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RESPONSES TO USEPA AND OHIO EPA COMMENTS ON THE REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 4, AUGUST 1993

11/02/93

DOE-FN/EPA
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RESPONSE
OU4

United States Environmental Protection Agency
Region V
Operable Unit 4 Remedial Investigation Report
Technical Comments

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #2
Comment: The response to this comment is acceptable. I have only one additional comment: the unit risk factors (URFs) should have medium concentration units specified in the tables in Attachments D.I and D.II. The URFs generated here are concentration-specific, as well as medium- and pathway-specific.
This should also be noted in the text, perhaps in bold print, as a precaution against any incorrect application.

Response: DOE agrees that the information in Appendix D, Attachment I is specific to a medium and therefore a footnote cautioning the reader to this fact is appropriate. However, Attachment II presents ILCRs and HIs which have no concentration units.

Action: The following precautionary text was added to Section D.5, page D.5-1, line 27 in bold:

The URFs and UTFs developed in Attachment D.I are specific to the identified pathway and medium presented. It should be further noted that they are only applicable to the specific scenario developed for the identified receptor and the reader is cautioned against their use in any other fashion.

The following footnote was added to each of the tables presented in Attachment D.I:

a - Units are risk (or HQ as appropriate) per pCi/g (or mg/kg as appropriate) of solid media, risk per pCi/cu m for air and risk per pCi/l of water. **Caution should be used in the application of these factors as they are specific to the medium and exposure route (pathway) identified.**

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #12
Comment: Regarding the SA parameter values for the Dermal Contact with Soil/Sediments pathway, please reread the OSWER Directive 9285.6-03. The directive specifies that the upper-bound values should be used for IR (intake/contact rate); however the directive does not give values for the dermal exposure pathways, which are discussed in further guidance: the 1992 Dermal Guidance. The body surface area is a measure

of contact rate (contact area) in the dermal equations. Therefore, it is appropriate to use the upper-bound values (95th percentile values) as indicated in the dermal guidance. The changes should be made in all dermal contact scenarios.

I agree that the upper-bound values recommended for ET and EF may not be appropriate for the Incidental Ingestion and Dermal Contact with Surface Water pathways. I said that the difference requires discussion of the scenario and justification in the text. I think that the likelihood of wading in Paddys Run is high for the trespasser, and I could justify an exposure scenario of 1 hr/event x 52 events/year x upper-bound SA for partial body exposed.

Response: DOE agrees to use the upper-bound SA in all RME scenarios. DOE has provided justification in the text for the trespassing child scenario. DOE agrees to the wading scenario for the trespassing child/youth proposed by the reviewer except that the suggested exposure frequency of 52 events per year was revised to 40 events per year to account for local weather conditions.

Action: All tables in Attachment I and II to Appendix D were revised to use the upper bound SA. Likewise, Tables D.3-11 and D.3-12 and associated text were revised to describe the use of upper bound SA. Summary tables in Section D.5, D.7, 6 and 7 were revised as appropriate.

ET and EF were changed as requested and referenced by footnote to "Specific guidance from EPA Region 5 (10/01/93 comments on Draft Final RI for OU4." Parameter values for the wading scenario were derived as follows, with the explanation added to Section D.3.3.4, page D-3-57, line 31: "As requested by EPA Region V, dermal contact with surface water for the trespassing child is evaluated for a wading scenario. It is assumed that the SA exposed during wading involves the legs, feet, hands and arms, which constitutes approximately 57 percent of total body surface area for children age 7 to 18 years (EPA 1990e). The upper-range value for child total body SA of 1.7 m^2 (EPA 1992d) is multiplied by 0.57 to estimate an upper-range wading SA of 0.97 m^2. It is conceivable that wading might occur during each week of the year, except that the water in Paddys Run is expected to be frozen for at least three months of the year. Therefore, it is conservatively assumed that wading might occur 40 times/year for 1 hour per event."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Table D.3-12 Pg. #: Line #: NA Code:
Original Comment #13
Comment: There are still problems with footnotes here. Reference "d" (Region III screening tables) is not a justification for choosing a site-specific parameter value anywhere; it was used by Region III as a default for a screening method, with the intent that the parameter values would be replaced by site-specific values. I also asked for the basis of the values referenced as "e" and "f" to be included; adding the teleconference notation does not give the reader any insight into the basis of the values used for this

assessment. Describe the exposure (see footnote "d" and "e" in Table D.3-11 for example).

The SA for the dermal contact pathways does not reflect the RME exposure. See comment #12 above.

The new on-site Farmer IR does not reflect the inclusion of the 480 mg/day occupational exposure; footnote "p" does nothing to explain this value and is meaningless.

Response: We agree that the footnotes are deficient; the following actions explain the corrections made.

Action: All the footnotes in this table were fully reviewed and, if appropriate, expanded as requested by the reviewer. The following footnote changes were made":

[d] (applied to the inhalation rate for the on-property resident child, changed to): "Derived from an algorithm relating respiratory rate to body weight, corrected by an activity factor of 2.11 (EPA 1988d)."

- The following reference was added to the document: EPA, 1988d, "Recommendations for and Documentation of Biological Values for Use in Risk Assessment," Environmental Criteria and Assessment Office, Cincinnati, OH, EPA/600/6-87/008, PB88-179874.

