FINAL LEAD RISK MEMORANDUM FOR RESIDENTIAL SOILS AT THE EAST HELENA SUPERFUND SITE EAST HELENA, MONTANA SEPTEMBER 2023

1.0 OVERVIEW

In 1995, a human health risk assessment (HHRA) was completed for the East Helena Superfund site that evaluated risks to human health due to metals in residential soil near the former Asarco East Helena Plant (lead smelter) in East Helena, Montana (Asarco, 1995). Lead was identified as the chemical of greatest health concern for residential soil, based on the Environmental Protection Agency (EPA) risk reduction goal at that time of having no more than 5 percent (%) probability of exceeding a blood lead level of 10 micrograms per deciliter (µg/dL) in children. Since that time, EPA has conducted numerous remedial actions in East Helena, including the removal of contaminated soil for those properties exceeding 1,000 parts per million (ppm) lead with a cleanup level of 500 ppm as established in the 2009 Operable Unit (OU) 2 Record of Decision (ROD).[1] Lead toxicology and risk assessment have evolved in the intervening years. Recognizing those changes, EPA has resampled soil from 50 residential yards in East Helena, analyzed the samples for lead and in vitro bioaccessibility (IVBA), and evaluated those sampling results based on current lead risk assessment methodologies. This document provides an overview of the changes in lead risk assessment methodologies, summarizes the results of the 2023 residential soil sampling, and updates the risk calculations based on those methodologies. In addition, the updated risk results are presented in comparison to the 1995 Asarco HHRA risk results.

2.0 UPDATES TO LEAD RISK ASSESSMENT METHODOLOGY

The updates to lead risk assessment methodologies include changes in sampling soil as well as changes in modeling lead risk. The major changes in lead risk assessment methodologies since the 1995 Asarco HHRA include the following:

1. Incremental composite samples were collected from residential yards to characterize the variance in soil lead concentration over the exposure area (ITRC, 2020).
2. Prior to analysis for lead concentration, surface soil samples were sieved to less than (<) 150 micrometers (µm) particle size fraction to yield the soil particles that adhere to skin. This fraction represents the soil fraction available for incidental ingestion (EPA, 2016).

[1] OU2 consists of non-smelter property surface soils in residential areas, irrigation ditches, rural developments, and surrounding undeveloped land.

3. Soil lead bioavailability was determined for the residential soil samples and considered quantitatively in lead risk calculations (EPA, 2007, 2021a).
4. Updates to the Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK Model Version 2, build 1.72) were used for all risk calculations. The changes to the IEUBK model since 1995 primarily effect default exposure factors. These updates are consistent with current EPA risk assessment guidance (https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals).
5. In addition to 10 µg/dL, lower target blood lead concentrations were evaluated (i.e., 3.5 and 5 µg/dL) for the lead risk assessment which is consistent with current EPA guidance and practice (EPA, 2013, 2020, 2021b).

3.0 RESIDENTIAL SOIL DATA

The residential soil lead information available in the 1995 Asarco HHRA and from the 2023 sampling that was used for this risk assessment update are discussed below.

3.1 Soil Lead Concentration

Lead concentration data for historical samples were extracted from EPA's Scribe database for the East Helena Site. Data queried from the Scribe database for use in this evaluation focused on lead results for soil samples collected from the 0 to 1 inch (0-1") depth at the 50 properties that were sampled in 2023. Historical data were available in the Scribe database for 1991 through 2016. Data were extracted corresponding to the date range of data used in the 1995 Asarco HHRA (1991-1993) and for the interim period 1994-2016. Soil data used in the 1995 Asarco HHRA were collected from residential properties throughout East Helena from August 1991 through the fall of 1993 (Asarco, 1995). As described in the 1995 Asarco HHRA, these data represented five-point composite samples collected within each quadrant of a residential yard to yield four separate composite yard samples. Lead concentrations were analyzed by X-ray fluorescence (XRF) with a subset of samples subsequently analyzed in the laboratory for confirmational wet chemistry analysis. Analysis information was not available in Scribe to determine which lead concentration data for the 1991-1993 sampling period correspond to laboratory analysis versus XRF. The data in Scribe for the sampling period 1994-2016 were presumed to have not been collected under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and are of unknown quality. They are presented in this evaluation for completeness.

