg for the CT.	The text and calculations were corrected.	
	0-4	Para. 2	76. The acceptable RPD range is referenced to the OU5 work plan. The OU5 work plan references specific methods or data validation guidelines for acceptable RPDs.	The acceptable limits for RPDs are defined in the QAPjP (EG&G, 1991) and in the GRRASP (EG&G, 1991).	

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			The text should identify the primary reference for acceptable RPDs.		
	0-8	Para. 1	77. The first sentence of this paragraph states that laboratory accuracy is assessed through "percent RPD." However, laboratory accuracy is assessed through percent recovery. This statement should be corrected.	Agreed, precision and accuracy are confused in the text. Laboratory accuracy is assessed through spike recoveries and analysis of standards, whereas precision is assessed through the analysis of duplicate samples. Additionally, "percent RPD" is redundant, because it means "percent relative percent difference." The text was corrected accordingly.	

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REVIEW COMMENT SHEET

Return comments to: Carol Bicher (Name) 080 (Bldg.) 966-9100 (Phone) 8663 (fax) Comment Due Date: January 23, 1996

Document: RF/ER-95-0098 (Number) O (Rev) Final-Draft (Draft or Final) OU5 RFI/RI Report (Woman Creek Priority Drainage) (Title)

General (G) comments require resolution but do not require resolution acceptance. Mandatory (M) comments require resolution and resolution acceptance. 1 A03-PPG-004 provides complete definitions of General and Mandatory comments.

TYPE G or M	PAGE	SECTION or LINE #	COMMENT	DISPOSITION	Disposition accepted initial & date
	ES-4 and 10-3	Exec Summary & Sec 10.1	1. Maximum cancer risks in both AOC1 and AOC2 exceed the 1E-6 point of departure. It is the position of CDPHE that excess cancer risk must be below 1E-6 to warrant no further action.	These sections were rewritten to conform with the No Further Action (NFA) decision criteria established for RFETS.	
	ES-4 and 10-2	Executive Summary & Sec 10.1	2. It would be useful to add to the statement about health risks to offsite receptors not being addressed on an OU-specific basis, that these risks will be addressed on a site-wide basis in the final site-wide ROD.	A statement concerning offsite receptors was added to these sections.	
	ES-5 and 10-4	Executive Summary & Sec 10.2	3. A recommendation for no further action is inappropriate in an RFI/RI document.	This statement was modified to conform with the NFA decision criteria.	
	1-4	Sec 1.2.2.1	4. In the IHSS 133 subsection, the meaning of "time domain electromagnetic area" is not	The text was modified to provide clarification.	

____ No Comments

CDPHE Representative, Carl Spreng (Reviewer's Name) _____ (Signature)

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Resolutions Accepted

_____ Signature _____ Date

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			explained. The reference to "two additional ash pits referred to as TDEM-1 and TDEM-2" in the first sentence on page 1-5 is confusing in the context of the previous sentence. Use of the term "incinerator" in this document is not quite correct since the operation in question did not involve a typical incinerator as defined in regulations. This should be clarified in the text.		
	1-5	Sec. 1.2.2.1	5. The second sentence in the last paragraph on this page describes the disposal of depleted uranium. The sentence construction makes it difficult to account for the total amount of uranium attributed to the landfill or the ash pits.	The text was modified to provide clarification.	
	4-3	Sec. 4.3	6. It does not make sense that there are VOCs in seep water, but not in groundwater. Does this inconsistency mean that there are plumes of VOC contamination in groundwater that went undetected by the current well locations?	Summaries of the seep data for OU5 indicate that only one seep has detected VOC concentrations. This sample was collected at a well point installed just downgradient of the seep northeast of the landfill (62893). Actually, the VOCs were not detected in the surface seep, but in the groundwater (10-15' bgs) associated with this seep. The text was modified to explain this. The sitewide VOC plume map prepared by RMRS Geosciences for the RFETS Groundwater Strategy does show this	