[e] (applied to CT resident drinking water rate, changed to): "Special guidance from EPA Region V for the CT scenario (Teleconferences between P. Van Leeuan, EPA Region V, and M. Bollenbacher, IT Corp., 12/3/92 and 12/7/92); drinking water ingestion rate = 1.4 L/day; EF = 275 days/year; vegetable and fruit ingestion = 78 g/day; meat ingestion = 50 g/day; milk ingestion = 0.2 L/day; soil ingestion rate = 122 mg/day; dermal contact with soil = 48 days/year; hours/day spent indoors an outdoors = 19.8 and 4.2, respectively."

[f] (applied to ET for time spent indoors and outdoors for RME adult receptors, changed to): "Special Guidance from EPA Region V (Teleconference between P. Van Leeuwen, EPA Region V, and M. Bollenbacher, IT Corp., 2/25/93); 8 hours/day spent outdoors for 250 days/year = 2000 hours/year; this value divided by 350 days/year; on-site = 5.7 hours/day spent outdoors; 18.3 hours/day spent indoors determined by difference."

[d] (applied to the soil/sediment ingestion rate for the CT receptor). The value (0.1 g/day was changed to 0.122 g/day, and footnote "e" as explained above was applied.

[p] (applied to the RME on-property farmer soil/sediment ingestion rate changed to): "See explanation in Section D.3.3.1." The following was added to Section D.3.3.1, page D-3-53, line 17.5: "The soil ingestion rate for the RME adult farmer is a site-specific time-weighted average value based on specific activities performed during

the course of the receptor's lifetime and the relative length of time spent in each activity. The first 6 years of this receptor's life are spent as a young child ingesting 0.2 g/day for 350 days/year (total of 420 g during this period). Between 18 and 70 years of age, the RME farmer is assumed to spend 50 years working a farm. Assuming the farmer follows the usual and recommended agricultural practices in Hamilton County (DOC 1989; USSCS 1992), he will spend 100 days/year outdoors working the land, during which he is assumed to consume 0.48 g of soil/day, or a total for this activity of 2400 g. During the remaining 14 years (12 years spent as an older child and 2 years spent as an adult) it is assumed that the soil ingestion rate is 0.1 g/day for each of the 350 day/year spent on site (total of 490 g during this period). The total soil ingestion, 4560 g, divided by 25550 days (365 days x 70 years) yields a time-weighted average intake of 0.18 g/day.

- The following references were added to the document: U.S. Dept. of Commerce, 1989, "Census of Agriculture, Volume 1, Geographic Area Series Part 35, Ohio State and County Date," Bureau of the Census.

  USSCS, 1992, "U.S. Soil Conversation Services Field Guide."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #15
Comment: What is "Webster et al. (1991)" given as the reference in footnote "b" in Table D.3-14? How does this reference fit into the hierarchy listed in the action for this comment?

Response: The footnote is not related to the hierarchy mentioned in the original comment response; the hierarchy pertains to water permeability coefficients.

Action: Footnote "b" was changed to: "EPA 1993d: ECAO-recommended default value for inorganic chemicals."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #17
Comment: The discussion on page D-4-46 does not explain that the TEF values listed in Table D.4-6 are recommendations and are based on skin-painting studies, not oral ingestion. This difference would indicate that a less exact TEF value should be used - at best the values rounded to one significant digit. USEPA has recommended using only the order of magnitude ranking, but I prefer the former approach.

Response: The TEF values developed by Clement Associates and presented in Table D.4-6 were based on a combination of mouse skin painting and rat lung implantation studies. The TEF values should be rounded to one significant figure, as requested. This altered slightly the corresponding oral and inhalation slope factors, which are

expressed to two significant figures as before, and necessitate the recalculation of PAH-associated cancer risks.

Action: The TEF values were rounded to one significant figure and the Table in Section D.4 were revised as appropriate.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #18
Comment: The explanations of the conversion of the RFC to the RFD and the Unit Risk to the SF do not point out that the calculation of the administered dose is affected by lung physiology, dust particle size, etc., whereas the comparison of the air concentration with the RFC or Unit Risk value provides a direct and probably more accurate estimate of risk. That is why USEPA is moving toward the RFC/Unit Risk approach for inhalation exposure.

I provided FERMCO with the same ECAO issue paper on the provisional RFD for cobalt that is referenced as "Region III guidance". The reference should be ECAO issue paper on cobalt, 1992. We seem to have a communication gap here.

Response: DOE agrees and will expand the text on respiratory tract anatomy and physiology, particularly the differences between laboratory animals and humans. These issues are addressed in the current methodology for inhalation RfC derivation by which a $NOAEL_{HEC}$ (a human equivalent concentration) is derived from the empirical data. For inhalation cancer studies, these issues are addressed by assuming that "the air concentration is generally considered to be the equivalent dose between species based on equivalent exposure times..." (IRIS Background Document 2). When available, pharmacokinetic data are used to refine interspecies extrapolation. In either case, interspecies differences in lung function are addressed in the derivation of the inhalation RfC or unit risk; these differences are not part of the estimation of inhaled dose (mg/kg-day) from the concentration in air.

Dust particle size, on the other hand, was not addressed in the toxicity evaluation. This issue is important for oral, dermal, and inhalation exposures. This issue is now addressed for all routes of exposure in Sections D.4 and D.6.

Action: The following sentence was inserted in Section D.4.1.1, page D-4-1, line 22: "Species differences in respiratory tract antimony and physiology, if relevant, are considered in this derivation, so that the RfC represents a threshold concentration in air for humans." The following sentence was inserted in Section D.4.1.2, page D-4-6, line 11: "The inhalation slope factor is intended to reflect a concentration in air to which humans are exposed; pharmacokinetic or metabolic data are used, when available, in the animal-to-human extrapolation."