EPA obtained access to conduct soil sampling at 50 residential properties in East Helena in April 2023. This soil sampling was conducted under the EPA-approved Quality Assurance Project Plan (QAPP) (EPA, 2023) using incremental sampling methodology (ISM) in each yard. Each

ISM sample was composed of 30 increments collected from the 0-1" depth interval following ITRC technical guidance (2012, 2020). Replicate (three) ISM samples were collected from the unpaved areas of each of the 50 properties and sent to the laboratory to be sieved to <149 μm. This particle size fraction represents the fraction expected to adhere to skin via dermal contact (Ruby and Lowney, 2012) and is the soil particle size fraction recommended for lead risk assessment (EPA, 2016). All ISM samples were submitted to the laboratory for wet chemistry analysis.

Table 1 summarizes the average lead concentrations for each of the 50 properties included in this evaluation for the sampling periods 1991-1993 (referred to as "1995 Asarco HHRA"), 1994-2016, and 2023.

3.2 Relative Bioavailability (RBA)

3.2.1 Relative Bioavailability (RBA) for Data from 1991-2016

In the 1995 Asarco HHRA, the default assumption for soil lead bioavailability (60% RBA) was used in the risk calculations. The difference between 1991-2016 and 2023 average soil lead concentrations for many of the properties is more than 50 ppm, this suggests that the difference is unlikely due to sampling and analytical variability. Therefore, the RBA value from the 1995 HHRA was retained for the 1991-2016 data set. For each property, the average soil lead concentration from sampling in 1991-2016 was used with the IEUBK model default soil lead RBA (60%) to derive an RBA-adjusted exposure point concentration (RBA-adjusted EPC) as the input to the IEUBK model (EPA, 2020) (see Table 1).

3.2.2 Relative Bioavailability (RBA) for Data from 2023

The 2023 sampling included collection of samples for IVBA measurement to inform relative bioavailability of lead in soil. Lead RBA is predicted from IVBA using the following regression model (EPA, 2007, 2020): lead RBA (%) = 0.878 × IVBA (%) – 2.8. The 2023 IVBA results and calculated RBA are shown in Table 1 and summary statistics for the RBA data are shown in Table 2. The 2023 RBA information for each yard was plotted on a map (see Figure 1). No spatial trends are apparent based on the 2023 RBA information, so property-specific RBA adjustment was selected as the most appropriate estimate of soil lead RBA for risk calculations using the 2023 data. For each property, the average soil lead concentration was used with the average property-specific soil lead RBA to derive an RBA-adjusted EPC (EPA, 2020) (see Table 1).

4.0 HUMAN HEALTH RISK ASSESSMENT FOR LEAD

The IEUBK model predicts the likely range of blood lead levels in a population of young children (aged 0–84 months; the 12–72 month age group is used for Superfund sites [EPA, 2017]) exposed to a specified set of environmental lead levels. This model requires input data on the concentrations of lead in soil, dust, water, air, and diet at a location, as well as the amount of these media ingested or inhaled by a child. Consistent with EPA guidance, all inputs to the IEUBK model are central tendency estimates (CTEs). These point estimates are used to calculate an estimate of the central tendency (the geometric mean) of the distribution of blood lead values that might occur in a population of children exposed to the specified conditions. Assuming the distribution of blood lead values in a population of similarly exposed children is lognormal and given an estimate of the variability between different children (this is specified by the geometric standard deviation), the IEUBK model calculates the expected distribution of blood lead values in the population of similarly exposed children and estimates the probability that any random child might have a blood lead value over the target blood lead level (EPA, 1994a, 1994b, 1998).

