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585

RESPONSE TO U.S. EPA & OEPA COMMENTS ON THE REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 4

10/29/90

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REPORT

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585

Response to U. S. EPA & OEPA Comments on the Remedial Investigation Report for Operable Unit 4

Feed Materials Production Center (FMPC)
Fernald, Ohio

U. S. DEPARTMENT OF ENERGY
OAK RIDGE OPERATIONS OFFICE

U.S. EPA COMMENTS

FOR OPERABLE UNIT 4 RI REPORT

Comment Number	Section	Page	Paragraph	Comments
1.	**General**			**Generally the RI report addresses all areas by the national contingency plan; however, several sections are incomplete because all data elements have not been collected.**
	Response:			Agree with comment. Report was submitted to meet the Consent Agreement Date.
	Action:			Revise text as data become available.
2.	**General**			**The combination of target populations evaluated in the Risk Assessment does not consider all risk groups. The population identified as the most sensitive population may not be correct. Children have access to Paddys Run and have typical sediment ingestion rates of about 100 mg/day, given normal mouthing habits. This exposure should be in addition to the penetrating radiation and airborne radon/radon daughter exposures, if it is found that this operable unit contributes exposures along this pathway.**
	Response:			The risk assessment team believes that the most sensitive receptors have been considered in the OU4 RI/RA report dated August 1990. The sediment ingestion pathway presented in the risk assessment (Appendix E) results in a risk of 1 x 10^{-6}, which is nominal and within the acceptable risk range specified in 40CFR300. Although it is possible that the child receptor for the sediment ingestion pathway may simultaneously be a receptor for the airborne radon and penetrating radiation exposure pathways, the addition of the sediment ingestion risk (1 x 10^{-6}) to the airborne radon risk (5 x 10^{-3}) does not change the total risk nor does it change the decision regarding the need for remediation from a risk assessment perspective. However, combining the three pathways is questionable because the description of the RME receptor for the sediment ingestion pathway is different from the receptor description for the airborne radon and penetrating radiation pathways. The sediment ingestion receptor is exposed at a location in Paddys Run adjacent to the silos for an exposure duration of 6 years, not continuously as is the case for the adult in the airborne radon and penetrating radiation pathways. The airborne radon and penetrating radiation

U.S. EPA COMMENTS

FOR OPERABLE UNIT 4 RI REPORT

Comment Number	Section	Page	Paragraph	Comments
				receptor is exposed off site at a hypothetical nearest residence in the vicinity of the western FMPC boundary fenceline for an exposure duration of 70 years.
	Action:			Revise text in both RI and RA as appropriate.
3.	**General**			**No data is presented for the evaluation of the risk calculations, either from monitoring or analysis. All data must be included in the report.**
	Response:			The environmental monitoring data and assumptions made for evaluating risk from exposure pathways are presented in detail in the risk assessment (Appendix E), Chapter 3. Input data values are tabulated in Table E3-3 for each of the pathways evaluated.
	Action:			Revise text to reflect response.
4.	**General**			**Cows grazing in area. Results from the testing of milk and meat must be presented from cows grazing in the Paddys Run area and possibly drinking from it. This information should be included in the "accumulating" Risk Assessment reports for each operable unit.**
	Response:			Analytical data for milk from cows that graze in the area west of OU4 are not available. Analytical data for milk from cows that graze in other areas of the site are available from the WMCO environmental monitoring program. These data do not include analyses for radon progeny, which would be the contaminants of interest from OU4. The potential for accumulation of radon progeny (Pb-210) contamination on the ground in the areas where cows graze has been investigated. Air dispersion modeling using very conservative assumptions for transport of radon from the K-65 silos indicate that accumulation of Pb-210 on the ground surface would not reach background levels. Therefore, an exposure pathway involving cows grazing near OU4 was not quantified in the baseline risk assessment for OU4.
	Action:			Revise text to reflect response.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
5.	**General**			**Radon and associated decay products (transported in air and direct radiation) are by far the largest sources of exposure to residents from this operable unit. The amount of data presented in characterization of these sources of exposure is entirely inadequate. Existing data is largely the result of an array of alpha track detectors and thermoluminescent dosimeters (TLDs) along the fence-line of the facility. The alpha track detectors are only able to measure the long-term average of radon-222, not decay products from radon-222 or thoron (radon-220) that may be associated with thorium in the silos. The alpha track detectors are not sensitive enough to accurately discriminate between elevated radon levels and background. TLDs are not adequate to characterize direct radiation fields at fixed locations. Detailed radiation levels at many points on and off-property, including background locations, can be readily obtained using pressurized ion chambers (PICs) located in the vicinity of the silos.**
	Response:			The risk assessment team evaluated all available airborne radon concentration data and penetrating radiation dose rate data when assessing the airborne radon and penetrating radiation exposure pathways. The available data are adequate to determine, from a risk assessment perspective, that baseline conditions are unacceptable and remediation is needed. The alpha track radon detectors provide long-term average radon concentration results, which are the most appropriate type of results to incorporate in the pathway exposure assessment. The use of any field instrument for radon detection will involve difficulty in distinguishing between background radon concentrations and off-site above-background contributions from the silos because there are large temporal fluctuations in radon release rates from the silos, fluctuations in background radon concentrations, and because the off-site above-background contribution from the silos is comparable to or less than the background contribution.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				The available data do not substantiate significant thoron emissions from the silos. Emission of significant thoron activity is unlikely considering the time needed for the gas to diffuse out of the silos and the short 55-second half-life of thoron. Analyses of silo waste samples also reveal that the activity inventories of the thoron parent radionuclides Ra-224 and Th-228 are much lower than the inventories of the radon parent radionuclide Ra-226 indicating that the source term for thoron is small compared with the source term for radon. Radon progeny or thoron progeny are not likely to be released from the silos in significant quantity considering the primary release mechanism from the silos involves movement via diffusion and pressure differentials through the concrete domes and foam cover layer, and the progeny are generally attached to particulates inside the silos. It is unlikely that particulates would be released through these mechanisms. Exposure to radon progeny is incorporated in the evaluation of the airborne radon exposure pathway by converting airborne radon concentration to a Working Level estimate assuming a conservative radon progeny equilibrium factor. This conversion and incorporated assumptions are presented in Appendix E, Chapter 3, and is conservative for the contributions from the silos. TLDs are appropriate devices to use. They are routinely used for quantifying penetrating radiation dose rates for environmental monitoring programs. PIC exposure rate measurements have been collected on the site and at various off-site locations and have been compared to the data from appropriate TLD monitoring locations. Comparison of the two types of measurements reveals that the PIC and TLD data are consistent with each other.
	Action:			No action.
6.	**General**			**Based on estimates made using existing data, risks to residents near or on the site are clearly unacceptable. There are several questions regarding the existing data that need to be answered and may possibly indicate an even higher risk than previously assumed:**

(4)

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Response:			Agree that estimates based on existing data indicate an unacceptable risk to human health. However, refinements of these data will not alter the conclusion that human health risks are unacceptable.
	Action:			No action.
				A. What is the degree of equilibrium of radon and its decay products at nearby residences all around the facility? To what degree are radon decay products being emitted form the silos along with radon? The actual dose to residents is influenced by this.
	Response:			The environmental monitoring data and the assumptions used for evaluating risk from the airborne radon exposure pathway are presented in detail in the risk assessment (Appendix E), Chapter 3. Input data values, including the radon progeny equilibrium used, are tabulated in Table E3-3. Radon progeny equilibrium values vary considerably in different indoor and outdoor environments depending on the effects of many site-specific parameters. Empirically derived equilibrium values are not available and would be expected to be highly variable. The risk assessment team used radon progeny equilibrium values that are reasonable yet likely to be conservative and overestimate exposure. References for values used are included in Table E3-3. It is unlikely that significant quantities of radon progeny are emitted from the silos as discussed in the response to Comment Number 5.
	Action:			No action.
				B. Is thoron emitted from the silos? Are thoron decay products present in the plume? What is the associated exposure/dose? Many of the typical assumptions about insignificance of thoron dose relative to radon dose may not be valid at the site.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Response:			The potential for emission of thoron and thoron progeny from the silos is addressed in the response to Comment Number 5.
	Action:			None required.
				C. What are the temporal patterns of radon exposure? What are the seasonal patterns? This may effect dose significantly, due to temporal and seasonal variations in home occupancy and would best be measured using continuous monitors, rather than passive integrating devices.
	Response:			The radon measurement data available for incorporation into the August 1990 OU4 RI report included data depicting average airborne radon concentrations over quarterly time periods. No data were available for daily or weekly time periods. The average quarterly data were used to determine an annual average for each location. Annual average data are most appropriate for use in quantifying the airborne radon exposure pathway; it is inappropriate to use radon concentration data collected over short time periods to quantify a lifetime airborne radon exposure pathway.
	Action:			None required.
				D. How is the level of radon within the living areas of nearby residents in all directions affected by the silos?
	Response:			The level of airborne radon in the vicinity of nearby off-site residential areas is indistinguishable from background levels in all directions from the FMPC except for off-site areas in the vicinity of the western FMPC boundary fenceline. It is assumed that all above-background contributions to airborne radon concentrations in this area off-site are attributable to releases from the silos. The potential contribution to or relationship between airborne radon concentration in indoor living areas from above-background radon concentration outdoors is not well defined and will vary depending on the effects of many site-specific parameters. The risk assessment team has made the assumption that the

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				contribution to airborne radon concentration in indoor living areas from above-background radon concentration outdoors is the same as the above-background radon concentration outdoors. This assumption is likely to be conservative and overestimate exposure.
				E. What is the actual background levels for radon? Continuous monitoring should be used to make this determination because the emissions are not continuous. As previously stated, alpha track devices are not the most sensitive monitoring devices available.
	Response:			The background concentration of airborne radon is specified in Appendix E, Table E3-3. The average annual background airborne radon concentration is derived from quarterly measurements collected at two locations many kilometers from the FMPC as part of the WMCO environmental monitoring program. Continuous monitoring by alpha track detection was used in the WMCO airborne radon monitoring program. The radon emissions from the silos are likely to be continuous; however, the rate of emission is likely to fluctuate with time. Alpha track detection is an appropriate method for collecting field measurements of airborne radon concentration at environmental levels. The use of any field instrument for airborne radon detection will incorporate considerable relative uncertainty in the measurement of environmental concentrations of airborne radon.
	Action:			None required.
7.	**General**			**Information on the degree of equilibrium, thoron dose, and distribution of radon exposures needs to be addressed.**
	Response:			Refer to the response to General Comments 5 and 6.
	Action:			No action.
8.	**General**			**The risks should also be presented by sensitive populations, not just by pathways/media. A better approach may be determined a set of sensitive**