"Another source of uncertainty in the estimation of slope factors for human exposure from animal data is the chemical form and mode of administration, as discussed in Section D.4.2.1."

The following paragraph was inserted in Section D.4.4.1, page D-4-1, line 25: "Another source of uncertainty in the derivation of an RfD or RfC is the test form and mode of administration of the chemical. For example, the relevance of once-daily gavage administration of a bolus dose of a chemical in corn oil to rats compared with ingestion several times daily of small doses in drinking water (or beverages made with drinking water) by humans is not clear, and is not usually addressed in the uncertainty factor applied. Even greater differences in form and mode of administration occur in inhalation studies. For example, a test chemical may be administered to animals as a aerosol, but environmental exposure of humans may involve inhalation of vapors. Greater uncertainty may occur with dusts and particulates, where differences in size (geometric standard deviation and mass median aerodynamic diameter) may profoundly affect regional deposition and uptake within the respiratory tract and the nature of the effects induced."

The inhalation RfD for cobalt was referenced to "ECAO issue paper on cobalt, 1992," as requested.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #19

Comment: Region V provided a list of oral and dermal absorption efficiency values from ECAO to FERMCO for use in FEMP risk assessments. Although the headers on the memos from ECAO indicate that the values were provided in response to requests from other toxicologists evaluating other sites, only peer reviewed papers were considered by the ECAO contractors who recommended these absorption values. These are the same contractors who review literature data and provide absorption values and concentration values to the EPA workgroup for development of EPA's toxicity values. In the interest of consistency, these recommendations should be used. Some contractors may not agree with the studies chosen for the evaluation. However, as I previously stated, USEPA does not expect each contractor to develop their own set of absorption factors and toxicity values, but expects that values derived by their own (EPA's) contractor through the Environmental Criteria and Assessment Office (ECAO) to be used in the risk assessment. I do not have the time to do literature searchs and review these derivations, and will not accept contractor derivations that differ from recommendations received from ECAO unless ECAO cannot provide any useful information. If the FERMCO risk assessment team wishes to submit their evaluations, on a chemical by chemical basis, to ECAO and its contractors for review, we can do this. However, FERMCO will still be bound by the same time schedule.

Response: DOE requested reference toxicity values for the chemicals of potential concern (CPC) for Operable Unit 4. ECAO values for many of the CPCs were received and used. However, ECAO values were not received and presumably do not exist for many other chemicals. For those chemicals with no ECAO values DOE has continued to use the values collected from peer-reviewed research. Table D.4-4, next page, lists the GAF and ABS values used and the superscripts note the source of the value

TABLE 4-31B

BERM SOIL INORGANIC ANALYSES RESULTS BY DEPTH

Boring No.	1620	1620	1620	1621[a]	1621[a]	1621[a]	1622	1622	1622	1790	1623	1623
Depth (ft)	5	16	21	6	6	6	5	20	30	5	16	24
Analyte (mg/kg)[b,c,d]												
Aluminum	12100	9070	10500	9890	4990	11800	10100	4530	10500	9040	10800	9860
Antimony	24.9	27.4	22.9	27.1	26.3	27.6	19.1	--	18.6	20.6	14.6	18
Arsenic	8	7.5	7.9	6.1	4.5	7.3	5.6	4.1	8.3	5	5	3.6
Barium	89.4	62.7	97.3	75	41.9	95.1	69.6	30.5	86.4	47.1	72.2	65.5
Beryllium	0.85	0.84	1.1	0.78	0.65	1.1	0.67	ND	0.81	0.81	0.86	0.82
Cadmium	4.2	5.4	4.1	4.3	5.8	4.6	2.6	7.5	2.5	3.2	4.3	4.4
Calcium	39600	86700	37900	44900	92800	49000	30000	161000	11600	95600	59200	64800
Chromium	20	16.6	18.5	18.7	12.1	20.6	16.4	20.8	15.7	28.4	17.5	17.1
Cobalt	13.3	12	14.9	12.3	9.8	13.9	11.3	ND	12.6	11	10.8	10.5
Copper	23.8	27	23.9	20.4	19.5	23.7	19.3	20.5	19.5	20.7	22.1	22.2
Cyanide	ND	1.6	ND	0.15	0.26	0.13	0.12	1.2	ND	--	ND	ND
Iron	25400	23100	27500	19900	13600	24700	20900	11200	25800	18600	20800	20900
Lead	11.8	11	10.6	12.2	8.3	13.6	11.9	6.1	12.2	9	13.8	8.9
Magnesium	13900	22100	12700	15500	28500	16200	6390	40700	5070	23900	22900	20700
Manganese	519	597	880	489	324	525	395	330	228	411	547	627
Mercury	ND[e]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Molybdenum	3.2	4.6	3.3	3.6	3.8	3.5	2.4	ND	2.9	13.3	ND	3.3
Nickel	32.4	30.6	33.7	28.1	26	29.7	21.7	31.7	22.2	24.2	28.6	26.5
Potassium	1080	950	712	917	590	926	711	993	546	1230	981	1180
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	7.2	8.2	7	7.5	7.7	8	5.8	19.2	3.6	14.4	5.8	6.2
Sodium	79.8	138	82.9	81.9	98.7	91.3	77.7	237	47.8	197	83.2	113
Thallium	ND	0.97	0.63	ND	0.88	1.1	0.71	ND	ND	ND	ND	ND
Vanadium	28.4	25.1	27.5	25.6	17.4	28.2	24.6	21.8	27.7	27.5	26	26.4
Zinc	59.6	58.8	53.9	61	33.1	58	48.6	30.7	47.1	44.2	52.4	49.3

[a]These samples were all taken at a depth of 5 to 6 feet. These samples were filtered.
[b]The sample numbers used in this data set include: 99469, 99470, 99475, 99488, 99490, 99491, 99513 through 99515, 99540, 99542, 99543, 99557, 99559, 99560, 99580, 99581, 99583, 99594 through 99596, 99607, 99609, 99610, 99624, 99626, 99627, 99659, 99661, 99662, 99676 through 99678, and 99686 through 99688.
[c]Values qualified with an R, U, or UJ are excluded.
[d]Values expressed in milligrams per kilogram (mg/kg).
[e]ND - Not detected.