EPA is in the process of reevaluating target blood lead level recommendations at Superfund sites. EPA (2013) reported that the range of cognitive effects in children were substantiated to occur in populations or groups of children with mean blood lead levels between 2 and 8 µg/dL. The IEUBK model cannot be used with a risk benchmark below 3 µg/dL because the risk goal would be exceeded even if the soil lead concentration were 0 milligrams per kilogram (mg/kg; primarily due to dietary lead exposure). For these reasons, target blood lead levels of 3.5, 5, and 10 µg/dL were selected for this Site. Target blood lead levels of 3.5 and 5 µg/dL were selected to quantitatively evaluate the lower and middle risk range of child blood lead levels associated with adverse health effects, and 10 µg/dL was selected because it was used in the 1995 Asarco HHRA. Thus, the risk results below are based on the criteria that there is no more than 5% probability that mean child blood lead values may exceed 3.5 µg/dL (referred to as P3.5), 5 µg/dL (referred to as P5), or 10 µg/dL (referred to as P10).

Tables 3 and 4 present the IEUBK model input parameters (age-independent and age-dependent parameters, respectively) used in the risk calculations. All input parameters were set equal to IEUBK Version 2 defaults, except for residential yard soil lead concentration.[2] Site-specific data were available for these model inputs based on 2023 sampling results as described in Sections 3.1 and 3.2, respectively.

[2] The input to the IEUBK model was the RBA-adjusted EPC, so the default bioavailability estimate was used in the IEUBK model.

5.0 COMPARISON OF 1995 TO 2023: SAMPLING INFORMATION AND RISK RESULTS

Table 1 shows the sampling data and risk results for the residential properties in East Helena where residential soil was sampled for the 1995 Asarco HHRA, between 1994-2016, and in 2023. For the 50 properties sampled in 2023, average soil lead concentrations (not adjusted for RBA) ranged from 147 to 923 mg/kg. RBA-adjusted average soil lead concentrations, based on site-specific measured IVBA, ranged from 128 to 1,064 mg/kg, with 22 properties exceeding the OU2 cleanup level from the 2009 ROD of 500 mg/kg RBA-adjusted lead in soil. Based on risk calculations performed using the IEUBK model and the 2023 RBA-adjusted soil lead concentrations, all 50 properties exceeded the P3.5 target risk level, 47 properties exceeded P5, and 7 properties exceeded P10. Twenty of these residential properties were evaluated in the 1995 Asarco HHRA, and their soil lead concentrations (adjusted for RBA using a default of 60%) ranged from 246 to 760 mg/kg. Of these 20 properties evaluated in the 1995 Asarco HHRA, all exceeded target lead risk benchmarks of P3.5 and P5, and 3 exceeded P10. For some residential yards, there are differences in soil lead concentrations and risk estimates between 2023 and earlier results. Table 5 presents the relative percent difference (RPD) for each property. The 2023 results reflect the best available science on assessing lead exposure and risk and are reflective of current human exposures.

6.0 UNCERTAINTIES

Quantification of risks to humans from exposures to lead is subject to a number of data limitations and uncertainties. The main source of uncertainty in lead exposure is the amount of soil ingested by human receptors: the soil and dust ingestion rates used in the IEUBK model do not incorporate variability in consumption patterns, nor do they reflect pica behavior. Additionally, the mean lead concentration in each environmental medium (measured soil concentrations and default water, air, and diet concentrations) is used in the exposure and risk calculations in the IEUBK model. However, there is uncertainty in the true average concentration of lead in each environmental medium. Finally, even if the amount of lead ingested at the Site was known with confidence, the effect on blood lead would still be uncertain. This is because the rate and extent of blood lead absorption is a highly complex physiological process and can best be approximated by a mathematical model. Thus, the blood lead values predicted in children by the IEUBK model should be understood to be uncertain, and because of a general preference to use realistic or slightly health-protective values, are more likely to be high than low.