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				sample as part of a VOC groundwater plume originating instead from the IA and migrating south. This plume, which shows concentrations of VOC exceeding MCLs (TCE and PCE) will be further investigated through the Sitewide Groundwater Strategy.	
	4-3 thru 4-16	Sec. 4.3	7. The data showing the extent of contamination is well presented in this section. Descriptions are generally clear and the division of chemical concentrations into levels 1-5 helped present the data in a coherent and organized fashion.	No response required.	
	4-8	Sec. 4.3.1.3	8. Dissolved barium and manganese are the dominant metal COCs associated with IHSS 115, although their distribution does not seem to be correlated with waste materials. Is there any evidence that these chemicals can be associated with background media? What concentrations of these metals are found in the subsoil in this area? Did the fill material used in the landfill come from onsite or offsite sources?	Barium and manganese concentrations were greater than background for both subsurface soil and groundwater according to the results of the statistical comparisons performed using the methodology, which was agreed upon by DOE, EPA, and CDPHE. The number of significant tests make it impossible to argue that these are below background, regardless of their source. See the COC TM. Although not substantiated in writing, interviewed sources seem to recall that the fill material was obtained onsite.	
	4-9	Sec. 4.3.2.2	9. The parenthetical reference to Figure 4-4C should be to Figure 4-4D.	The reference was changed to Figure 4-4D.	
	4-12	Sec. 4.3.3.1	10. Why weren't water samples collected from the C-Series ponds as part of the OU5	The justification for not collecting additional surface water samples in the C-	

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			RFI/RI? Was it the data collected regularly as part of the site-wide sampling program used for risk assessment of surface water? This report should clearly state which data are used in this assessment. Otherwise, it is difficult to determine whether the data that was used meets the data quality required for use in a human health risk assessment per EPA's Guidance for Data Usability in Risk Assessment (Part A) Final (9285.7-09A).	Series ponds as part of the OU5 RFI/RI is documented in the agency-approved Technical Memorandum No. 1, Revised Network Design, Section 5.3 Summary of Recommended Field Sampling Plan (FSP) Revisions. This section recommends that no additional Pond C-1 data will be obtained except data collected as part of the environmental program (e.g., NPDES sampling). In Pond C-2, quarterly multiple water-depth interval field measurements will be made for water-temperature, pH, Specific Conductivity (SC), and Dissolved Oxygen (DO) to assess thermal and/or chemical stratification. The reason this decision was made and agreed to by the stakeholders was the abundance of data already available from on-going sampling programs at the C-Series ponds. A list of the data sources is provided in Table 1 of TM1. Information used to characterize the pond water quality was collected as part of the NPDES permit, as well as weekly, monthly and quarterly sampling surveillance data from on-going or recently discontinued or reduced sampling and analytical programs. This information is detailed and summarized in Volume A1 Hydrologic Data Summary to the OU5 Phase I RFI/RI Report.	
		Table 4-7	11. The title should be "Summary of Metal	The text was corrected. Groundwater data	

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			COCs Exceeding Background in Groundwater", not ". . .in Subsurface Soil". Also, where is the organic data for groundwater?	are available in Appendix A and Appendix E. Appendix E contains the groundwater data collected from the TM15 field program.	
		Table 4-8	12. Where is the data on plutonium and americium in groundwater? Both of these chemicals are COCs in groundwater (Table 6-25).	Appendices A and E contain the OU data. Appendix A, the Hydrologic Data Summary, contains the data collected prior to the implementation of TM15. Appendix E contains the data collected during the implementation of TM15. Furthermore, Table 4-8 contains data for americium that exceeded the background mean. While Pu-239/240 did not exceed the background mean, it was selected as a COC based on the concentration/toxicity screening (>5% detection frequency).	
	5-2	Sec. 5.1	13. This report does not assess inhalation of VOCs that have infiltrated into basement air, even though that possibility is discussed on page 5-2 and shown in Figure 5-3. If any of the VOC plumes coincide with any of the AOCs that were evaluated, VOC inhalation from basement air should have been evaluated.	VOCs were not identified as COCs in groundwater or subsurface soils. Therefore, this pathway could not be evaluated. A statement was added to make this clear in Section 6.4.2 and Table 6-27. Also, the maximum concentrations of VOCs detected during the soil-gas survey were incorrectly used to calculate/model the VOC concentrations that were to be used to estimate risk from basement VOCs. In addition, these data were obtained at the landfill (AOCI), which could not structurally support office buildings. The office worker was deleted from the risk estimates as a receptor.	