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([h] denotes ECAO values). Other appropriate sources of GAF values includes ATSDR profiles, EPA documents, and recognized compendia such as the Handbook on the Toxicology of Metals. These sources are discussed in Section D.4.1.4 (pages D-4-6 through D-4-12 of the draft final).

Tables D.3-14 and D.4-4 were subjected to an additional quality check; none of the ECAO values were revised. Therefore, there is no impact on the baseline risk assessment.

It should be noted that this pathway is a very small contribution to risk and will remain small due to the more conservative assumptions developed for these parameters. Accordingly, any additional changes to GAF and ABS values for the non-ECAO values would neither change the conclusions of the baseline risk assessment nor the RI Report.

Action: Tables D.3-14 and D.4-4 have been quality checked to assure accuracy in transcribing the non-ECAO values and, also, the ECAO information provided by EPA.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #24

Comment: The discussion on page D-6-7 fails to point out that the TEF values presented in Table D.4-6 are recommendations based on skin-painting studies, not on orally administered doses. Therefore, application of these TEF values to oral effects of PAHs may result in some inaccuracy. At best, the TEF values are useful to indicate potential differences in magnitude of effect between the B2 carcinogens.

Response: The derivation of the TEFs for the B2 PAHs, which was used to modify both the oral and inhalation slope factors, was based on mouse skin painted studies and rat lung implantation studies. Clearly, the route of administration (particularly the entirely unnatural exposure via lung implantation) introduces uncertainty to the risk assessment. An appropriate statement to that effect was added to this discussion.

Action: The sentence beginning on line 26, page D-6-7, Section D.6.2.2 was changed to: "The TEF approach (see Section D.4.2.17) attempts to fill this data gap by estimating slope factors for the other B2 PAHs based on potency relative to benzo(a)pyrene in mouse-skin painting to rat lung implantation tests, rather than on oral administration testing. The application of the TEFs to oral exposure is expected to result in some inaccuracy, because the TEFs are not based on oral data. Therefore, the TEFs are considered useful only to indicate potential differences in potency between the B2 PAHs."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: Line #: NA Code:
Original Comment #25
Comment: Table D.7-1 gives the Total Risk (All Media) risk as the sum of risks from both radiation and chemical exposures. This is acceptable, but a better format would be to separate the risks from these two kind of exposure as the remediation actions may differ. This presentation leaves the calculations to the RPM.

Response: Agreed.

Action: Table D.7-1 was revised to include a radiological and chemical sum for all media as well as the existing "Total -All Media" summation of risk.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2.3.2 Pg. #: D-2-12 Line #: NA Code:
New Comment #1
Comment: (1) The use of aluminum as an example in #3 is not a good choice; aluminum has a provisional RfD of 1 mg/kg/day (affected by chemical form). (2) Regarding the elimination of chemicals detected infrequently/only in one medium, such chemicals should not be eliminated as CPCs without the approval of the EPA site RPM or toxicologist. Frequency of detection is a nebulous thing, and depends on the numbers of samples taken and the distribution of samples. Some contaminants, due to their chemical properties, will only be found in one medium.

Response: (1) As requested, aluminum was removed from the example list of chemicals that are not appropriate for hazard analysis. Aluminum will not, however, be included as a CPC and carried through the risk assessment. Although the reviewer stated that a provisional RfD of 1 mg/kg-day was available for aluminum (affected by chemical form), no guidance was provided on how to adjust for chemical form. (2) Thorough review of the CPC tables in Section 2.0 revealed that no chemical was eliminated solely because of infrequent detection. It appears that "chemicals found infrequently and in only one medium" is boilerplate that does not apply. The statement was removed from the text.

Action: Aluminum, was removed from the example list of chemicals that are not appropriate for hazard analysis. Item 4 "chemicals found infrequently and in only one medium", was removed from Section D.2.3.2.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: D-2-2 Line #: 12 Code:
New Comment # 2
Comment: Why was "within" operable unit 4 changed to "adjacent" to operable unit 4? Also in line 14, "within" is changed to "within or near". Please comment on this change.

Response: The change from "within" to "adjacent" or "within or near" in describing the location of the family farm was made to recognize the fact that with the Operable Unit 4 physical size and layout, farming was not very practical. The wording was changed

to acknowledge this fact although the reviewer will note that the soil concentrations used in the risk characterization were those generated for Operable Unit 4 only and did not include the adjacent area sampling results. The phrasing was also changed to be consistent with the conceptual model of the failure of Silo 3 in that the area over which its contents would spread extended outside of Operable Unit 4.

Action: No action planned.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2.3.3.1 Pg. #: D-2-13 Line #: 3 Code:
New Comment #3
Comment: To what does the added notation of "oil and grease" refer to here?

Response: Oil and grease refers to material that is organic solvent-extractable from an acidified sample (Standard Methods for the Examination of Water and Wastewater, American Public health Association, Washington D.C.)