6.1 Soil Lead RBA Estimate

In addition to consideration of property-specific soil lead RBA when no spatial pattern was seen in the RBA information, use of a site-wide RBA was evaluated. As shown in Table 2, the mean, geometric mean, and 95UCL (Student's t) resulted in approximately the same estimate of soil lead RBA (i.e., ~64%). Because the 2023 sampling was complete in that all properties had an IVBA estimate, the property-specific RBA estimate was considered the most applicable RBA estimate for the risk calculations (avoiding the possibility of over- or underestimating risk).

6.2 Addition of Soil or Sod to Yards Since 1991

Surface soil for the 50 residential properties sampled in 2023 were sampled using incremental composite sampling (IRTC, 2020), whereby the top inch of soil, underneath any organic layer present, was sampled for laboratory analysis. In some of the yards, the sampling team noticed what appeared to be sod cover in some of the yards. It is unknown the extent to which sod and soil from offsite had been applied to the residential yards (if at all) in the past; however, if sod or soil was applied to the yard between 1991 and 2023 that would likely alter the soil lead concentration and/or the lead bioavailability, and ultimately the RBA-adjusted EPC.

7.0 REFERENCES

Asarco. 1995. Human Health Risk Assessment for Residential Soil, East Helena Plant, East Helena, Montana. Prepared by Kleinfelder (Bellevue, Washington) and Hydrometrics, Inc. (Helena, Montana). July.

EPA. 1994a. Guidance manual for the Integrated Exposure Uptake Biokinetic model for lead in children. Office of Emergency and Remedial Response, U.S. Environmental Protection Agency. Publication Number 9285.7-15-1. EPA/540/R-93/081. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=2000WN4R.txt. July 15, 2020.

EPA. 1994b. Parameters and equations used in the Integrated Exposure Uptake Biokinetic model for lead in children (v0.99d). Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency. EPA 540/R-94/040. OSWER 9285.7-22. https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100FKYJ.txt. July 15, 2020.

EPA. 1998. Clarification to the 1994 Revised Interim Soil Lead Guidance for CERCLA Sites and RCRA Corrective Action Facilities. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency. OSWER Directive 9200. 4-27. EPA/540-F98/030. July 15, 2020.

EPA. 2007. Estimation of relative bioavailability of lead in soil and soil-like materials using in vivo and in vitro methods. U.S. Environmental Protection Agency. OSWER 9285.7-77.

EPA. 2013. Integrated Science Assessment (ISA) for Lead. Final Report. U.S. Environmental Protection Agency. EPA/600R-10/075F. July.

EPA. 2016. Recommendations for Sieving Soil and Dust Samples at Lead Sites for Assessment of Incidental Ingestion. Technical Review Workgroup Lead Committee. OLEM Dir #9200.1-128, July 2016. https://semspub.epa.gov/src/document/HQ/100000133.

EPA. 2017. Recommendations for default age range in the Integrated Exposure Uptake Biokinetic (IEUBK) model. U.S. Environmental Protection Agency. OLEM Directive #9200.2-177. https://semspub.epa.gov/work/HQ/100000664.pdf.

EPA. 2020. Evaluation of IEUBK version 2.0 model performance. U.S. Environmental Protection Agency. September 23, 2020.

EPA. 2021a. Guidance for Sample Collection for In Vitro Bioaccessibility Assay for Arsenic and Lead in Soil and Applications of Relative Bioavailability Data in Human Health Risk Assessment. U.S. Environmental Protection Agency. January 4, 2021.

EPA. 2021b. Advancing Pb Exposure and Biokinetic Modeling for U.S. EPA Regulatory Decisions and Site Assessments Using Bunker Hill Mining and Metallurgical Complex Superfund Site Data. U.S. EPA Office of Research and Development, Washington, DC, EPA/600/R-21/017F.