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	5-54 & 5-59	Sec. 5.3.3 & 5.3.3.5	14. The discussion of air modeling gives the impression that FDM is a validated model, which is not correct. It is sponsored by EPA, but has not yet undergone validation.	Page 5-54 was not revised because it does not imply that FDM is an EPA-approved model. Page 5-59 was revised to clarify that FDM has not been approved by EPA.	
	5-65	Sec. 5.3.3.5	15. In equation 5.3.3-4, the number 1.9068u is incorrect; the number should be 1.90684E-03u.	The equation was corrected.	
	5-64	Sec 5.3.3.6	16. The discussion on average wind speed is misleading. While it appears to be correct that a sustained wind of one hour duration will scrub out most if not all of the immediately available suspendable particles, there are other possibilities. While hourly averages may be below the threshold only because of a short duration in which wind speed drops drastically, the major part of the hour may be at or above the threshold and yet not be counted. Additionally, gusting should be accounted for. The particle pick-up by gusty winds is often greater than that of a sustained wind due to hard jolts and other mechanical action.	The average wind speed determined in the OU3 wind tunnel study was used for the air dispersion modeling of wind-resuspended contaminated soils at OU5. This selection was considered to be conservative because soils at the OU5 site generally display more non-erodible elements than at OU3 locations and are not disturbed. In addition, the OU3 wind tunnel study found that the equations for wind-erosion potential substantially exceed the measured erosion potentials for the highly disturbed surfaces tested in OU3. Consequently, the wind speed values reported in the OU3 wind tunnel study were applied to the air-dispersion modeling for OU5 as a more conservative approach.	
	6-10	Sec. 6.3.2	17. What is meant by the statement, "Also, to be conservative, the site-specific exposure factors for the current onsite industrial worker will be used for the current onsite security worker"? By definition, the current onsite industrial worker has always been	This was clarified. References to "current onsite industrial worker" were replaced with "current onsite security worker". The use of the industrial worker exposure factors is conservative because it assumes the security worker would spend 8 hrs/day	

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			the onsite security worker. This is a confusing statement and should be clarified, since this is a public document.	in one AOC. This is highly unlikely and greatly overestimates the risk.	
	6-12	Sec. 6.4.1	18. The last sentence on this page starts out, "Stream sediment", but is not completed on page 6-13. Please provide the missing text.	The text was corrected.	
	6-13 & 6-15	Sec. 6.4.2.1 & 6.4.2.3	19. The intake equation contains the fraction ingested from contaminated source factor and the matrix effect factor, and these factors have been applied to the CT calculations. Both of these factors are the subject of continued debate among DOE and the regulators. The regulators have tentatively agreed that it is appropriate for the risk assessment contractors to use the fraction ingested from contaminated source factor for industrial worker receptors, since the time spent at work does not appear to be double counted in the determination of this factor. However, this factor would not be appropriate to use in calculating intakes (either ingestion or dermal) for a residential receptor, since DOE's proposed fraction did double count time spent at home. Also not settled among the parties is whether a 0.5 matrix factor is appropriate across the board for many Rocky Flats chemicals if the default factor of 1 is not used. This comment has been made on other risk assessments, and is probably	EPA guidance on calculation of intakes for incidental ingestion of soil includes the use of the parameter "fraction ingested from contaminated source." In RAGS (EPA, 1989) guidance is given to consider contaminant location and population activity patterns." In the EPA draft document on CT and RME values (EPA, 1993), it is "advocated that this factor be *given consideration*" (EPA's italics). In Attachment J2, "Exposure Factors Tables, "all the FC values for soil ingestion are equal to 1.0 in the reasonable maximum exposure (RME) case for all exposure scenario EPA directed this approach in a letter dated April 11, 1995. The CT value for FC is 0.9 for all scenarios used in OU5 except for the open space scenario, which does not include a FC parameter. It has been agreed in discussions with EPA and CDPHE that this is reasonable for noncontact workers at RFETS due to movement of workers around the plantsite. DOE disagrees that use of a soil matrix	