Action: The text will be clarified by inserting (solvent-extractable material, not otherwise characterized) after "oil and grease."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: D.2.3.3.2 Pg. #: D-2-13 Line #: 13 Code:
New Comment #4
Comment: Table D.2.4 indicates that antimony was detected at a frequency of 1/1; that's 100% of the samples. Infrequent detection is not an appropriate argument for elimination. Please comment.

Response: DOE agrees that infrequent detection is not a good argument for the deletion of antimony as a constituent of potential concern for Silo 3, but that was not the justification stated in the footnote. As stated in the footnote to the table, deletion was justified since the single detection was lower than the 95 quantile of the background distribution. Antimony was qualified as "N" (tentatively identified) by the laboratory in all 11 samples collected from Silo 3 and 10 samples were rejected during data validation (matrix spike outside control limits). Both the rejected values and the estimated value were all of similar concentration. DOE did not however rely on this information to remove antimony from risk characterization in scenarios involving the Silo 3 waste materials.

The conceptual model used in establishing exposure point concentrations and completing risk characterization states that the contents of Silo 3 are distributed on the ground surface following silo failure in the future source-term scenario. The silo contents then are treated as "soil" for risk characterization purposes. In establishing the exposure point concentration, the CPC list for the OU 4 soil data set and the Silo 3 data set were combined to arrive at those constituents for which risk characterization would be performed for the future source-term scenario. For the sake of conservatism, the higher of the two concentrations was used (either the OU 4

soil UCL or Silo 3 materials UCL of the mean constituent concentration) to establish the exposure point concentration.

The reviewer can confirm this usage by reviewing Table D.II-30 as an example. Here the value used for the antimony soil exposure point concentration is 29 mg/kg which is that value from OU 4 soil sampling instead of 5.5 mg/kg, the single non-rejected detection of antimony in Silo 3. While the value used for barium is 280 mg/kg which is from the Silo 3 data set (UCL of the arithmetic mean). It should also be noted that any constituent present in the soil data set but not in the Silo 3 data set was used in risk characterization activities. This resulted in the inclusion of several organic compounds not present in Silo 3.

Given that the conceptual model states that the existing soil of OU 4 is covered by the release contents of Silo 3, DOE feels this is an conservative approach to risk characterization based on the available data set. However the text is not clear on the approach taken and should be amended.

Action: Table D.3-4 was revised by combining it with Table 3-5 to display the soil exposure point concentrations for both the current and future source term scenarios. The presentation of sediment exposure point concentrations in Table 3-4 was removed and provided as a new Table D.3-5.

The text on page D-3-24, lines 26 - 30 was revised to read as follows:

"Exposure point concentrations for soil under the future source-term scenario were developed by combining the CPC list for Silo 3 with that of the existing soil in Operable Unit 4. The higher constituent concentration (UCL of the arithmetic mean) of the two data sets was then selected as the representative exposure point concentration. This approach is conservative in that some mixing of the two materials is likely and dilution would be expected to occur. The future source-term soil exposure point concentrations are presented in Table D.3-4.

Based upon the release of perched groundwater to the banks of Paddys Run, a sediment exposure point concentration for the future source-term was calculated for stream sediments. This calculation is described in Appendix E, Section E.3 of this report. The calculated sediment exposure point concentrations for the future source-term are presented in Table D.3-5."

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Table D.3-4 Pg. #: D-3-25 Line #: NA Code:
New Comment #5

Comment: This and subsequent table show many additions and some eliminations - e.g., 2-hexanone and 4-methyl-2-pentanone. I did not see any comment in the FERMCO responses to indicate the reasons for this elimination of organic contaminants.

Response: In the April draft of the report, it was noted in Attachment D.III, that the data base had been revised for Operable Unit 4 at a late date which did not allow time to

revise the risk calculation. Additionally, the method for selection of constituents of potential concern had been revised and the revised UCLs for certain constituents were submitted too late for inclusion in the April draft of the report. Instead the impact on the risk assessment from these changes was discussed in Attachment D.III.

DOE did not want to allow these inconsistencies in the data base to be presented in the final version of the report. All changes to the data base, the revised method of determining the CPCs, and adjustments to selection of the concentration term (i.e. the UCL of the arithmetic mean or maximum detected concentration) were incorporated into the August draft final version of the report and Attachment D.III removed. Revised data validation criteria, the driver of many of these changes, were discussed in the transmittal letter for the August version of the report. DOE feels that it is appropriate to discuss these issues in the report text.

Action: Section 2 of the report was revised to further discuss data validation criteria used to assess the data quality for Operable Unit 4.

Commenting Organization: U.S. EPA Commentor: PVL
Section #: Pg. #: D-4-36 Tox Profile for Lead Line #: NA Code:
New Comment #6
Comment: Tox Profile for Lead. The statement in line 36 is inflammatory, in the least. Actually USEPA has a high regard for the EPA UBK (IEUBK) Lead Model; its use is recommended by SAB, who has reviewed it. The use of the OSWER directive is more applicable at this site, which does not afford current measures of residential exposure (e.g., water, indoor dust, paint, etc.).

Response: DOE concurs.

Action: The sentence in question was reworded as follows: "In the absence of current measures of residential exposure and other site-specific variables, the OSWER Directive (EPA 1989d) appears to be the soundest..."

Commenting Organization: U.S. EPA Commentor: PVL
Section #:D.4.2 Pg. #: Line #: NA Code:
New Comment #7 Tox Profiles
Comment: It would improve the readability of this section if the names of the chemicals were in capital letters or in bold print.