EPA. 2023. Quality Assurance Project Plan: East Helena Superfund Site – Residential Sampling, Helena, Montana. U.S. EPA/Environmental Response Team. April 4.

ITRC. 2012. Technical/Regulatory Guidance: Incremental Sampling Methodology. The Interstate Technology & Regulatory Council, Washington, DC.

ITRC. 2020. Technical/Regulatory Guidance: Incremental Sampling Methodology (ISM) Update. The Interstate Technology & Regulatory Council. October 2020. https://ism-2.itrcweb.org/wp-content/uploads/2020/11/itrc_ism_compiled_508_011921.pdf

Ruby, M.V. and Lowney, Y.W. 2012. Selective soil particle adherence to hands: Implications for understanding oral exposure to soil contaminants. Environ. Sci. Technol. 46(23): 12759-12771.

Figure 1. Soil Lead RBA based on 2023 Residential Soil Sampling

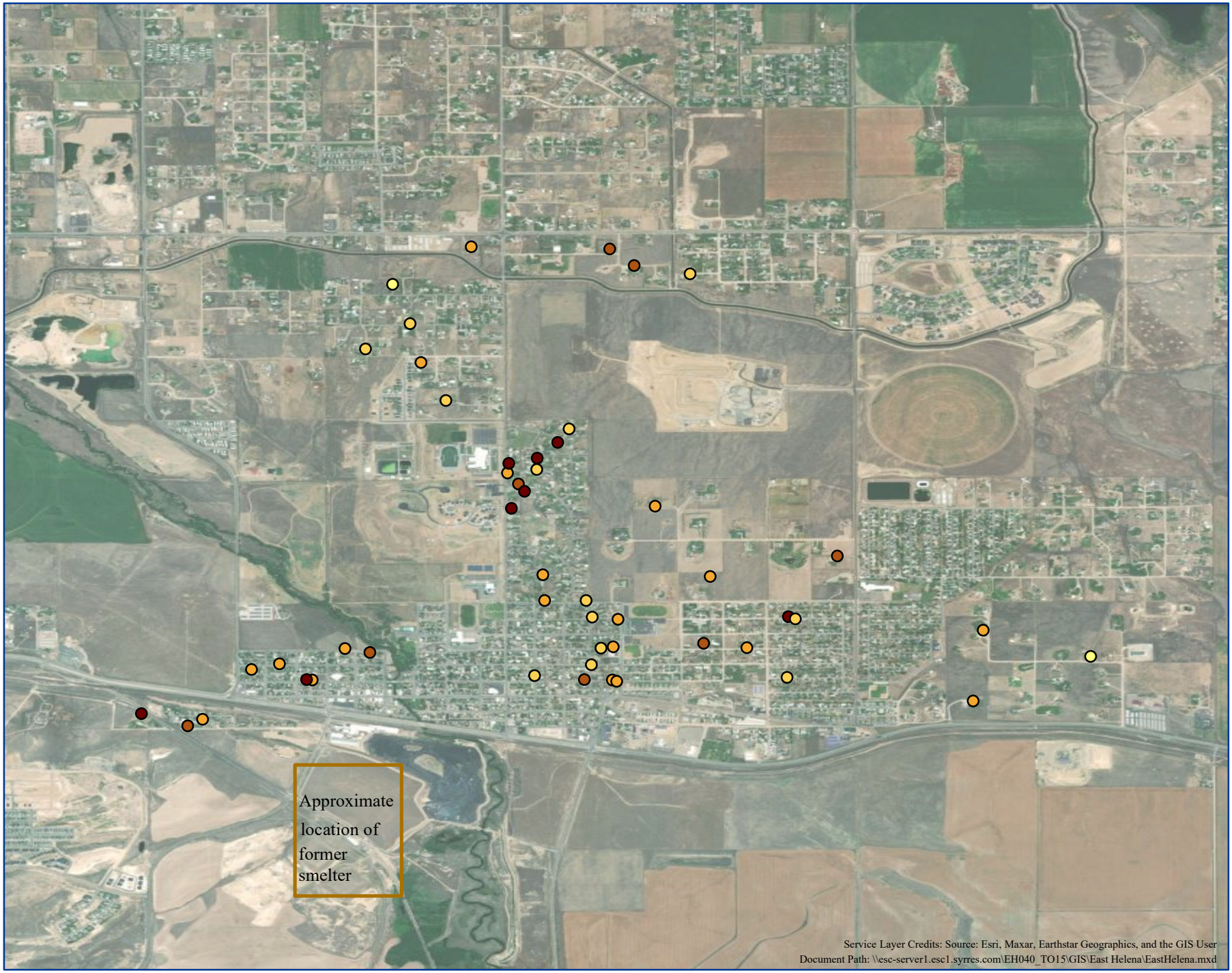

Table 1. Summary of 1995 Asarco HHRA, 1994-2016, and 2023 residential soil lead sampling information and risk results for 50 residential properties in East Helena, MT

Property ID	Soil Lead Concentration [a] (mg/kg)				Soil Lead Relative Bioavailability (%RBA)				RBA-adjusted Soil Lead Exposure Point Concentration (mg/kg)[†]		
	Mean Concentrations			Maximum Concentration Across All Data							
	1995 Asarco HHRA	1994-2016	2023		1995 Asarco HHRA %RBA[b]	1994-2016 %RBA[b]	2023 %IVBA	2023 %RBA[c]	1995 Asarco HHRA[b]	1994-2016 [b]	2023 [c]
CK06	418.75		480.00	537.00	60		75	63.05	**418.75**		**504.40**
DB03	578.50		390.00	700.00	60		67	56.03	**578.50**		**364.17**
DE10		424.75	200.00	627.00		60	68	56.90		**424.75**	189.68
DH05	626.88		516.67	858.00	60		72	60.42	*626.88*		**520.25**
DK06		770.00	576.67	999.00		60	75	63.05		*770.00*	**605.98**