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				sub-populations for each operable unit. When sub-populations do no receive exposures from a particular operable unit, they can be deleted (with an explanation) from the analysis for a particular operable unit. This would allow for a concise and uniform evaluation of health risk in the final RI report.
	Response:			The risk assessment team has considered sensitive populations and has selected the most sensitive populations for quantitative exposure assessment in the OU4 RA using the pathway/media approach. Refer to the response to comment number 2.
	Action:			No action.
9.	**General**			**The nearby resident population is exposed to airborne radon and radon daughters, and it could be expected that radon daughters are deposited in the soil. Soil ingestion (both child and adult) should be included as a pathway.**
	Response:			Analytical data for radon progeny in surface soil in the area west of OU4 are not available. The potential for accumulation for radon progeny (Pb-210) contamination in surface soil as a result of releases of radon from the K-65 silos has been investigated. Air dispersion modeling using very conservative assumptions for transport of radon from the K-65 silos indicates that accumulation of Pb-210 on the ground surface would not reach background levels. Therefore, an exposure pathway involving surface soil contaminated by radon progeny was not quantified in the baseline risk assessment for OU4.
	Action:			Addressed in response to a previous comment.
10.	**General**			**Why are the background risks from penetrating radiation and airborne radon so high? The location of background samples needs to be specified in the Risk Assessment report. Are all the "background" samples elevated?**

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				How do these values compare with measurements made in other rural Ohio areas?
	Response:			The background risks estimated for exposure to background levels of airborne radon and penetrating radiation are not within the acceptable risk range specified in 40CFR300 (1×10^{-4} to 1×10^{-6}). This illustrates the fact that risks estimated for background exposures to materials that pose a health hazard are not necessarily "acceptable" with respect to the definition in 40CFR300. The locations of background airborne radon and penetrating radiation measurements are specified in Appendix E, Table E2-8 and Figure E2-1. The average background sample measurements for airborne radon concentration and penetrating radiation are reasonable and are not elevated. These averages are presented in Appendix E, Table E3-3 and were used to estimate the risks associated with exposure at background levels. The average background levels of airborne radon and penetrating radiation are consistent with background levels in Ohio and many other areas of the country.
	Action:			No action.
11.	**ES**	**ES-2**	**2**	**The remedial investigation (RI) for Operable Unit 4 (OU4) also should include the underlying soils and ground water to determine the extent the silos are potentially contaminating the environment media.**
	Response:			The underlying soils and groundwater are included in the remedial investigation for Operable Unit 4 as presented on Page ES-3, Paragraph 2. However, groundwater will be remediated under OU5. Only perched water will be considered under OU4.
	Action:			No action.
12.	**ES**	**ES-3**	**6**	**The value of 657 picocuries per gram (pCi/gm) may be an outlier and not representative of the K-65 residues. This should be explained in the text.**

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Response:			Disagree with comment. The value of 657 pCi/g reflects a sample having lower radium content. The material in the silos is not expected to be uniformly mixed forming a homogeneous residue. So some samples will have higher or lower concentrations of particular parameters.
	Action:			Will be addressed in Appendix E, Section E2.2.
13.	**ES**	**ES-9**		**A third bullet should be added. "Refine radon monitoring network to accurately quantify risks and success of removal actions".**
	Response:			Disagree with comment. The suggested third bullet will be unnecessary as explained in responses to General Comments 5 and 6.
	Action:			No action.
14.	**1.1**	**1-7**	**2**	**Silo 4 should be included in the remedial investigation/feasibility study (RI/FS) process, even if a non-action alternative is possibly of this silo. There is liquid in this silo.**
	Response:			Agree with comment.
	Action:			Delete last sentence in Paragraph 2. Revise text to state that several alternatives including the no-action alternative are being considered for Silo 4 under the FS.
15.	**1.1**	**1-16**	**2**	**The issues related to OU4 element 6 (Regional Environment) are also appropriate to be investigated as part of element 5 (OU4 Study Area); these include radon emissions, long term migration potential of materials released from the silos, and nearby environmental resources that could be impacted (e.g., ambient air, groundwater, surface water and soils).**
	Response:			Agree with comment. The issues related to OU4 Element 6 are also appropriate to be investigated as part of Element 5.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Revise Element 5 as suggested.
				The issue of worker safety was not addressed in the risk assessment. The risk calculations were based on receptors being exposed at the fence line of the FMPC boundary. An additional exposure scenario, on-site worker, needs to be added to the risk assessment.
	Response:			The issue of worker safety is not addressed in the baseline risk assessment because assessment of worker risk is not within the scope of the risk assessment for the RI. In the baseline risk assessment human health assessment is performed for the public. Assessment of the risk to workers is part of the scope for the FS risk assessment.
	Action:			None required.
16.	**1.3.1**	**1-25**		**The text describes the silo's designed structure. The RI report should describe the silo's current state and state that recent studies have shown major degradation in both the silo wall and dome structural stability and thickness.**
	Response:			Section 1.3.1 Page 1-38 Paragraph 2 presents the current state of the silos' wall deterioration and the installation of an earthen embankment to prevent their collapse. Paragraph 3 describes the temporary dome cover and Section 1.3.2, Page 1-42 paragraph 3 is a recent study on the physical structure of the silos.
	Action:			Refer to Section 1.3.2 at the end of Section 1.3.1, Paragraph 1.
17.	**1.3.2**	**1-44**	**2**	**If actual dose levels from field monitoring are available, it would be appropriate to present them in this section.**
	Response:			The referenced paragraph on Page 1-44 of the RI report discusses the University of Cincinnati probabilistic risk assessment for the K-65 silos. Doses to workers,

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				the nearest resident, and the nearest population center modeled by the University of Cincinnati are presented. These doses are estimated by a model to result from release and air dispersion of radon and K-65 waste material from the silos. Field measurements of existing penetrating radiation dose rates are not compared to the doses modeled by the University of Cincinnati because the exposure situations are different.
18.	**1.3.2**	**1-44**	**3**	**EPA previously had significant comments concerning the risks reported in the University of Cincinnati Risk Assessment Report; these should be addressed and incorporated into this RI report.**
	Response:			The risks presented are reported in the University of Cincinnati risk assessment report. It is not within the scope of the OU4 RI report to address comments on the University of Cincinnati report.
	Action:			No action.
19.	**1.3.2**	**1-45**	**4**	**Additional information concerning the number of samples, type of analyses, and sample location should be presented.**
	Response:			Information on the slant boring program concerning the number of samples and types of analyses are contained in Section 2.2.
	Action:			Revise the text to include a reference (to Section 2.0) in this Paragraph and a sample location map in Section 2.0.
20.	**1.3.2**	**1-46**	**1**	**The purpose of this portion of the RI report is to present results of previous investigation; therefore, the results of the vadose zone modeling should be presented.**
	Response:			Results of the vadose zone modeling are presented in Attachment III, Appendix E of the OU4 RI report. Tables EIII-1 through EIII-4 specifically present

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				modeled contaminant concentrations in the aquifer from the silos for current land-use and future land-use scenarios. Results of the assessment of exposure to these modeled contaminant concentrations are presented in Appendix E, Tables E3-5 through E3-8.
	Action:			Revise text as stated in the response.
21.	1.3.2	1-46	2	**The RI report states that the Monsanto-Mound study recommended additional radon monitoring should be conducted. If additional monitoring was conducted, the results of the additional monitoring should be presented.**
	Response:			No additional radon monitoring on the silos has been made since the completion of the Monsanto-Mound Study. However, the fenceline radon monitoring has continued and the results are contained in the FMPC Environmental Monitoring Reports. Data taken from these reports are presented in Section 4.0.
	Action:			No action.
22.	1.3.2	1-46	2	**Data from the Monsanto-Mound report is presented for radon concentrations near the silos; the actual distance from the silo plus radon concentrations from more remote monitoring locations should be included.**
	Response:			Accept comment.
	Action:			Revise text as suggested.
23.	1.3.2	1-47	3	**The RI report states data from the FMPC Environmental Monitoring Program is used "when possible". It would be appropriate to present a summary of this information in this section of the RI report.**
	Response:			Any data from previous studies, including the Environmental Monitoring Reports, used in the RI is presented in Section 4.0

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Indicate in the text that these data are presented in Section 4.0.
24.	1.3.2			**This section provides only a brief description of the previous, ongoing, and some future investigations of OU4. Little information regarding the data generated from the previous investigations is presented. This section of the RI report should discuss the objectives of previous investigations, location and number of samples, validity of the data, conclusions drawn from the data, and the comparability of the data from previous investigations to the ongoing RI.**
	Response:			Section 1.3.2 is not intended to present data from past investigations but rather, to briefly present the objectives and significant findings from the previous investigations. For more information on these studies such as location and number of samples, validity of the data, etc. The reader has been referred to appropriate reports as cited in the text.
	Action:			No action.
25.	2.1	2-1	3	**It is more important to report the average recovery length of each case, not the average penetration length.**
	Response:			The average recovery length of each case is reported in Section 4.1 Paragraph 2.
	Action:			No action.
26.	2.1	2-1	4	**The quality assurance criteria for completeness is typically given for both the number of samples collected (field completeness) and the number of valid analyses (laboratory completeness). The quality assurance project plan (QAPP) for this site specified only laboratory completeness (90 percent). Sampling completeness is defined as the number of samples actually collected compared to the number of samples planned to characterize the waste material. Typically both field and laboratory completeness is set at 90**