Response: DOE concurs.

Action: Each constituent as discussed in Section D.4 of the report was typed in bold-face.

TECHNICAL REVIEW COMMENTS ON THE RESPONSE TO COMMENTS (RTC) FOR OPERABLE UNIT (OU) 4 DRAFT REMEDIAL INVESTIGATION (RI) REPORT AND OU4 RI REPORT, REVISION 1 (EXCEPT FOR APPENDIX D)

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Pg. #:NA Line #: NA Code:
Original Specific Comment #: 7

Comment: In response to the U.S. Environmental Protection Agency (U.S. EPA) request that all data tables indicate whether aqueous radiological and metals samples are filtered, U.S. Department of Energy (U.S. DOE) indicated that footnotes would be added to the data tables in Section 4-0. These footnotes have only been added to a few data tables. All appropriate data tables should be revised to include these footnotes.

Response: The footnote was erroneously omitted from Table 4-1.

For clarity, the footnote will be added to the decant tank results portion of Tables 4-13 and 4-17 where the decant sump liquid results as compared to Silos 1 and 2 TCLP and EP Toxicity results. However, it should be noted that the footnote had been added to those tables which reported the decant liquid results.

The other tables which report aqueous results are for organic analyses analyses or are summaries for TCLP or EP Toxicity analysis for solid samples such as silo residues or OU 4 soils. Filtering is a standard part of the TCLP or EP Toxicity analyses and a footnote will not be added to those tables.

Action: A footnote was added stating whether or not the samples were filtered to Tables 4-1, 4-13, and 4-17.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 2.7.3 Pg. #: 2-45 Line #: 6 Code:
Original Specific Comment #: 14

Comment: U.S. EPA requested a clearer definition of the term "full radiological analysis," U.S. DOE stated that the terms "isotopic uranium," "Sr-90," "isotopic thorium," "Tc-99," "total uranium," Am-241," "Cs-137," and "isotopic plutonium" would be added to the text. U.S. EPA could not locate these terms in the revised RI report. U.S. DOE should verify that this information is included in the revised RI report.

Response: Agree. DOE will add the appropriate parameters in the text. Please note that isotopic thorium and isotopic uranium can be found on page 2-48, lines 24 and 25.

Action: DOE has added the following after Section 2.7.3, page 2-48, line 29:

- Total Thorium
- Total Uranium

Select samples (4 of 16) were also analyzed for transuranic radionuclides and fission products. These additional parameters are:

- Isotopic Plutonium
- Cs-137
- Np-237
- Ru-106
- Sr-90
- Tc-99

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-1 Pg. #: 4-4 to 4-6 Line #: Code:
Original Specific Comment #: 29

Comment: As reported in the revised RI report, the background concentrations of antimony, arsenic, cadmium, lead, and thallium in groundwater are still above maximum contaminant levels (MCL). This situation is highly unlikely and must be investigated. However, if this situation actually exists, the method for determining contaminants of concern may need to be modified for these inorganics.

Response: The values presented in Table 4-1 are the 95th percentile of the distribution of the background data set unless otherwise stated by reference to a footnote. These values were used only to assist the reader in judging whether measured concentrations in soil or groundwater in the vicinity of Operable Unit 4 exceed background. Since Operable Unit 4 does not evaluate the risk of constituents which are currently present in groundwater (this assessment is deferred to Operable Unit 5) these values were not used in selection of constituents of potential concern.

The groundwater values presented in the table were taken from the data presented in "Characterization of Background Water Quality for Streams and Groundwater - Fernald Environmental Management Project" which was reviewed and approved following comment response by U.S. EPA. Summary statistics are presented in Section 6, Table 12 of that report. The following information is summarized below for your convenience:

Constituent (mg/L)	Mean[a]	Median	Range
Antimony	1 detect	1 detect	0.038
Arsenic	0.027	0.005	0.002-0.260
Cadmium	0.003	<0.005	0.004-0.008
Lead	0.008	<0.002	0.003-0.140
Thallium	no detects	no detects	no detects

[a] - non-detects were included in the average at 1/2 the SQL

As can be seen in the table, the median values are considerably lower than the 95th quantile of the distribution which is consistent with outlier values. As noted in Table 4-1 two of the questioned constituents were infrequently detected and the average SQL was listed for comparison purposes.

DOE believes that values presented are adequately identified and represent a basis for comparison to measured values presented in Section 4 which is appropriate.

Action: No action planned.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: Table 4-28 Pg. #: NA Line #: Code:
Original Specific Comment #: 46
Comment: In response to the original U.S. EPA comment that requested depth information for inorganic berm soils data, U.S. DOE indicated that a table or figure showing this information would be added to the revised RI report. U.S. EPA was unable to locate this information. U.S. DOE should include this data in the revised RI report.

Response: Agree. DOE has included a table showing inorganic berm soil data by depth.

Action: Table 4-31B is provided to show inorganic berm soil data by depth.

TECHNICAL REVIEW COMMENTS ON THE RTC FOR OU4 AND APPENDIX D OF THE OU4 RI REPORT, REVISION 1

GENERAL COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.2.1.2 Pg. #: D-2-5 Line #: 21 Code:
Original General Comment #: 5

Comment: U.S. DOE is correct in noting that the background sampling plan was reviewed and approved by the U.S. EPA. However, some samples collected to establish representative background concentrations may actually have been collected from locations contaminated by the site or other anthropogenic sources. Therefore, the revised report should discuss the criteria used to determine that each sample collected to represent background concentrations actually represents background concentrations and was not impacted by the site or other anthropogenic sources.