DK08		680.25	546.67	923.00		60	71	59.54		*680.25*	**542.46**
EB08	365.25		390.00	645.00	60		74	62.17	**365.25**		**404.12**
ED03	478.25		473.33	656.00	60		74	62.17	**478.25**		**490.47**
EF08	607.00		456.67	722.00	60		75	63.05	**607.00**		**479.88**
EF09	246.00	392.25	760.00	780.00	60	60	92	77.98	**246.00**	**392.25**	*987.70*
FA01	389.75	520.75	463.33	653.00	60	60	76	63.93	**389.75**	**520.75**	**493.67**
FD02	617.00	692.50	923.33	980.00	60	60	82	69.20	*617.00*	*692.50*	*1064.85*
GH05		822.00	800.00	984.00		60	71	59.54		*822.00*	*793.84*
HE06	534.00	785.75	513.33	996.00	60	60	71	59.54	**534.00**	*785.75*	**509.38**
HE08		812.00	480.00	893.00		60	80	67.44		*812.00*	**539.52**
HF07	333.75	306.75	346.67	533.00	60	60	74	62.17	**333.75**	**306.75**	**359.22**
HI05		896.25	503.33	970.00		60	72	60.42		*896.25*	**506.82**
IC09	456.75		286.67	595.00	60		74	62.17	**456.75**		**297.04**
IC20	760.20		720.00	910.00	60		81	68.32	*760.20*		*819.82*
IC26	395.25		480.00	649.00	60		84	70.95	**395.25**		**567.62**
MH05	423.83		363.33	570.00	60		73	61.29	**423.83**		**371.17**
MI01		488.00	456.67	828.00		60	79	66.56		**488.00**	**506.61**
NA08		582.50	420.00	935.00		60	91	77.10		**582.50**	**539.69**
NC05		428.25	170.00	726.00		60	67	56.03		**428.25**	158.74
NK03		550.50	306.67	557.00		60	70	58.66		**550.50**	**299.82**
S4CF15		511.00	490.00	945.00		60	74	62.17		**511.00**	**507.74**
S4FIS04		466.25	380.00	694.00		60	72	60.42		**466.25**	**382.63**
S4GV01	396.60		216.67	550.00	60		67	56.03	**396.60**		**202.32**
S4HOF02		403.13	396.67	510.00		60	71	59.54		**403.13**	**393.61**
S4LAN20		364.67	146.67	600.00		60	63	52.51		**364.67**	128.37