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				percent. The RI report needs to justify why a 30 percent field completeness is adequate to characterize the waste material in Silo 3.
				Additionally, 30 percent sample recovery may indicate that there is significant variation in the waste material preventing near complete sample recovery.
	Response:			The 1989 sampling of the silos was not conducted under the RI/FS QAPP. This activity was done by WMCO under a separate plan. All the material in Silo 3 was produced on site, came from the same waste stream, was calcined to produce a powder-like material, and air conveyed to the silo. Thus it is expected to be fairly homogeneous because of their source and how they were processed and handled. Therefore, a 30 percent sample recovery should be nearly representative and adequate to characterize the waste material in Silo 3.
	Action:			Revise text in Section 4.1 to include the response.
27.	**2.1.3**	**2-3**		**The analytical parameters and number of samples has not been agreed upon between U.S. EPA and U.S. DOE. The revised draft RI report should reflect the resolution of these discussions.**
	Response:			These issues are currently being reviewed under the current sampling plan.
	Action:			No action.
28.	**2.2**	**2-5**	**2**	**The location, number, and collection methods of the 1983 slant borings needs to be presented to fully evaluate the data presented in Section 4.0.**
	Response:			Section 2.0 presents brief descriptions of the field activities conducted during the RI. It is not intended to reproduce data from other reports, but rather to make the reader aware of what has been done. The cited report (NLO 1983) contains information on collection methods, sampling location maps, etc.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			No action.
29.	2.2.2	2-6		**EPA comments on the low angle boring sampling program need to be incorporated into revised draft RI report.**
	Response:			The auger borings at very low angles are unconventional; however, it is a technically feasible method and in this case is probably the best method to use, even though it may be difficult to implement.
	Action:			No change to current plan or report.
30.	2.4.2	2-12	3	**Information describing the samples collected during the Weston Characterization Investigation Study (CIS) should be presented. This information should include the sample collection methods, location, and number of samples.**
	Response:			Section 2.0 presents brief descriptions of the field activities conducted during the RI. It is not intended to reproduce data from other reports, but rather to make the reader aware of what has been done. The cited report (Weston 1987) contains information on collection methods, sampling location maps, etc.
	Action:			No action.
31.	2.3.2	2-11	3	**The last sentence of this paragraph contradicts the statements in Section 2.4.2. Section 2.4.2 states "the criteria for selecting areas of surface soil samples were those areas that indicated radioactive contamination exceeding 35 pCi/g."**
	Response:			Paragraph 3 on Page 2-11 is under Section 2.3.3 and not 2.3.2. The last sentence on this paragraph refers to the random soil sampling as indicated in the last sentence of the preceding paragraph. The criterion of 35 pCi/g mentioned in Section 2.4.2 was used for biased soil sampling.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Revise text for clarity. Insert a reference "Section 2.3.2, last paragraph" in the last sentence of Section 2.3.3. Also, insert "biased" in Section 2.4.2 in the first sentence of Paragraph 2.
32.	**3.0**	**3-1**	**2**	**The RI report is indented (sic) to be a "stand alone" document, therefore it is appropriate to summarize information from other reports. However, it is not appropriate to only reference the other documents to present information.**
	Response:			The two documents summarize information provided in this section and cannot be repeatedly cited at the end of sentences or paragraphs. The other documents are cited for the reader who is interested in more information than what is presented in the report.
	Action:			No action.
33.	**3.3**	**3-4**		**This section should provide a discussion on surface water hydrology specific to the OU4 area.**
	Response:			Agree.
	Action:			Include a description on hydrology.
34.	**3.4.3**	**3-16**	**2**	**The conclusion of limited hydraulic connection needs to be documented with graphs or charts. Data in the appendix to the RI report shows that groundwater elevations in wells screened in the till fluctuate sympathetically (with the exception of well 1029). This indicates there is good hydraulic communication within the perched aquifer in the OU4 area.**
	Response:			The hydrographs show response to rainfall not to a stress placed on the well and observed in another well like a pump test. The fence diagram shows the geologic interpretation which is the basis for the statement. There may indeed be interconnection.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			No action.
35.	3.4.3	3-16		**Neither well 1048 or 1079 is in the area defined as OU4. Hydraulic conductivities for the hydrogeological units in the OU4 area should be provided.**
	Response:			The values used were to illustrate the extremes over the entire FMPC. Well 1034 has a hydraulic conductivity of 0.07 ft/day and is the only well in the area for which we have data.
	Action:			No action.
36.	4.0	4-5	2	**The RI report should list other wastes which are unique to the K-65 or metal oxide silos. The location, concentration, and frequency of occurrence of waste constituents not unique to the K-65 or metal oxide silos can also indicate if contamination is originating from the silos.**
	Response:			Previous studies provide only radiological and metallic composition of the waste; no organic constituents were analyzed. A review of metallic constituents is presented under Section 4.1.2. Waste constituents not unique to the K-65 or metal oxide silos cannot indicate if contamination is originally from the silos because the material could also originate from other operable units. We are unable at this time to identify waste unique to specific units. Therefore, cannot incorporate commenters' suggestion.
	Action:			None.
		4-5	2	**Groundwater was not analyzed for lead 210; therefore, the use of lead-210 as an indicator parameter is questionable.**
	Response:			Pb-210 was added on the list of parameters to be analyzed later during the RI/FS program, which is why it does not appear on the groundwater chemical list. However, it is one of the target parameters to be analyzed for in the silo content,

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				silo embankment, and subsoil samples. Therefore, its use as an indicator parameter should not be questionable.
	Action:			Revise text to reflect response.
37.	4.1.1	4-11	Table 4-1	**What does "d" under beryllium and NG under various chemicals stand for? An explanation must be included in key.**
	Response:			The symbols "d" and "NG" could not be found in Table 4-1. Also Table 4-1 follows Page 4-7, it is not on Page 4-11.
	Action:			None required.
38.	4.1.1	4-11	2	**The RI report needs to document how background concentrations were established for all media.**
	Response:			The bases for background concentrations established in the risk assessment for airborne radon, penetrating radiation, surface soil, subsurface soil, groundwater, surface water, and sediment are presented in Appendix E, Tables E2-8, E2-9, E2-10, E2-11, E2-12, and E2-13, respectively. Background measurements at locations established in the WMCO environmental monitoring program are used for airborne radon concentration and penetrating radiation as specified in Table E2-8. Background concentrations for surface soil are obtained from a literature source and assumptions concerning natural isotopic ratios of uranium and secular equilibrium with uranium as specified in Table E2-9. Background concentrations for subsurface soil are assumed to be the same as for surface soil as specified in Table E2-10. Background concentrations for groundwater are determined from analytical results from selected wells specified in Table E2-11. Background concentrations for surface water are obtained from the WMCO environmental monitoring reports for 1987 and 1988. Background concentrations for sediment were assumed to be the same as for surface soil as specified in Table E2-13.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Indicate in the text where background information is summarized.
39.	4.1.2	4-16	2	**The RI report should state that holding times for volatile organic analyses were exceeded by over 3 months. Furthermore, conclusions concerning the absence of hazardous substance list (HSL) volatile organic compounds should not be made until valid data is available.**
	Response:			Agree with comment.
	Action:			Revise text as suggested.
40.	4.1.2	4-17	Table 4-6	**One sample collected from the K-65 silos has an E.P Toxicity concentration for selenium of 1.08 mg/L which also exceeds the maximum acceptable concentration.**
	Response:			Agree with comment.
	Action:			Revise text as suggested.
41.	4.2	4-21	1	**The location of the National Lead of Ohio (NLO) subsoils samples needs be provided to determine the usefulness of the data presented.**
	Response:			Acknowledge comment.
	Action:			Include a description for the location of the NLO samples.
42.	4.4.1	4-24	3	**The location of each CIS sample needs to be shown on a figure to evaluate the usefulness of the data presented.**
	Response:			All the CIS data within OU4 study area is presented in Appendix B. Selected significant data will be shown on a figure.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Include a figure showing the CIS data.
43.	4.4.1	4-24	5	**The data in Table 4-9 shows the concentration of the two radiological indicator parameters (uranium-283 (sic) and radium-226) is highest adjacent to silos 1 and 2. This suggests that the data is not as inconclusive as the RI report states. The report should also propose additional work to characterize the nature and extent of near surface radiological contamination.**
	Response:			The data presented in Table 4-9 indicate the contamination is in the OU4 study area. The contaminant concentrations presented in Table 4-9 are only slightly above background concentrations for surface soil with the exception of U-234 and U-238. There is no demonstrated direct mechanism relating contamination in adjacent surface soils to the silos other than historical silo filling operations. Migration from other operable units could account for the contaminant concentrations identified in Table 4-9. The need to further characterize the extent of soil contamination in the OU4 study area has led to the proposal for sampling the berm soil and the soil beneath the silos. Analytical results from these additional sampling programs will be incorporated when they are available.
	Action:			Revise text to include response.
44.	4.7.3	4-47	2	**The conclusions in this section are not supported by data. The text should be revised to acknowledge the following:** **The boring log for Well 1032 does not indicate the unnatural debris is present at 7.5 to 9.5 feet below the land surface (screened interval of well 1032).**
	Response:			The boring log for Well 1032 does not show a distinct difference between the fill and the native material since both are from the glacial overburden. The site for Well 1032 was leveled by a bulldozer which smoothed the obvious dump truck loads of material on the surface. Trenching under the remedial investigation for Operable Unit 3 fifty south of Well 1032 indicated that fill exists to a depth

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				of four feet. Soil samples from this trench indicate total uranium values of 2200 to 11,100 ppb. This information will be documented in the Operable Unit 3 RI.
	Action:			Revise text to include response.
				Uranium-238 (indicator compound for K-65 silos 1 and 2) is present in Well 1032 (immediately down gradient of the K-65 silos) at a concentration approximately 20 times higher than well 1033 (immediately up gradient of the K-65 silos).
	Response:			Uranium 238 is present in virtually every soil sample. The presence of U-238 is not a valid reason for selecting the silos as the source.
	Action:			Revise text to include response.
				Four principle inorganic constituents are of K-65 silos are chloride, sulfate, calcium and sodium. These are present in the down gradient well at concentrations greater than the up gradient well. Specifically, chloride 36-, sulfate 3-, calcium 4, and sodium 6 times greater in the down gradient well than the up gradient well.
	Response:			The comment is accurate, however the materials mentioned are not unique to the silos, therefore the conclusion may not be accurate. Well 1032 is in an area covered with fill from the production area and is adjacent to a road used all year-round where deicing materials such as salt may be used. Until the slant borings are drilled under the silos, there will not be any definitive answers as to whether the silos leak or not.
	Action:			Revise text to include response.
45.	**4.7.3**	**4-48**	**1**	**The report should also state that direct vertical percolation of contaminated groundwater can also impact the water quality in the Great Miami Aquifer.**