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			expressed in exponential form in combination with the decimal form. For example, the correct HI RME value for AOC1 should be 7E-02, not 0.07E-02.	expressing HI. The value now reads "0.07.".	
		6.6.2.1, 6.6.2.3, 6.6.2.5, 6.7.4.1, 6.7.4.3, 6.7.4.5, Tables 6-28 to 6-30, & all associated risk tables.	23. This report appears to have assessed inhalation of airborne particulates derived only from surface soil. The possibility that sediments or subsurface soil may also be sources of airborne particulates for ecological workers and open space users or for construction workers, respectively doesn't seem to be assessed. All text references are to surface soil as the input to the fugitive dust model. It is unclear from Tables 6-28 to 6-30, whether the fugitive dust model also includes sediments or subsurface soils, too. Table 6-30, for example, includes an air particulate concentration for mercury, when surface soil was not considered for AOC3. Was this concentration derived from the surface soil area sources discussed in Section 5.3.3.6, or was it obtained by modeling pond and stream sediment concentrations measured in AOC3? Because Pu and Am air particulate concentrations are listed in Table 6-28 & 6-29, even though neither of these chemicals are listed as surface soil COCs, it appears the dust model inputs are surface soil inputs, as described in Section 5.3.3.6.	The risk estimates were recalculated to include the inhalation of particulates from subsurface soil by the future onsite construction worker and the inhalation of particulates from sediments by the future onsite ecological worker and the open space user. For those COC exposure point concentrations that were not derived using the fugitive dust model, inhalation intakes were calculated using EPA's default particulate emission factor (PEF) and the appropriate soil or sediment concentration.	

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			These tables should be footnoted so that the media that is the source of the air particulate concentrations is made clear. No intake or risk calculations on air particulates were performed on open space or ecological receptors for AOC3. This is an additional indication that DOE did not assess intakes and risks from sediment COCs. No justification for failing to assess subsurface soil and sediments as potential sources of airborne particulates is presented. Thus, future construction worker exposure to inhalation of airborne particulate antimony, beryllium, cadmium, molybdenum, and nickel from exposed subsurface soil during construction were not assessed, even qualitatively. Future ecological workers' or open space users' exposure to inhalation of airborne particulate antimony, beryllium, and zinc in dried stream and pond sediments were not assessed either, since no air particulate modeling was done on these COCs. Both dried sediment inhalation and inhalation of subsurface soil are potentially complete pathways, and the risks from them should be assessed as was done for OU6. Whether or not they are major, significant pathways should be addressed as part of a justification for not assessing them. However these potential exposures		

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			cannot just be ignored without underestimating the risks. TM12, Exposure Assessment, states that inhalation of airborne particulates would be assessed for the future ecological researcher and for the future open space user, as well as for the future onsite worker, which includes construction workers. No stipulation was made in that document restricting the use of the fugitive dust air modeling to surface soils.		
	6-34	Sec. 6.6.3.3	24. Any COCs which do not have toxicity values (See EG&G memo 94-RF-11283) need to be included in the qualitative uncertainty analysis.	A discussion of chemicals without toxicity values was added to the uncertainty analysis.	
	6-44	Sec. 6.8	25. The discussion in this section mentions that risks for several exposure scenarios are within the range of 1E-06 to 1E-04. It continues to be the position of CDPHE that aggregate risk above 1E-04 must be remediated and that risk above 1E-06 must be managed in some manner.	The statement regarding the fact that "the highest calculated risk is still within the National Oil and Hazardous Substances Pollution contingency Plan target risk range of 1E-06 to 1E-04. . ." is true and, because this section makes no recommendations concerning remediation, the text was not changed.	
		Fig. 6-2	26. The text in this section correctly places the professional judgment step as part of the Gilbert statistical methodology, before the elimination of essential nutrients, evaluation of detection frequency, and concentration-toxicity screens. However, Figure 6-2 shows a professional judgment	This figure has been corrected. However, OU5 meeting notes do have the EPA representative on the OU5 team state that professional judgment is also appropriate after the concentration/toxicity screen.	

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			step as the very last step before a chemical becomes a COC or not. Figure 6-2 is outdated, and should be revised or replaced with a more recent version.		
		Table 6-29	27. How can the modeled air particulate concentration for silver equal zero? Is this a correct value?	The input values from impirical data for silver as a particulate were low, the corresponding output was low enough to be rounded out to zero by the Fugitive Dust Model. This is not an unusual occurrence with most air models.	
	10.1	Sec. 10.0	28. The phrase "from the identified contaminants" is repeated in the first paragraph.	The text has been corrected.	

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