Table 1. Summary of 1995 Asarco HHRA, 1994-2016, and 2023 residential soil lead sampling information and risk results for 50 residential properties in East Helena, MT

Property ID	Soil Lead Concentration [a] (mg/kg)				Soil Lead Relative Bioavailability (%RBA)				RBA-adjusted Soil Lead Exposure Point Concentration (mg/kg)[†]		
	Mean Concentrations			Maximum Concentration Across All Data							
	1995 Asarco HHRA	1994-2016	2023		1995 Asarco HHRA %RBA[b]	1994-2016 %RBA[b]	2023 %IVBA	2023 %RBA[c]	1995 Asarco HHRA[b]	1994-2016 [b]	2023 [c]
S4WV05		495.93	350.00	921.00		60	66	55.15		**495.93**	**321.70**
SB01[d]		516.26	443.33	1420.00		60	72	60.42		**516.26**	**446.41**
SR01		442.50	356.67	591.00		60	81	68.32		**442.50**	**406.11**
SU01		531.13	566.67	687.00		60	72	60.42		**531.13**	**570.60**
TA04		540.58	380.00	838.00		60	87	73.59		**540.58**	**466.04**
TA09	485.75	506.43	460.00	741.00	60	60	80	67.44	**485.75**	**506.43**	**517.04**
TA10		564.78	273.33	746.00		60	75	63.05		**564.78**	**287.23**
TA12		542.75	540.00	934.00		60	89	75.34		**542.75**	***678.08***
TB03		616.33	416.67	966.00		60	95	80.61		***616.33***	**559.79**
TC13	434.50	551.57	423.33	859.00	60	60	71	59.54	**434.50**	**551.57**	**420.07**
TD08		410.00	266.67	550.00		60	68	56.90		**410.00**	**252.91**
TE03		381.00	236.67	721.00		60	95	80.61		**381.00**	**317.96**
TE15	493.83		566.67	945.00	60		100	85.00	**493.83**		***802.78***
TJ04	579.00		433.33	819.00	60		74	62.17	**579.00**		**449.02**
XA05		448.50	616.67	710.00		60	81	68.32		**448.50**	***702.16***
XB07		357.88	383.33	615.00		60	78	65.68		**357.88**	**419.65**
XC14		323.00	533.33	596.00		60	71	59.54		**323.00**	**529.23**
ZA02		281.08	266.67	573.00		60	72	60.42		**281.08**	**268.52**
ZB03		315.79	253.33	824.00		60	65	54.27		**315.79**	**229.14**
ZD05		319.28	203.33	507.00		60	76	63.93		**319.28**	**216.64**

[a] Mean soil concentrations were calculated for each property for each dataset. For completeness, the maximum concentration reported across all data (regardless of dataset) is also shown.

[b] The soil lead RBA used was the default value in the IEUBK model (60%).

[c] The soil lead RBA used was based on a site-specific (property-specific) estimate calculated from the 2023 residential soil sampling IVBA results.

[d] The average result for 1994-2016 for property SB01 is based on 16 samples that includes 1 sample that reported lead as not detected (the reported concentration in Scribe is 1.1 mg/kg).

[†] All properties from all three time periods have soil lead concentrations that exceed P3.5. Bold indicates the soil lead concentration exceeds **P5**, bold blue italics indicates the soil lead concentration exceeds ***P10***.