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Response:			Agree.
	Action:			Revise text as suggested.
46.	**4.7.3**	**4-48**	**2**	**Well 2034 should also be listed as having above background levels or uranium.**
	Response:			Agree.
	Action:			Revise text as suggested.
47.	**4.7.3**	**4-49**	**1**	**While the uranium concentrations in the groundwater are close to typical background concentrations, the RI report should clearly state these are above background and indicate contamination.**
	Response:			Among the 3000-series wells, Well 3005 contains uranium concentrations above background levels. However, data of the other wells are within the background ranges.
	Action:			Revise text to include response.
48.	**5.0**	**5-1**	**2**	**While most radionuclides generally present a greater hazard than their toxic characteristics, this is not true for uranium.**
	Response:			Although it is true that at occupational exposure limit concentrations for uranium the toxic characteristics control the hazard, at the environmental concentrations of concern in the OU4 risk assessment the radiological characteristics control the hazard because the environmental concentrations are below the uranium toxicity threshold.
	Action:			Revise text to reflect response.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
49.	**5.2**	**5-3**	**1**	**The statement that "at the time of their design, the K-65 silos did not need to by airtight" should be explained, since the radon concerns have long been known.**
	Response:			The silos were not designed to function as pressure vessels (air tight) consequently air exchanges with the outside environment will occur especially if there is pressure buildup due to air expansion in the silos.
	Action:			Revise text to include a reference (Grumski 1987).
50.	**5.2**	**5-4**	**5**	**The catastrophic failure dose, as estimated by UC, is significantly lower than the dose from continued chronic emissions and should be presented as such.**
	Response:			The total doses reported in the University of Cincinnati report for the catastrophic failure case (Acute Case A1, Table 3.6 in UC report) are greater than the doses reported in the UC report for the continued chronic emissions case (Chronic Case, Table 3.8 in UC report).
	Action:			No action.
51.	**5.4**	**5-6**	**4**	**The RI report state lead-210 is a good indicator compound, yet the groundwater was not analyzed for lead-210.**
	Response:			Groundwater sample analytical results for Pb-210 are not available. The identification of Pb-210 as a potential indicator contaminant for OU4 was made during the risk assessment process. The initiation of sampling and analyses for groundwater began before this identification. Upon identifying Pb-210 as a potential indicator contaminant and identifying the need for additional characterization of soil in the OU4 study area, the sampling programs for berm soil and soil beneath the silos were developed and included requests for Pb-210 analysis. The Pb-210 would be expected in berm soil or soil beneath the silos first if release of Pb-210 from the silos is occurring. Should the

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				contamination appear in these soil samples, the need to analyze for Pb-210 in groundwater will be evaluated.
	Action:			Revise text for clarity.
52.	6.3	6-3	1	**U.S. EPA uses a risk coefficient of 4E-4/rem for low linear energy transfer (LET) radiation, not the 1.25E-4/rem, which is used in the report. Risks that are estimated here for external exposure are thus lower by a factor of 3.**
	Response:			The use of the 4 x 10^{-4} rem^{-1} risk coefficient for low LET radiation in place of the 1.25 x 10^{-4} rem^{-1} risk coefficient would result in approximately a three-fold increase in the risk estimates for the penetrating radiation exposure pathway. The use of the more conservative risk coefficient would not change the determination regarding the need for remedial action from a risk assessment perspective. The risk estimates in the OU4 RI baseline risk assessment for the penetrating radiation pathway probably overestimate risk overall considering the conservative bias built into assumptions used to quantitatively evaluate the exposure pathway.
	Action:			Revise text to acknowledge EPA risk factor but not to apply.
53.	6.4	6-4	3	**The risk associated with exposure to background levels of radiation should be better documented.**
	Response:			The estimated risks associated with exposure to background levels of penetrating radiation and airborne radon are documented in the risk assessment (Appendix E) Chapter 3, Table E3-3. As the third paragraph on Page 6-4 of the RI report states, the risks from background exposures were estimated using the same calculational approach that was used to estimate risks from above-background exposures. This means that the methodology and input values were the same except for the substitution of the background exposure level in place of the above-background exposure level (refer to Table E3-3 for input values).

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			Revise text to include response.
54.	6.4	6-4		**As a result of using the U.S. EPA risk factor cited above, the combined risk of 6E-3 for present use, combined lifetime risk of 8.5E-2 for potential future use, are 13% and 70% higher, respectively.**
	Response:			Refer to response to comment on Section 6.3, Page 6-3, Paragraph 1.
	Action:			No action.
55.	6.4	6-5	3	**The "unacceptable" levels of the chemical toxicants detected in the groundwater should be quantitatively presented.**
	Response:			The last paragraph on Page 6-5 of the RI report refers to levels of several chemical toxicants including arsenic, lead, selenium, thallium, and uranium as "unacceptable" based on the results of modeling the migration of these materials from the silo waste to the aquifer. The statement in the paragraph that the levels are unacceptable is not based on empirical detection of these materials in the aquifer. Attachment III of Appendix E presents a description of the modeling effort and modeled concentrations in the aquifer (Tables EIII-1 through EIII-4).
	Action:			Revise text to include response.
56.	6.4	6-5	5	**Even using the lower NCRP risk factors, the conclusion that present and potential future risk increments is the same order of magnitude as background risks is incorrect. Incremental risks exceed background risks by nearly a factor of 10. When using the U.S. EPA factor cited above, the discrepancy is even greater.**
	Response:			The comment is incorrect. The estimated risks from background exposures to penetrating radiation and airborne radon are in the same order of magnitude as

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				the estimated risks from above-background exposure because the background and above-background exposure levels are in the same order of magnitude. The same input values for exposure assumptions and risk coefficients must be applied to both the background and above-background exposure pathways to maintain the validity of comparing the background exposure and risk estimates to the above-background exposure and risk estimates. Thus, when comparing the risk estimates for background exposure to risk estimates for above-background exposure the choice of risk coefficient makes no difference as long as the same choice is used in both the background and above-background cases. It is only the difference in penetrating radiation exposure level and airborne radon exposure concentration that results in a difference between the pathways.
	Action:			No action.
57.	7.1	7-1	1	**At the present time there is insufficient data to support the conclusion that the feasibility study should address only the silo contents and physical structure. At this time it is appropriate to consider all areas of contamination including soil and groundwater in the feasibility study, even if contamination has not migrated off-site.**
	Response:			Agree with comment.
	Action:			Revise text to read, "Based on existing data, the FS for the K-65 silos and Silos 3 and 4 will address the silo contents, the physical structures, the soil berm surrounding Silos 1 and 2 as well as any contaminated soil or perched water immediately below the silos."
58.	7.1	7-1	3	**The report needs to clarify why 30% sample recovery for Silo 3 is considered successful.**
	Response:			See response to comment on Section 2.1, Page 2-1, Paragraph 4. Comment Number 26.

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
	Action:			No action.
59.	7.1	7-1	4	**The conclusions concerning the presence or absence of HSL organics is not supported. Holding times for volatile organic compounds were exceeded by over 3 months.**
	Response:			The silos will be resampled and volatile organic compounds will be analyzed within the required holding time.
	Action:			Revise text to include response.
60.	Appendix E	ES Exiii	5	**"Assuming that a single individual could reasonably be exposed to the current estimated above-background RME from both penetrating radiation and airborne radon, the combined lifetime risk form lifetime exposure to these two pathways is 5.3 X 10-3." The risk to a child from ingestion of contaminated soils should also be included in this total risk. The child will be potentially exposed to airborne radon and penetrating radiation, in addition to the ingestion.**
	Response:			Contaminant concentrations detected in soil in OU4 were used to model the migration of these contaminants to sediment in Paddys Run. The child sediment pathway was then constructed and evaluated using the modeled contaminant concentrations in sediment. The estimated risk associated with the child sediment ingestion pathway is 1×10^{-6} (see Appendix E). Although it is possible that the child receptor for the sediment ingestion pathway may simultaneously be a receptor for the airborne radon and penetrating radiation exposure pathways, the addition of the sediment ingestion risk (1×10^{-6}) to the airborne radon risk (5×10^{-3}) does not change the total risk nor does it change the decision regarding the need for remediation from a risk assessment perspective. However, combining the three pathways is questionable because the description of the RME receptor for the sediment ingestion pathway is different from the receptor description for the airborne radon and penetrating radiation pathways. The sediment ingestion receptor is exposed at a location in Paddys Run adjacent to the silos for an

U.S. EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				exposure duration of six years, not continuously as is the case for the adult in the airborne radon and penetrating radiation pathways. Because this child receptor is located within the FMPC property boundary, the child sediment ingestion pathway has a low probability of occurrence. The pathway is provided as an upperbound assessment for the exposure of a young child. The airborne radon and penetrating radiation receptor is exposed off site at a hypothetical nearest residence in the vicinity of the western FMPC boundary fenceline for an exposure duration of 70 years. These two pathways have a much higher probability of occurrence than the child sediment ingestion pathway.
	Action:			No action; previously addressed in response to General Comment 2.
61.	**Appendix E-5.1.1.5 ES-3**			**As stated previously, a child will also be exposed to airborne radon and penetration radiation in addition to ingestion of sediments. It would be reasonable to include all pathways in the total risk calculation.**
	Response:			Refer to response to comment on Appendix E, Page Exiii, Paragraph 5.
	Action:			No action.

OHIO EPA COMMENTS

FOR OPERABLE UNIT 4 RI REPORT

Comment Number	Section	Page	Paragraph	Comments
General 1				**The preparation of this report should have been delayed until all of the needed sampling of silos wastes, underlying soils, and berm soils was completed. This report particularly the risk assessment portion, will likely change significantly when the results from these activities are obtained. To prepare a report with major sampling and waste characterization still needing to be performed is nothing short of an incredible waste of time and resources both on the part of DOE and the regulatory agencies that have to review such an incomplete and deficient document. Further, the use of historical sampling data to characterize silo wastes is of limited value because of the uncertainty in QA/QC procedures used at the time.**
Response:				Agree with comment. However, to meet the Consent Agreement date, the report had to be written using the existing data.
Action:				No action.
General 2				**All samples taken within the Operable Unit 4 study area, including Silos 1 and 2, should have been analyzed for Actinium-227 and Protactinium-231. These constituents were found in samples from Silo 3. Actinium-227 was discharged into the Great Miami River from the FMPC at over 200 percent of DOE's DCG in 1988.**
Response:				Average concentrations from the silo waste sample analytical results are reported in Appendix E of the OU4 RI report, Table E2-3 for radionuclides. Table E2-3 includes average concentrations for Ac-227 and Pa-231 based on the sample analytical data. The K-65 silo contents were analyzed for actinium-227 and protactinium-231. However, the presence of high concentrations of numerous radionuclides in the Silo 1 and 2 waste samples interfered with the analytical quantification of Ac-227 and Pa-231 concentrations in the Silo 1 and 2 waste samples. That is why it was not reported in samples collected from the K-65 silos. This interference was not a problem in Silo 3 waste samples because concentrations of interfering radionuclides are lower in Silo 3 waste. The values for Silos 1 and 2 had to be estimated because the sample analysis was unable