Response: Agree.

Action: The following was added to Section 2.1.2: "To minimize the possibility that samples were collected from areas where air emissions from the FEMP would bias the study, all samples were collected from an area near Shandon, OH, a distance of 3 to 7 miles northwest of the FEMP. After potential sampling locations were identified, but prior to sampling, the locations were adjusted to avoid the following:

- Areas where solid or hazardous waste may have been stored or areas affected by their runoff
- Roads, parking lots, or other paved areas
- Railroad tracks or other areas affected by railway access
- Storm ditches or ditches presently or historically receiving industrial, urban, or agricultural runoff
- Fill areas
- Spill areas
- Areas subject to residential influence, such as fertilized yards or gardens

Since the locations were not field checked prior to sampling, some locations required adjustments in the field by the field geologist in accordance with the criteria listed above.

SPECIFIC COMMENTS

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3.2 Pg. #: D-3-55 Line #: 16 and 22 Code:
Original Specific Comment #: 34

Comment: Intake Equations D.3-9 and D.3-10 were rewritten by U.S. DOE. However, Equation D.3-9 does not include a conversion factor (CF). In fact, a CF of 1×10^{-3} kilograms per gram (kg/g) is required to produce an intake value (I_{iv}) in the units required, picocuries (pCi). Therefore, Line #16 should be revised to include a CF term, and Line 22 should be revised to read "CF" Conversion factor (1×10^{-3} kg/g)."

Response: DOE agrees with the comment.

Action: The equation was revised as noted in the comment.

Commenting Organization: U.S. EPA Commentor: Saric
Section #:D.3.3.7 Pg. #: D-3-62 Line #: 7 Code:
Original Specific Comment #: 34

Comment: Intake Equation D.3-17 (now labeled as Equation D.3-20) was rewritten to include a CF term (365 days per year). This CF term is not required. Equation D.3-20 should be revised to remove the CF term. The revised equation will produce an intake value (i_w) in the units required (pCi).

Response: DOE agrees with the comment.

Action: The equation was revised as noted in the comment.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.3.3 Pg. #: D-3-47 Line #: Code:
Original Specific Comment #: 38

Comment: Footnotes e, f, and p of Table D.3-12 include names of individuals involved and dates of specific guidance or memoranda. However, the organizations with which the individuals named are associated are not provided. Therefore, Footnotes e, f, and p of Table D.3-12 should be revised to specify these organizations for each individual named.

Response: Agree.

Action: The names of the organizations with which the persons named in the footnotes are associated were added to the footnotes.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: D.4.1 Pg. #: D-4-2 to D-4-5; D-4-7 to D-4-10 Line #: Code:
Original Specific Comment #: 56

Comment: Risk calculations were revised to respond to other comments on the risk assessment. However, U.S. DOE should have used this opportunity to compare toxicity values in the OU4 RI Report, Revision 1, to toxicity values currently available, and update and revise toxicity values as necessary.

Response: As stated in the response to Original Comment #56 requesting updating of toxicity values, "All toxicity values and associated data were checked to be certain they were correct and current with IRIS (as of April, 1993) and the 1992 HEAST (including Supplements dated July and November 1992). In addition, an EPA data base updated quarterly that lists other ECAO-sanctioned toxicity values was consulted. Also, EPA Region V was given a list of chemicals for which toxicity values were not located. If toxicity values for these chemicals are obtained in a timely manner, they will be incorporated into the remedial investigation reports for Operable Units 2, 3 and 5." Toxicity values received from ECAO and used in the risk assessment include oral RfD values for 2-Hexanone, tributyl phosphate and endosulfan. The 1993 HEAST was not available to us at the time of the last revision of the document.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #:D.4.1 Pg. #: D-4-8 Line #: Code:
Original Specific Comment #: 59

Comment: The reference in Table D-4-2 for methylene chloride is incorrectly footnoted in Footnote e as Health Effects Assessment Summary Table (HEAST). The correct reference is Integrated Risk Information System (IRIS); therefore, the footnote should be changed to Footnote d to indicate IRIS.

Response: Table D.4-2 was examined carefully; the data for methylene chloride was referenced to footnote "e", as noted by the reviewer. Footnote "e", however, refers to IRIS, not to the HEAST, as indicated by the reviewer. The reference for methylene chloride, therefore, is correct as written.

Action: None required.

Commenting Organization: U.S. EPA Commentor: Saric
Section #:D.4.2.2.1 Pg. #: D-4-21 Line #: 8 Code:
Original Specific Comment #: 65

Comment: Because inorganic forms of antimony are more likely to be present at the Fernald Environmental Management Project (FEMP) than organic forms, an uncertainty discussion addressing the use of the oral toxicity value of antimony potassium tartrate should be added to the text.

Response: This comment is related to Pat Van Leeuwen's comment on Original Comment #18, regarding the impact of dust particle size on inhalation toxicity.

Action: As stated in the response to Original Comment #18, this issue is now addressed for all routes of exposure in Section D.4 and D.6.

Commenting Organization: U.S. EPA Commentor: Saric
Section #:D.6.3 Pg. #: D-6-13 Line #: 20 Code:
Original Specific Comment #: 94
Comment: U.S. DOE added two references (EPA 1990d and 1991e) related to the U.S. EPA uptake biokinetic (UBK) model. However, the second reference is incorrect, and the version number of the model was dropped. Therefore, the reference to "(EPA 1991e)" should be changed to "(EPA 1991d)" and the EPA UBK model" should be changed to "Version 0.60 of the EPA UBK Model."

