ATTACHMENT D2

EPC UNCERTAINTY EVALUATION

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D2. EPC UNCERTAINTY EVALUATION

Calculation of exposure point concentrations (EPCs) for the Soils Operable Unit (OU) Remedial Investigation (RI) 2 included assignment of the average chemical of potential concern (COPC) concentration to grids within an exposure unit (EU) of a solid waste management unit (SWMU) or area of concern (AOC) for which data were not available in order to fill the empty cell. This process has the potential for introducing an uncertainty into those calculations where there are many empty cells. The uncertainties associated with these calculations are discussed below.

For EUs with 10 or more grids, the EPC was calculated using the grid values to determine the 95% upper confidence limit on the mean concentration (UCL 95). The 29 SWMU/EU combinations for which the uncertainty associated with this process applies are listed in Table D2.1.

Table D2.1. SWMU/EU Combinations with Greater than Ten Grids

SWMU/ AOC	EU	# GRIDS	SWMU/ AOC	EU	# GRIDS	SWMU/ AOC	EU	# GRIDS
13	1	15	13	12	11	15	9	12
13	2	12	13	13	11	26	1	13
13	3	11	13	14	11	26	2	11
13	4	10	15	1	12	26	3	10
13	5	10	15	3	12	26	4	16
13	6	10	15	4	15	80	3	12
13	7	10	15	5	12	204	1	11
13	8	15	15	6	12	204	2	11
13	9	12	15	7	12	204	5	11
13	11	11	15	8	12			

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Using the average concentration for empty cells can impact the EPC estimate, depending on the number of actual results and concentration distributions. If fewer than 10 results are available, the maximum concentration was used as the EPC, and this factor was considered in determining uncertainties. The following are general observations made when reviewing the results for the future industrial worker.

- Many EUs/parameters had values for all or most grids; thus, the UCL 95 is considered the best estimate of the EPC.

- Many contaminants that have significant differences in the EPC and maximum concentrations, however, make no significant contribution to the cumulative excess lifetime cancer risk (ELCR) or hazard index (HI) and/or are not contaminants of concern (COCs).

The grid averaging process described above has the potential to underestimate an EPC compared with one calculated using other protocols. Depending on the data set, this may be a UCL 95 calculated with fewer analytical values or the maximum concentration. By assuming the maximum concentration for each constituent instead of a calculated concentration, a higher ELCR or HI result is obtained. The cumulative ELCR and HI for each EU is used for the initial screening of the results to understand the uncertainty, prior to a more in depth review of the underlying data.

D2.1. EPC UNCERTAINTY FOR THE EXPOSURE UNIT HAZARD INDEX

The HIs for the future industrial worker calculated using the grid based EPCs (HI-EPC) are compared to the HI calculated assuming each COPC was present at its maximum detected concentration (HI Max) (Table D2.2). These HIs are calculated using the current approach in the Risk Methods Document, and do not consider the additional uncertainties as discussed in Section D.6 for metals.

There was little difference in the impacts on the decision-making process based upon the different methodology. The HIs differed generally by less than a factor of 2, with no difference at all for 5 of these pairs of estimates. Irrespective of the method of calculation, there is no impact on the decision process when both HI estimates are below the benchmark value of 1. Twenty-six of the 29 EUs had HIs < 1 using both estimates of the exposure concentration. For 1 EU, the HIs were greater than 1 for both methods.

There were two EUs where the HI calculated using the maximum concentration was greater than 1; whereas, the HI using the grid based EPC was below 1. Most of the analyses for these EUs (SWMU 15/EU 3 and SWMU 26/EU 4) had grid values; thus, the UCL 95 is an appropriate methodology with which to estimate the average. The analyses for which average values were used would have minimal impact.

For SWMU 15/EU 3, the total HI was 1 using the maximum concentrations and 0.53 using the EPC. Only cobalt was averaged for the UCL 95. Using the maximum concentration, the hazard quotient (HQ) for cobalt was 0.05; therefore, cobalt would not have been considered a COC.

For SWMU 26/EU 4, the total HI was 1.37 using the maximum concentrations and 0.69 using the EPC. Only aluminum was averaged for the UCL 95. Using the maximum concentration, the HQ for aluminum was 0.01; therefore, aluminum would not have been considered a COC.