OHIO EPA COMMENTS

Comment Number	Section	Page	Paragraph	Comments
				to quantify these two radionuclides in the Silo 1 and 2 waste samples due to interference from other radionuclides. The sampling program for the soil beneath the silos will quantify the Ac-227 and Pa-231 in these soils if they are present. The difficulties associated with quantification of Ac-227 and Pa-231 in Silo 1 and 2 waste samples should not present a problem because the concentrations of radionuclides in the soils beneath the silos if detectable are expected to be much lower than in the Silo 1 and 2 waste samples. The Ac-227 and Pa-231 would be expected first in soil beneath the silos if release of silos waste is occurring. Should contamination appear in the samples beneath the silos the need to analyze for Ac-227 and Pa-231 in other media, for example groundwater, will be evaluated.
Action:				No action. The third sentence of the comment is incorrect. The 1988 EMR reports Ac-227 as <217 times DOE's DCG and appears to be based on the LLD rather than a positive detection. Addressed under specific comments.
General 3				**A section of the report or an appendix should be added which provides a comprehensive list of background levels (soil, surface water) for potential inorganic contaminants in the FMPC region. Such a list would allow the reader to better assess the significance of any contaminant levels detected and reduce searching through the document.**
Response:				Disagree background values will be provided in the text and tables as needed.
Action:				Include appropriate background levels in tables presented in the text.
1.		**ES-6**	**1**	**Since Actinium-227 is a constituent of the Silos, radiological analysis of the silo contents should have included this isotope. DOE should explain why this isotope was excluded and discuss if future samples will analyze for it.**
Response:				The K-65 silo contents were analyzed for actinium-227 and protactinium-231. However, the presence of high concentrations of numerous radionuclides in the Silo 1 and 2 waste samples interfered with the analytical quantification of Ac-

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				227 and Pa-231 concentrations in the Silo 1 and 2 waste samples. That is why it was not reported in samples collected from the K-65 silos. This interference was not a problem in Silo 3 waste samples because concentrations of interfering radionuclides are lower in Silo 3 waste.
Action:				No action required.
2.		ES-7	2	**The statement that no conclusion can be drawn that the K-65 silos are the source of groundwater contamination should include a conditional statement referencing the future results from the slant boring program.**
Response:				Agree.
Action:				Revise text to include a conditional statement referencing the future results from the slant boring program.
3.		1-1	3	**The current (August, 1990) Remedial Investigation of Operable Unit 4 does not fulfill the July 1986 Federal Facilities Compliance Agreement (FFCA) referenced of Page 1-1, Paragraph 3, which was "intended to ensure that environmental impacts associated with past and present activities at the FMPC are thoroughly and adequately investigated so that appropriate remedial response actions could be formulated, assessed and implemented." Results from the Berm Soil Sampling, Slant Boring Program, and additional Silo Content Sampling, which are not included in this document, may have a significant effect on site characterization and the conclusions of this Draft Remedial Investigation.**
Response:				Agree with comment. However, to meet the Consent Agreement date, the report had to be written using the existing data.
Action:				No action.

(3)

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
4.		**1-1**	**1**	**The Executive Summary on Page ES-1 indicates that the FMPC is located 20 miles northwest of Cincinnati, whereas this section indicates 15 miles.**
Response:				Agree. The FMPC is located 20 miles northwest of Cincinnati. The 15 miles indicated in Section 1.0, Page 1-1, Paragraph 1 is incorrect.
Action:				Revise text to indicate the correct distance of 20 miles.
5.		**1-6**	**1**	**Contrary to what is stated in the first sentence, this RI report does not "serve to document the data collection and analysis phase of the RI/FS for Operable Unit 4" because this phase is incomplete.**
Response:				Agree with comment. However, to meet the Consent Agreement date, the report had to be written using the existing data.
Action:				No action.
6.		**1-7**	**Last**	**This paragraph states that any underlying soils or perched water under Silos 1, 2, and 3 will be incorporated into the remedial action program for Operable Unit 4. Page ES-2, third paragraph, suggests these areas will be addressed during the Operable Unit 5 FS. Please clarify under which Operable Unit(s) these areas will be addressed.**
Response:				The underlying soils or perched water under Silos 1, 2, and 3 will be incorporated into the remedial action program for Operable Unit 4.
Action:				Revise text on Page ES-2 as stated in the response above.
7.		**1-7**	**2**	**Further explanation of "quantifiable," levels of uranium isotopes and inorganic chemicals is needed. Page ES-2, Paragraph 2 states that radiological and chemical analysis of standing rain water in silo 4 indicates the presence of uranium below "levels of concern."**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Response:				The term "quantifiable" was used to mean detectable or measurable amounts of uranium isotopes and inorganic chemicals. The concentration of uranium in standing water in the silo is below the DOE's DCGs and represents a small inventory; therefore, as stated in the Executive Summary the presence of uranium in the Silo 4 water is not a concern.
Action:				Replace the word "quantifiable" with "detectable" or "measureable".
8.		**1-7**	**3**	**Why are the underground decant sump and piping beneath the solos (sic) not included?**
Response:				The underground decant sump and piping beneath silos are included in the remedial action program for OU4.
Action:				Revise text to state as the response above.
9.		**1-11**	**3 bullet**	**Should read "quantification".**
Response:				Agree.
Action:				Revise text to read "quantification."
10.		**1-12**	**Table 1-1**	**Element number 3, related issues, first bullet: potential accumulation of Pb-210 and Po-210 should replace "buildup." Buildup implies present Pb-210 and Po-210.**
Response;				Potential buildup and potential accumulation mean the same thing.
Action:				No action.
11.		**1-14**	**Table 1-1**	**This page is a duplication of Table 1-1 on Page 1-2 and should be eliminated. Also, these tables have two footnotes, "a" and "b," which are**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				used but are not defined anywhere in the table. These footnotes must be defined.
Response:				Agree.
Action:				Include the correct page with footnotes "a" and "b."
12.		**1-19**	**2**	**Type of solvent used in solvent extraction should be noted.**
Response:				Tributyl phosphate was used in the extraction process.
Action:				Revise text to include response.
13.		**1-20**	**2**	**What type of containers are used to "repackage" deteriorated drums, 80-gallon over-pack drums?**
Response:				Deteriorated drums are repackaged in either 55-gallon or 80-gallon carbon steel drums, depending on their size.
Action:				Include repackaging drum size.
14.		**1-20**	**2**	**What type of containment is provided for the "other waste materials stored in drums on contained surfaces"?**
Response:				Other wastes are inside the warehouses stored in drums that sit on contained surfaces provided with dikes and sumps.
Action:				Revise text for clarity.
15.		**1-20**	**4**	**The term "Clearwell" is not clear or defined.**
Response:				The Clearwell is a settling basin for surface runoff from the waste pit area.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Action:				Revise text for clarity.
16.		**1-29**	**Table 1-2**	**Milling Process column is blank.**
Response:				The milling process was meant to be a row, not a column, to indicate the acid leach process for the three types of ores.
Action:				Remove the word "milling process."
17.		**1-37**	**4**	**How did this soil contamination occur? Did this occur over extended periods of time? What, if any, containment or clean-up measures were implemented?**
Response:				Soil contamination occurred due to leakage from the drums that was washed by rainwater from the concrete pad to the surrounding soil. It is believed to have occurred over a short period of time, because the silos were filled by 1959. The drum handling building has long been demolished. Any remaining contamination will be cleaned up under the current remediation program.
Action:				Revise text to incorporate response.
18.		**1-41**	**1**	**The Hazen Report is stated to conclude that a "slimes" fraction contained solubilized recrystallized fractions. Are the Radium-contaminated barium sulfate solubilized or crystallized, or is it correct as stated?**
Response:				This is a direct quote from the report as indicated in the text.
Action:				Indicate in the text that this is a direct quote.
19.		**1-41**	**4**	**It is indicated that the Metal Oxide silo 4 contains infiltrated rain water. Are the other silo covers and embankments constructed in a similar manner? If so, what does this imply about the isolation of contents of silos 1, 2, and**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				3? What does this imply, if anything, about the structural conditions of the silos?
Response:				The silo covers are constructed in a similar manner except that Silos 1 and 2 also have a foam covering. The isolation of contents of Silos 1, 2, and 3 and their structural conditions will be evaluated in the FS.
Action:				No action.
20.		**1-47**	**3**	**What is the date of this Weston Study?**
Response:				The date for the Weston Study is 1986.
Action:				Include the date in the text.
21.	**2.1.3**	**2-3**		**Only Silo 3's contents were analyzed for Actinium-227 and Protactinium-231. The contents of Silos 1 and 2 as well as the subsurface soils should be analyzed for these radio-isotopes.**
Response:				Wastes in Silos 1 and 2 were also analyzed for Ac-227 and Pa-231; however, the presence of high concentrations of numerous radionuclides in the Silo 1 and 2 waste samples interfered with the analytical quantification of Ac-227 and Pa-231 concentrations in the Silo 1 and 2 waste samples. This interference was not a problem in Silo 3 waste samples because concentrations of interfering radionuclides are lower in Silo 3 waste. Also refer to response to general comment number 2.
Action:				Revise text to include response.
22.	**2.2.3**	**2-7**		**See Comment #21 above. (1B) Page 2-12, third paragraph: A technical or trade name should be used instead of "cookie-cutter" sampler, if one exists.**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Response:				The sampling program for the soil beneath the silos includes gamma spectral analyses that will quantify the Ac-227 and Pa-231 in these soils if they are present. The difficulties associated with quantification of Ac-227 and Pa-231 in Silo 1 and 2 waste samples should not present a problem because the concentrations of radionuclides in the soils beneath the silos, if detectable, are expected to be much lower than in the Silo 1 and 2 waste samples.
Action:				Replace the term "cookie cutter" with the term "coring."
23.	**2.5.3**	**2-17**		**It is unclear how leachable iron and manganese can be indicators of contaminant migration and attenuation at the FMPC.**
Response:				Iron and manganese occur as oxide coatings on soils and sediments in areas where conditions are reducing. They have very high adsorption capacities and very high affinities for heavy metals. They are sensitive to changes in oxidation potential (pE) and pH within certain ranges, thus they are leachable. Their presence as determined by leach tests can be quantified and used to assist in the determination of contaminant attenuation.
Action:				Revise text to incorporate response.
24.		**2-22**	**3**	**It is stated here that because of the high water level in the 3000-series wells in the O.U.4 area, it was not possible to install a bentonite pellet seal, and hence these wells have no bentonite seal. How were these wells sealed then? This statement requires some clarification as it suggests that no bentonite seal was used at all. This appears to be contradicted by Figure 2-6 which shows that the 3000-series wells were indeed sealed with a bentonite grout and that only the bentonite <u>pellet</u> seal was eliminated.**
Response:				Wells were sealed using volclay grout as shown in Figure 2-6.
Action:				Revise text for clarity.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
25.		**2-22**	**5**	**Does figure 2-7 show "all the wells that were sampled during the RI" or all the wells within the Operable Unit 4 study area?**
Response:				Figure 2-7 shows all the wells within the OU4 study area that were sampled during the RI.
Action:				Add OU4 study area to the text for clarity.
26.		**3-4**	**3**	**Effluent discharge to Great Miami River is not indicated on Figure 3-2.**
Response:				Effluent discharge to Great Miami River will be shown on the figure.
Action:				Revise the figure to show effluent discharge.
27.		**3-6**	**3**	**Vertical seepage rates through the storm sewer outfall ditch is compared to that of Paddy's Run stream bottom. Neither of the vertical seepage rates are presented.**
Response:				Both streams flow directly on the aquifer sands and gravel. Therefore both will have similar seepage rates when water is present. Since the streams are intermittent there is no good way to present a seepage rate in a quantifiable way.
Action:				No action.
28.		**3-6**	**4**	**Paragraph four states that the storm sewer outfall ditch historically conveyed surface water run-off from the production area to Paddys Run. Are approximate dates available? How recent were the storm water retention basins constructed? Has runoff from a 10-year, 24-hour rainfall event occurred since the date of construction?**
Response:				The basins have overflowed in January 1989 and February 1990 when several heavy storms occurred in rapid secession.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Action:				Revise text to include response.
29.		**3-16**	**2**	**Well 1034 is not indicated on the Glacial Overburden Fence Diagram in pocket.**
Response:				This was a typographical error, it should have been Well 2034.
Action:				Revise text to incorporate response.
30.	**3.7**	**3-27**	**2**	**Reference to the "Town of Hamilton" should be the "City of Hamilton."**
Response:				Agree.
Action:				Revise text as suggested.
31.		**3-28**	**2 and 4**	**Paragraph two suggests that FMPC contains eight mammal species while paragraph four lists thirteen mammal species on FMPC. This inconsistency should be corrected.**
Response:				Agree with comment.
Action:				Revise text to correct the inconsistency.
32.		**4-6**	**Figure 4-4**	**The significance, if any, of sample colors should be addressed in the text.**
Response:				The color of the samples may indicate different chemical compositions of the material.
Action:				Revise text to mention that color may indicate variability in chemical composition.
33.		**4-7**	**1**	**Are core sample recovery percentages for each boring in Figure 4-4 for silo 3 reported as percent of each boring or percent of depth of contents of silo 3? If percentages reported are for individual borings, then why are**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				the percentages (28-35%) considered adequate to characterize the contents of Silo 3?
Response:				The core sample recoveries for Silo 3 are for individual borings. The materials in Silo 3 are expected to be fairly homogeneous because of their source and how they were processed and handled. They were all produced on site, all came from the same waste stream all were calcined to produce a powder-like material that was air conveyed to the silo. Therefore a 28 to 35 percent sample recovery should be nearly representative and adequate to characterize them.
Action:				Revise text to reflect response.
34.		**4-8**	**Table 4-1**	**Clarification is needed in this table as to which silo(s) the "NLO (1980)" characteristics column is supposed to be under. Proper centering of the silo 1 and 2 and silo 3 headings would provide this clarification.**
Response:				The "NLO (1980)" belongs to Silos 1 and 2.
Action:				Headings will be properly centered.
35.		**4-12**	**1**	**The ODH, 1988 report, appears to provide dissimilar conclusions to the of Gels, 1989 referenced on Page 4-12, third paragraph.**
Response:				The conclusions made by the ODH are not very different from the airborne radon assessment made in Appendix E of the OU4 RI report. Page 4-11, Paragraph 3 of the RI report, presents annual average background airborne radon concentrations and annual average airborne radon concentrations at FMPC boundary locations. The above-background contribution from the FMPC may be as high as the background contribution or there may be no above-background contribution from the site at all. Considering the variation that occurs in background airborne radon concentrations, the potential for an above-background contribution to airborne radon from the site that is less than or equal to background is not very different from the conclusions made by the ODH. The