Response: Agree.

Action: The requested changes were made.

Commenting Organization: U.S. EPA Commentor: Saric
Section #: 6.6 Pg. #: 6-10 Line #: 16 through 18 Code:
Original Specific Comment #: 103
Comment: In general, U.S. DOE's response is satisfactory. However, U.S. DOE states that "as a practical matter, however, these data limitations probably represent risks that are trivial compared with the risks associated with exposure to the contents of the silos." This statement is misleading because exposure to the silo contents does not necessarily reduce the risk from exposure to contaminants that may not have been adequately characterized in the RI. This statement should therefore be removed from the text.

Response: DOE agrees that the text requires clarification to avoid misleading the reader.

Action: The sentence starting near the end of line 16, Page 6-10 and continuing to mid-line 18 was deleted and replaced with the following:

"(This data limitation and its expected impact on the baseline risk assessment is further discussed in Section 7.5.)"

Commenting Organization: U.S. EPA Commentor: Saric
Section #:D.4.2 Pg. #: D-4-18 and D-4-19 Line #: 20 Code:
Original Specific Comment #:
Comment: Table D.4-5 should have a reference. U.S. EPA compared the values given in the table to those found in three reference books and was unable to determine the source of the values in Table D.4-5 (Merck and Company, Inc. 1989; Eisenbud 1987; U.S. EPA 1992).

Response: DOE agrees that the source should have been listed on this table. In reviewing the data presented, it was decided that a more appropriate reference was available and the information was revised to be consistent with the selected source.

Action: The table was revised to include the source of the information. (International Commission on Radiation Protection, Radionuclides Transformation, ICRP Publication #38, Pergamon Press, New York, New York)

REFERENCE

Merck and Company, Inc. 1989. *The Merck Index.* Eleventh Edition. Susan Budavari, Editor. Rahway, New Jersey.

Eisenbud, Merril. 1987. *Environmental Radioactivity.* New York. Academic Press, Inc.

U.S. Environmental Protection Agency (EPA). 1992 "Guidance for Data Useability in Risk Assessment (Part B)." Publication 9285.7-09B.

Ohio EPA Comments
on the Operable Unit 4
Remedial Investigation Report, August 1993

Response to Ohio OEPA Comments

Commenting Organization: Ohio EPA Commentor: Mitchell
Section #: Pg #: Line #: Code:
Original Comment # 41
New Comment # 1
Comment: Ohio EPA believes that updated groundwater table contours should be included in the O.U. 4 RI that reflect the change in gradient. It is true that other documents will pick up this issue but the final RI should represent the current environmental conditions in O.U.4.

Response: Agree.

Action: In addition to the existing groundwater elevation contour maps, four updated maps (Figure 3-31B) showing 1992 data have been included in Section 3 of the RI.

General Comment

Commenting Organization: Ohio EPA Commentor: Mitchell
Section #: Pg #: Line #: Code:
Original Comment #
New Comment # 1
Comment: Ohio EPA maintains that DOE can not disregard the failed TCLP result from the silo berm material. DOE will need to incorporate contingencies within the Feasibility Study/Proposed Plan to address the fact that portions of the berm soils may be hazardous by toxicity.

Response: Final disposition of the berm soils under the preferred remedial alternative or Subunit C (Alternative 2C - Demolition, Removal, and On-Property Disposal) is subject to the relevant and appropriate requirement for hazardous waste determinations (40 CFR 262.11 and OAC 3745-52-11). The Operable Unit 4 Draft Feasibility Study/Proposed Plan issued on September 9, 1993 identifies this requirement for Alternative 2C in Table F.2-1c.

Action: None required.

Specific Comments

Commenting Organization: Ohio EPA Commentor: Mitchell
Section #: 5 Pg #: 5-28 Line #: Table 5-4 Code:
Original Comment #
New Comment # 1
Comment: The table does not include concentrations for Silo 3 materials. In the initial draft RI Table 5-4 included silo 3 material exposure point concentrations.

Response: Agree. The range of values were however discussed in the text.

Action: The referenced table has been revised to include the contribution to Silo 3 surface water as discussed in the text and presented in Appendix E, Table E.4-1.

Commenting Organization: Ohio EPA Commentor: Mitchell
Section #: 6.5.3 Pg #: 6-6 Line #: Code:
Original Comment #
New Comment # 2
Comment: Unlike Sections 6.5.1, 6.5.2, 6.5.4, 6.5.5, Section 6.5.3 does not include any summary risk numbers. The text should be revised to include summary risks.

Response: As noted in the referenced text, the risk values for this scenario are identical to those for the unrestricted access scenario. Therefore the risk were not repeated for the sake of brevity. However, for clarity the risk values will be included in Section 6.5.3.

Action: Risk values in Section 6.5.3 have been included.

Commenting Organization: Ohio EPA Commentor: Mitchell
Section #: 6.6.3 Pg #: 6-11 Line #: Code:
Original Comment #
New Comment # 3
Comment: DOE's response to previous OEPA comment #38 stated that uncertainty associated with berm soils data assumptions would be addressed in this section. The uncertainty section fails to address DOE's decision to disregard the failed TCLP data.

Response: Agree

Action: Table 6-3 has been revised to include the following for each of the table columns:

Source of Uncertainty: Subsurface soils were not included as a source term in groundwater fate and transport modeling due to their expected small contribution to risk in comparison to the potential for migration from the wastes in the silos.

Potential Impact on Estimated Risks: Low

Direction of Bias: Decreases conservatism.