Averages were infrequently used to fill data gaps. For this reason, the EPCs, calculated using the maximums as shown on Table D2.2, likely overestimate the HI.

Table D2.2. Comparison of HI for RME Calculations Based on the EPC as Compared to Maximum Concentrations

SWMU/ AOC	EU	HI EPC	HI MAX
13	1	0.00	0.01
13	2	0.06	0.08
13	3	0.09	0.16
13	4	0.03	0.03
13	5	0.05	0.11
13	6	0.04	0.05
13	7	0.05	0.04
13	8	0.05	0.08
13	9	0.01	0.01
13	11	0.02	0.01

SWMU/ AOC	EU	HI EPC	HI MAX
13	12	0.06	0.12
13	13	0.10	0.15
13	14	0.01	0.01
15	1	0.21	0.28
15	3	0.53	1.00
15	4	0.53	0.98
15	5	0.31	0.43
15	6	0.25	0.37
15	7	0.38	0.70
15	8	0.22	0.29

SWMU/ AOC	EU	HI EPC	HI MAX
15	9	0.24	0.32
26	1	0.13	0.11
26	2	1.48	1.35
26	3	0.61	0.77
26	4	0.69	1.37
80	3	0.09	0.18
204	1	0.02	0.02
204	2	0.21	0.38
204	5	0.26	0.48

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D2.2. EPC UNCERTAINTIES FOR THE ELCR

The cumulative grid based ELCR (ELCR-EPC) for the future industrial worker at each EU is compared on Table D2.3 to the estimated risk assuming each COPC was present at its maximum concentration (ELCR Max). In some cases, these values were identical; however, there are no instances where the ELCR estimate was below the benchmark value of 1.0E-06 using EPC and above the benchmark value using the maximum value. Therefore, there is no significant difference using calculated averages as gridding values. The overall impact of the variation in calculation is incorporated into differences in the ELCRs as shown on Table D2.3.

Table D2.3. Comparison of ELCR for RME Calculations Based on the EPC as compared to Maximum Concentrations

SWMU/ AOC	EU	ELCR EPC	ELCR MAX	SWMU/ AOC	EU	ELCR EPC	ELCR MAX	SWMU/ AOC	EU	ELCR EPC	ELCR MAX
13	1	N/A	N/A	13	12	N/A	N/A	15	9	3.51E-05	1.65E-05
13	2	8.50E-07	8.50E-07	13	13	N/A	N/A	26	1	6.02E-06	7.77E-05
13	3	2.40E-07	2.41E-07	13	14	2.28E-05	2.35E-06	26	2	1.73E-04	2.23E-04
13	4	4.02E-05	2.14E-06	15	1	2.67E-05	3.19E-05	26	3	1.33E-04	1.56E-04
13	5	6.56E-05	6.21E-05	15	3	6.42E-04	8.43E-04	26	4	7.23E-04	1.01E-03
13	6	7.78E-05	6.16E-05	15	4	1.55E-04	2.54E-04	80	3	3.11E-03	1.56E-03
13	7	7.89E-07	7.89E-07	15	5	1.06E-04	1.92E-04	204	1	6.28E-06	1.16E-06
13	8	1.36E-07	1.36E-07	15	6	5.83E-05	7.49E-05	204	2	3.55E-05	6.25E-05
13	9	5.49E-06	7.51E-06	15	7	1.03E-04	1.95E-04	204	5	4.38E-05	8.17E-05
13	11	3.39E-05	2.29E-06	15	8	3.36E-05	3.48E-05				

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D2.3. CONCLUSIONS

The EPCs calculated consistent with the approach in the work plan are reasonable estimates of the reasonable maximum exposure (RME) for surface soils. The differences in the HI/ELCR using the maximum concentration as compared to the grid-based approach, as shown on Tables D2.2 and D2.3, typically are minimal. The HI/ELCR results appear to yield accurate estimates of the RME. The use of the maximum concentrations will give somewhat higher values in some instances; however, in areas where more than 10 results were available, the EPC was often near or equal to the maximum.

The HIs generally were low except in cases where the uncertainties associated with the dermal absorption assumptions were a significant factor in the identification of COCs and the estimate of the RME concentration.

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