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				airborne radon assessment in Appendix E of the OU4 RI report employs the above-background airborne radon contribution associated with the highest annual average airborne radon concentration along the western FMPC boundary in order to incorporate a degree of conservatism. The potential contribution from the silos is slightly less than the average contribution typical of natural background in Southwest Ohio.
Action:				Revise text to reflect response.
36.		**4-13**	**Table 4-3**	**Results from the Vogel (1989) report on silos 1 and 2 are incorrectly listed under the Silo 3 portion of the table.**
Response:				Agree.
Action:				List under proper heading.
37.		**4-14 & 4-15**	**Tables 4-4 and 4-5**	**(in addition to several other data tables distributed throughout the report). Again, this RI report should not have been prepared on data that still has not been validated.**
Response:				Agree. However in order to meet the Consent Agreement date, the report had to be written using the existing data.
Action:				No action.
38.		**4-16**	**2**	**PCB concentrations reported in this paragraph do not correspond to values reported in Table 4-5 for Silos 1 and 2. This paragraph also states that Toluene was the only organic constituent observed in Silo 3 at concentrations above the respective laboratory blank. Results reported in Appendix B conflict with those reported in this paragraph. Appendix B results also list levels of Chloroethane, Acetone, Styrene, Total Xylenes, 4-Methyl-2-Pentanone, Trichloroethane, and Toluene present in various silo samples and whose respective blanks show "no detection." Such inconsistencies**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				between data and text must be corrected as they lead to confusion and suspect conclusions.
Response:				The inconsistencies will be corrected.
Action:				Correct inconsistencies.
39.		**4-19**	**3**	**The 0.074 mm size designation is the "break" between sand and silt size materials, not between sand, silt and clay.**
Response:				Agree. This was a typographical error.
Action:				Revise text as suggested.
40.		**4-28**	**2**	**The significance of the 15 pCi/g value for Ra-226 is unclear. Similarly, in the last paragraph on this page, the significance on the 10 pCi/g level of U-238 over which only one sample was found is also unclear. Are these values supposed to represent some sort of action level or are they merely arbitrary selections of concentrations for discussion purposes? Clarification is needed.**
Response:				The values of 15 pCi/g for Ra-226 as reported in the Weston report and 10 pCi/g for U-238 in the RI do not represent any sort of action levels, but were arbitrarily picked for discussion purposes.
Action:				Revise text to incorporate response.
41.	**4.5.1**	**4-29**	**1**	**This section states a "full radiological analysis" was performed on subsurface soil samples. The radiological analysis did not include tests for Ac-227 or Pa-231 even though the presence of these elements have been documented in Silo 3. The wording should be changed to state that selected radiological analysis was carried out.**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Response:				"Full radiological analysis" means that all the radioisotopes specified in the sampling plan were analyzed. The analytical parameters for each sample type under the sampling plan are listed in Chapter 2.0.
Action:				None required.
42.		**4-35**	**Table 4-13**	**The heading "well No." is incorrect as this table lists the results of stream sediment samples.**
Response:				Agree.
Action:				Delete "Well No." from the table.
43.		**4-37**	**1**	**Does the statement "any leakage of material from the solos (sic) might be detected in well 1032" depend on the assumption that the perched groundwater beneath OU-4 is continuous? If so, it should be stated as such.**
Response:				Yes, the conclusion is the whole point of the paragraph.
Action:				No action.
44.		**4-39**	**Figure 4-9**	**The map in the lower right-hand corner of this figure is incorrectly contoured in the area of well 2008. Appropriate corrections should be made.**
Response:				Agree.
Action:				Revise map to show correct contours.
45.		**5-1**	**1**	**Cadmium should also be considered a contaminant of concern since at least five wells within the Operable Unit 4 study area (1008, 1034, 2018, 3005, and 3034) have had one or more samples at or above the Safe Drinking Water Act MCL for cadmium. The hazards associated with this**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments

contaminant must be included in the baseline risk assessment for Operable Unit 4.

Response:

The following method was used to determine if individual wells contained above-background contaminants:

•Samples were evaluated and retained for the analysis only if they achieved acceptable sample quantitation limits. For cadmium the acceptable SQL was 0.002 mg/L.

•The average background concentrations for background wells were determined for 1000, 2000, 3000, and 4000 series wells. A Tolerance Limit, as specified by EPA, 1989e, was determined for each chemical, for each series wells.

•Average concentrations for each well were compared to the Tolerance Limits to determine potential contamination.

The results for this analysis for cadmium show:

Well number	Tolerance Level (mg/L)	Average Detected Concentration (mg/L)
1008	0.011	0.009
1034	0.011	0.01
2018	0.006	0.005
3005	0.006	<0.005
3034	0.006	0.012

In general, a single sampling result cannot be used to determine a chemical of concern. The single high 3000 series well detection does not warrant inclusion as a chemical of concern, especially since the 3000 series wells are so deep, it most likely would be influenced by other sources.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Action:				None required.
46.		**5-2**	**2**	**The ingestion of contaminated surface water from Paddys Run should also be considered as a potential exposure pathway for the risk assessment. Surface water can be contaminated via surface runoff containing soluble uranium from the Operable Unit 4 study area or through contaminated groundwater seepage from the creek bank.**
Response:				Contributions to surface water contamination in Paddys Run from surface water erosion of soil from OU4 were modeled as part of the modeling of contributions to sediment contamination in Paddys Run via this migration pathway. The modeled contributions to surface water contamination from OU4 soils are very low and would not contribute to a reasonable receptor exposure scenario.
Action:				Revise text to address comment generically.
47.		**5-6**	**Last**	**Since the Ra-226 present in Silos 1 and 2 is in a rather insoluble form, as suggested paragraph previously in the text, using it as an indicator of contamination from the silos is not very promising and the absence of Ra-226 in groundwater samples may simply be a result of its low environmental mobility. Uranium in the silos is in a more soluble form and might cause considerable groundwater contamination prior to significant levels of Ra-226 being detected.**
Response:				The comment presents a valid possibility regarding differential solubility of radium and uranium in the wastes in Silos 1 and 2. Unfortunately it has not been empirically determined if this is the case in the silo wastes. The identification of Ra-226 as a constituent of concern in OU4 is appropriate because the K-65 silos are a unique source of large quantities of Ra-226 activity at the FMPC. Therefore, Ra-226 could be used as an indicator of releases from the K-65 silos if consistently detected in significant quantities in media such as groundwater, perched water, or soils beneath the silos. The absence of Ra-

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				226 in wells in the OU4 study area could indicate several possibilities as noted in the comment.
Action:				Revise text to clarify.
48.		**5-7**	**1st Sentence**	**Explain the significance of moisture being detected in the Silo 2 sample. Is the intent here to imply that the higher the moisture content of the silo contents, the higher the potential for the silos to be the source of uranium in the O.U.4 area because of increased mobility.**
Response:				A water slurry was used to fill Silo 1 and 2 with K-65 residues and then decanted. Consequently, high moisture content is expected in the silo. The intent here was simply to report the results obtained.
Action:				No action.
49.		**5-7**	**1**	**Silo 1 and Silo 2 residues were determined to contain 1400 ppm and 1800 ppm uranium respectively (Page 4-7, second paragraph). Paragraph one on Page 5-7 states that the K-65 silos are not identified as sources of uranium. Should this conclusion state the K-65 silos are not a source of uranium contamination in the groundwater? They are a potential source, but they have not been determined to be a source of groundwater contamination, correct?**
Response:				The text is clear that the K-65 silos were not identified as the source of uranium. However, it is true that they are a potential source of uranium contamination in groundwater but have not been determined to be.
Action:				No action.
50.	**6.1**	**6-1**		**For reasons stated in Comment #45 above, cadmium should also be considered a contaminant of concern.**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments

Response:

The following method was used to determine if individual wells contained above-background contaminants:

•Samples were evaluated and retained for the analysis only if they achieved acceptable sample quantitation limits. For cadmium the acceptable SQL was 0.002 mg/L.

•The average background concentrations for background wells were determined for 1000, 2000, 3000, and 4000 series wells. A Tolerance Limit, as specified by EPA, 1989e, was determined for each chemical, for each series wells.

•Average concentrations for each well were compared to the Tolerance Limits to determine potential contamination.

The results for this analysis for cadmium show:

Well number	Tolerance Level (mg/L)	Average Detected Concentration (mg/L)
1008	0.011	0.009
1034	0.011	0.01
2018	0.006	0.005
3005	0.006	<0.005
3034	0.006	0.012

In general, a single sampling result cannot be used to determine a chemical of concern. The single high 3000 series well detection does not warrant inclusion as a chemical of concern, especially since the 3000 series wells are so deep, it most likely would be influenced by other sources.

Action:

None required.

(19)

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
51.	**6.2**	**6-2**	**2**	**The definition of a "working level month" should be provided. Lifetime exposure of individuals living in the vicinity of the FMPC boundary should not be considered the same as occupational exposures of those who work at the facility.**
Response:				The working level, working month, and working level month (WLM) are defined in Appendix E of the OU4 RI report, Page Ex. The WLM is defined on Page Ex as cumulative exposure to radon progeny. One WLM is equal to exposure to a combination of radon progeny equal to one working level times an exposure duration of a 170-hour occupational month. Lifetime exposure of individuals living in the vicinity of the FMPC boundary is not considered the same as occupational exposures of those who work at the facility. The issue of worker exposure is not addressed in the baseline risk assessment. The assessment of worker risk is not within the scope of the risk assessment for the RI. In the baseline risk assessment human health assessment is performed for the public. Assessment of the risk to workers is part of the scope for the FS risk assessment.
Action:				Revise text to include response.
52.	**6.3**	**6-3**		**The chemical toxicity of cadmium should be considered in the toxicity assessment for reasons stated previously.**
Response:				The following method was used to determine if individual wells contained above-background contaminants: •Samples were evaluated and retained for the analysis only if they achieved acceptable sample quantitation limits. For cadmium the acceptable SQL was 0.002 mg/L.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments

•The average background concentrations for background wells were determined for 1000, 2000, 3000, and 4000 series wells. A Tolerance Limit, as specified by EPA, 1989e, was determined for each chemical, for each series wells.

•Average concentrations for each well were compared to the Tolerance Limits to determine potential contamination.

The results for this analysis for cadmium show:

Well number	Tolerance Level (mg/L)	Average Detected Concentration (mg/L)
1008	0.011	0.009
1034	0.011	0.01
2018	0.006	0.005
3005	0.006	<0.005
3034	0.006	0.012

In general, a single sampling result cannot be used to determine a chemical of concern. The single high 3000 series well detection does not warrant inclusion as a chemical of concern, especially since the 3000 series wells are so deep, it most likely would be influenced by other sources.

Action: None required.

53. 6-3 2 **"Operable unit action level concentrations of concern . . ." Should this read; "operable unit action level concentrations?" Are these action levels listed?**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Response:				The application of action levels to Remedial Action Objectives is discussed in Section 7.3 of the RI. References to action levels cited above will be deleted.
Action:				Revise Section 6.0 to reflect these responses.
54.		**6-3**	**Last**	**Prior to the use of the acronym "RfD," the text should define it as the "Reference Dose" so the reader can better comprehend the text.**
Response:				The definition of reference dose (RfD) is provided in Appendix E, Page Ex. The RfD is defined as an estimate of the daily chemical exposure of humans that is unlikely to result in deleterious effects during a lifetime of exposure, based on the assumption that a threshold exists for certain toxic effects of chemical substances.
Action:				The phrase "reference dose", corresponding to RfD, is added to the text.
55.	**6.4**	**6-4**		**Risk Characterization: It is inconsistent with USEPA risk assessment methodology to calculate carcinogenic risks in terms of "risks of fatal cancer." USEPA does not separate carcinogenic risks into fatal and non-fatal. DOE's presentation of carcinogenic risk in this manner is very misleading and can give the appearance that carcinogenic risks are smaller than they really are. Total carcinogenic risks (fatal and non-fatal) should be calculated in the risk assessment.**
Response:				The EPA guidance document for conducting baseline risk assessments distinguishes between "fatal cancers" and "all cancers" in Chapter 10 (Radiation Risk Assessment Guidance), Exhibit 10-5 of the Human Health Evaluation Manual. The guidance document states that on average, approximately 50 percent of all of the cancers induced by radiation are lethal. It should be noted, however, for uranium the risk of fatal cancer is approximately equal to the risk of all cancers. U.S. EPA has established a precedent for the evaluation of fatal cancer as the principal health consideration for radionuclides in its rulemaking for National Emission Standards for Hazardous Air Pollutants; Radionuclides

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				(40CFR61). The rulemaking states that U.S. EPA has considered other health effects but that they are not addressed because none of them pose a more severe risk to health.
Action:				None required.
56.		**7-5**	**5**	**While it is true that 40 CFR 300 Subpart I gives an acceptable cancer risk range of 1×10^{-4} to 1×10^{-6}, it also states that the 1×10^{-6} risk level shall be used as the point of departure for determining remediation goals when ARARs are not available or are not sufficiently protective.**
Response:				Agree, comment noted.
Action:				None required because reported risks exceed 1×10^{-4}.
57.		**7-6 & 7-7**	**Bullet items**	**The rationale for considering 25% of annual dose limits, MCLs, proposed MCLs, etc., as remedial action objectives should be provided here. (i.e., why is 25% used as opposed to 10%, 50%, 75%, or some other percentage?)**
Response:				The concept of establishing the operable unit-specific RAOs at 25 percent of the site-wide limits is derived from the work plan for ARARs and the baseline risk assessment. This work plan establishes the concept of using "action levels" for a given operable unit of 25 percent of the exposure limits to ensure that the combined impact from all operable units does not inadvertently exceed established site-wide limits. In cases when exposures attributable to a combination of one or more operable units are not expected to exceed a site-wide limit, the 25 percent action level is not necessary. In cases when exposures attributable to a combination of one or more operable units are expected to exceed a site-wide limit, the 25 percent action level provides a useful means to help ensure that a site-wide limit is not exceeded. Whenever an action level is reached, an additional review is conducted to ensure that a site-wide limit is not exceeded.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Action:				Revise text to reflect comment.
58.	**Appendix B**			**Surface Soils Radiological Results: Surface soil should have been analyzed for Ac-227 and Pa-231 for previously stated reasons.**
Response:				See response to general comment No. 2.
Action:				None required.
59.	**Appendix B**			**Surface Soils Boring/Well Logs: These logs should have a legend that defines the meaning of abbreviations such as "10YR)," "5/8," "USCS," "TSF," etc. It must be remembered that this will be a public document when finalized and the public will not know what these things mean. In fact, Ohio EPA is unclear as to the meaning of some of these abbreviations.**
Response:				Agree.
Action:				An explanation will be added to the beginning of the appendix.
60.	**Appendix C**		**Tables**	**Surface Water General Chemical Results: A footnote should be included stating what the letters associated with certain values represent (i.e., "B" and "E"). This will allow the reader to better assess the significance of levels reported.**
Response:				A key to any symbols used will be provided.
Action:				Include a key to symbols.
61.	**Appendix C**		**Table**	**Surface Water Hazardous Substance List Results: Data are provided for only two sites, "ASIT-021" and "W-11." The location of neither of these sites is provided on Figure 2-4. A description of the location of these two sites should be given in the text or on the figure.**

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
Response:				Location on ASIT-021 was erroneously included in the OU4 study area, it should have been W-10. site W-11 is located downstream of OU4 study area and data for this location is provided only for comparison.
Action:				Replace ASIT-21 data with W-10 data.
62.	**Appendix C**			**Sediments/Analytical Results: The location of sampling point "W-11" should be provided as noted above.**
Response:				See response to comment No. 61 above.
Action:				No action.
63.	**Appendix C**		**Tables**	**Sediment Hazardous Substance List Results: A footnote should be provided with the table so the reader can tell what letters such as "XU," "B," and "J" stand for.**
Response:				Agree with comment.
Action:				Add key to symbols at the beginning of the results.
64.	**Appendix E**		**General**	**The text throughout the risk assessment incorrectly refers to tables and figures as Table 1-1 and Figure 2-1, for example, instead of Tables E1-1 and Figure E2-1. Appropriate corrections should be made to these references in the text. Also, as previously stated, cadmium should be considered a contaminant of concern since at least five wells within the Operable Unit 4 study area (1008, 1034, 2018, 3005, and 3034) have had one or more samples at or above the Safe Drinking Water Act MCL for cadmium. The hazards associated with this contaminant must be included in the baseline risk assessment for Operable Unit 4.**
Response:				The text of Appendix E will be changed to refer correctly to tables in Appendix E.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments

The following method was used to determine if individual wells contained above-background contaminants:

•Samples were evaluated and retained for the analysis only if they achieved acceptable sample quantitation limits. For cadmium the acceptable SQL was 0.002 mg/L.

•The average background concentrations for background wells were determined for 1000, 2000, 3000, and 4000 series wells. A Tolerance Limit, as specified by EPA, 1989e, was determined for each chemical, for each series wells.

•Average concentrations for each well were compared to the Tolerance Limits to determine potential contamination.

The results for this analysis for cadmium show:

Well number	Tolerance Level (mg/L)	Average Detected Concentration (mg/L)
1008	0.011	0.009
1034	0.011	0.01
2018	0.006	0.005
3005	0.006	<0.005
3034	0.006	0.012

In general, a single sampling result cannot be used to determine a chemical of concern. The single high 3000 series well detection does not warrant inclusion as a chemical of concern, especially since the 3000 series wells are so deep, it most likely would be influenced by other sources.

Action: None required.

(26)

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
65.	**Appendix E**	**Exi**	**2**	**As previously stated, the ingestion of contaminated surface water from Paddys Run should be also considered as a potential exposure pathway for the risk assessment. Surface water can be contaminated via surface runoff containing soluble uranium from the Operable Unit 4 study area or through contaminated groundwater seepage from the creek bank.**
Response:				Contributions to surface water contamination in Paddys Run from surface water erosion of soil from OU4 were modeled as part of the modeling of contributions to sediment contamination in Paddys Run via this migration pathway. The modeled contributions to surface water contamination from OU4 soils are very low and would not contribute to a reasonable receptor exposure scenario.
Action:				Revise text to address comment generically.
66.	**Appendix E**	**Various places throughout the risk assessment**		**It is inconsistent with USEPA risk assessment methodology to calculate carcinogenic risks in terms of "risks of fatal cancer," USEPA does not separate carcinogenic risks into fatal and non-fatal. DOE's presentation of carcinogenic in this manner is very misleading and can give the appearance that carcinogenic risks are smaller than they really are. Total carcinogenic risks (fatal and non-fatal) should be calculated in the risk assessment.**
Response:				The EPA guidance document for conducting baseline risk assessments distinguishes between "fatal cancers" and "all cancers" in Chapter 10 (Radiation Risk Assessment Guidance), Exhibit 10-5 of the Human Health Evaluation Manual. The guidance document states that on average, approximately 50 percent of all of the cancers induced by radiation are lethal. It should be noted, however, for uranium the risk of fatal cancer is approximately equal to the risk of all cancers. U.S. EPA has established a precedent for the evaluation of fatal cancer as the principal health consideration for radionuclides in its rulemaking for National Emission Standards for Hazardous Air Pollutants; Radionuclides (40CFR61). The rulemaking states that U.S. EPA has considered other health

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				effects but that they are not addressed because none of them pose a more severe risk to health.
Action:				None required.
67.	**Appendix E**	**Exiii**	**2**	**To state that "There is no indication that leaking is occurring from the silos at the present time," is presumptuous. Historical accounts document leaks from the silos with no accounts of how or if the leaks were fixed. Sampling at present has not proven that the contamination in area of Operable Unit 4 isn't attributable to the silos. Until such time as sampling proves conclusively that the silos are not leaking, DOE should refrain from making such statements.**
Response:				Agreed. However, there is insufficient basis for determining whether contaminants are migrating out of the silos and into subsurface soils and potentially the aquifer. Available sample analytical results have not shown that the contamination in wells in the Operable Unit 4 study area is attributable to the silos.
Action:				Revise text to reflect response.
68.	**Appendix E**	**Exiv**	**Last**	**Few studies have truly researched the effects of chronic doses of radiation on mammals and birds. To state that ". . . Operable Unit 4 does not appear to contribute to ecological risks" is inappropriate, since little knowledge on the chronic effects of radiation on the environment is available. Such exposure on a long-term basis may indeed pose a significant risk to the animal and plant communities around Operable Unit 4.**
Response:				Acknowledge comment.
Action:				Revise text to eliminate exposure risk to mammals.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
69.	**Appendix E**		**Tables E2-3, E2-5, E2-6, and E2-7**	**It is unclear how DOE utilized the analytical data for parameters that were below detection limits in its calculation of average concentrations. In obtaining the averages listed in the above-mentioned tables (and other tables throughout the RI and risk assessment documents), the value used to compute averages for those compounds that were below detection limits must be 1/2 of the detection limit, rather than zero. If this was not done, then the average concentrations given in the tables are misleading and must be recalculated using 1/2 of the detection limit of each respective compound.**
Response:				As a rule, average values were calculated including the nondetections as detections at the detection limit. This will be noted more clearly in the text.
Action:				The text will be revised to indicate that average values were calculated to include nondetection as detections at the detection limit.
70.	**Appendix E**	**E2-6**	**2 & 3**	**Ohio EPA does not believe that all of the volatile organic compounds that were detected in silo samples are the result of blank contamination and/or are lab contaminants and can consequently be dismissed. Appendix B results show levels of Chloroethane, Acetone, Styrene, Total Xylenes, 4-Methyl-2-Pentanone, Trichloroethane, and Toluene to be present in various silo samples where respective blanks show "no detection." These compounds must be considered in the risk assessment.**
Response:				Acknowledge comment.
Action:				Revise tables as appropriate.
71.	**Appendix E**	**E2-20**	**Last**	**As previously mentioned, using Ra-226 as an indicator or contaminants originating from the silos is questionable due to its relative insolubility in its present state.**
Response:				The comment presents a valid possibility regarding differential solubility of radium and uranium in the wastes in Silos 1 and 2. Unfortunately it has not

Comment Number	Section	Page	Paragraph	Comments
				been empirically determined if this is the case in the silo wastes. The identification of Ra-226 as a constituent of concern in OU4 is appropriate because the K-65 silos are a unique source of large quantities of Ra-226 activity at the FMPC. Therefore, Ra-226 could be used as an indicator of releases from the K-65 silos if consistently detected in significant quantities in media such as groundwater, perched water, or soils beneath the silos. The absence of Ra-226 in wells in the OU4 study area could indicate several possibilities as noted in the comment.
Action:				None required.
72.	**Appendix E**	**E2-25**	**First sentence**	**The sentence starting "No wells . . ." is incorrect and should be removed. Table E2-11 shows one 2000 series well within the vicinity of Operable Unit 4 having Ra-226 levels of 4.3 pCi/L, approximately 4 times the background level reported.**
Response:				The text is correct; however, the data in Table E.2-11 are incorrect.
Action:				Table E2-11 will be revised to reflect the correct value for Ra-226.
73.	**Appendix E**	**E2-25**	**2**	**The sentence starting "No other overburden wells . . ." is false and should be removed. The results in Table E2-11 reveal that at least one overburden (1000 series) well exhibited concentrations above background and 95% tolerance levels for the following metals: barium, cadmium, chromium, lead, manganese and mercury. Such blatant discrepancies between the data and the text are quite disturbing and suggest that DOE is somewhat careless in its preparation of this document.**
Response:				Acknowledge comment.
Action:				Revise tables as appropriate.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
74.	**Appendix E**	**E2-25**	**3**	**Why is the average background total uranium concentration for surface water in the vicinity of FMPC based on samples from the Great Miami River? Background samples should either be collected from Paddys Run upstream of any FMPC effects or from a tributary of comparable size and drainage area in the region. The GMR has a much larger drainage area and receives numerous industrial and municipal discharges, some of which discharge uranium (e.g., DOE MOUND). Using background samples from the GMR to assess levels found in Paddys Run is inappropriate.**
Response:				Uranium concentrations measured at locations in the Great Miami River upstream of the FMPC are used as background for all surface water in the vicinity of the site because these data are the most representative data that are available (surface water flow in Paddys Run is intermittent). As indicated in the FMPC annual environmental reports, uranium concentrations measured upstream in the Great Miami River are consistent with measured concentrations upstream in Paddys Run. It is agreed that other discharge sources could contribute to levels in the river selected as background; however, it does not appear that such sources have noticeably affected the upstream Great Miami River locations used in the risk assessment.
Action:				No action is necessary.
75.	**Appendix E**		**Table E3-1**	**Ohio EPA does not agree with DOE's definition of future land use being defined as that land use 100 years from the present. Future use in any land use that occurs in the immediate future in beyond and which under a no action scenario could expose populations to contaminants. Therefore, the assumptions made in the risk assessment relating to the 100-year future use must be changed to be consistent with a traditional future use scenario.**
Response:				Under current land use it is assumed that current security control measures will be maintained at the site for 100 years. Under future land use after 100 years assumptions regarding current security control measures change allowing access to the site within the FMPC property boundary. This change in assumptions

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
				allows risk assessors to evaluate potential resident farmer exposure scenarios within the property boundary beginning at a reasonable time in the future.
Action:				No action.
76.	**Appendix E**	**E3-15 & 16**	**Table E3-3**	**Please explain the significance of using an FI (defined as the time spent as waking or sleeping hours) of 1 for the exposure pathways listed on these pages.**
Response:				The parameter FI in Table E3-3, Pages E3-15 and E3-16 represents the fraction of medium or material ingested that is assumed to be contaminated in the groundwater and food ingestion exposure pathways. The parameter FI regarding hours per day spent awake or asleep is part of the airborne radon and direct radiation exposure pathways. Values used for FI are presented in Table E3-3, Page E3-14. This parameter in the radon and direct radiation exposure pathways is used to help distinguish time spent indoors and outdoors, providing the opportunity to include a shielding factor for time spent indoors in the direct radiation pathway.
Action:				None required.
77.	**Appendix E**	**E3-23 & E3-24**		**The ingestion rate of contaminated drinking water is not given. the ingestion rate should be 2 l/day for both radiological and chemical contaminants.**
Response:				The ingestion rate of contaminated drinking water is presented in Table E3-3, Page E3-15. A value of 2 liters per day is used for both radiological and chemical assessments.
Action:				None required.

OHIO EPA COMMENTS (Continued)

Comment Number	Section	Page	Paragraph	Comments
78.	Appendix E	E3-32	1 Last sentence	This sentence should state ". . . would be exposed to acute toxic concentrations . . ." As it stands, the sentence implies that chronic doses will not be encountered. Chronic toxic doses for aquatic organisms have not been well documented, making any statements about them questionable. Effects other than acute lethality can result in aquatic community degradations and this should be pointed out in the text. Factors such as decreased fertility or growth can decrease biotic integrity.
Response:				Acknowlege comment.
Action:				Revise text as suggested.
79.	Appendix E	E4-6	Table E4-1	Footnotes need to be added to this table defining what the letter "NG" and "d" mean so that the reader can understand the table better.
Response:				Acknowledge comment.
Action:				Table will be corrected.
80.	Appendix E	ER-7		DOE should use the most current USEPA Health Effects Assessment Summary Tables volume. The volume referenced here has been superseded by at least three updates.
Response;				The Health Effects Assessment Summary Tables reference citation shall be updated.
Action:				Update reference.