Table 2. Summary Statistics for 2023 Lead RBA Data

Statistical Parameter	Result
Sample number (n)	50
Minimum	52.51 %
Maximum	85%
Mean	63.98%
Geometric mean	63.6%
Standard deviation	7.28
Skewness	1.12
Coefficient of variation	0.114
25^{th} percentile (Quartile 1)	59.54%
50^{th} percentile (Quartile 2)	62.17%
75^{th} percentile (Quartile 3)	67.44%
95^{th} percentile	79.42%
99^{th} percentile	82.85
95% Student's-t UCL	65.71%

Table 3. Age-Independent IEUBK Input Parameter Values

Parameter	Units	Value	Source
Drinking Water Concentration	µg/L	0.9	IEUBK default
Indoor Dust Concentration (Cdust)	mg/kg	Calculated	Cdust = (0.7 x Csoil) + (100 x Cair)
Outdoor Air Concentration (Cair)	µg/m^3	0.1	IEUBK default
Indoor Air Concentration	µg/m^3	30% of outdoor	IEUBK default
Absorption Fraction (water)	unitless	0.5	IEUBK default
Absorption Fraction (diet)	unitless	0.5	IEUBK default
Relative Bioavailability	unitless	60%	IEUBK default
Absorption Fraction (soil, dust)	unitless	n/a	RBA-adjusted EPC was used (EPA, 2020)
Absorption Fraction (air)	unitless	0.32	IEUBK default
Fraction of Soil + Dust that is Soil	unitless	0.45	IEUBK default
Geometric Standard Deviation	unitless	1.6	IEUBK default
Maternal Blood Lead Concentration	µg/dL	0.6	NHANES 2009-2014
Target Blood Lead Concentration	µg/dL	3.5 5 10	Professional judgment

Table 4. Age-Dependent IEUBK Input Parameter Values

Age (months)	Time Outdoors (hours)	Ventilation Rate (m^3/day)	Dietary Intake (µg/day)	Water Intake (L/day)	Soil-Dust Intake (mg/day)
0 to <12	1.0	3.22	2.66	0.4	**86**
12 to <24	2.0	4.97	5.03	0.43	**94**
24 to <36	3.0	6.09	5.21	0.51	**67**
36 to <48	4.0	6.95	5.38	0.54	**63**
48 to <60	4.0	7.68	5.64	0.57	**67**
60 to <72	4.0	8.32	6.04	0.6	**52**

Values shown in this table correspond to the IEUBK default parameters.

Table 5. Comparison of Historic and Current EPCs

Property ID	RBA-adjusted Soil Lead Exposure Point Concentration (EPC) (mg/kg)[†]			Relative Percent Difference (RPD) of Historic Sampling EPCs and 2023 EPCs (%) [d]
	1995 Asarco HHRA[a]	1994-2016[a]	2023[b]	
CK06	**418.75**		**504.40**	19
DB03	**578.50**		**364.17**	45
DE10		**424.75**	189.68	77
DH05	*626.88*		**520.25**	19
DK06		*770.00*	**605.98**	24
DK08		*680.25*	**542.46**	23
EB08	**365.25**		**404.12**	10
ED03	**478.25**		**490.47**	3
EF08	**607.00**		**479.88**	23
EF09	**246.00**	**392.25**	*987.70*	120
FA01	**389.75**	**520.75**	**493.67**	24
FD02	*617.00*	*692.50*	*1064.85*	53
GH05		*822.00*	*793.84*	3
HE06	**534.00**	*785.75*	**509.38**	5
HE08		*812.00*	**539.52**	40
HF07	**333.75**	**306.75**	**359.22**	7
HI05		*896.25*	**506.82**	56
IC09	**456.75**		**297.04**	42
IC20	*760.20*		*819.82*	8
IC26	**395.25**		**567.62**	36
MH05	**423.83**		**371.17**	13
MI01		**488.00**	**506.61**	4
NA08		**582.50**	**539.69**	8
NC05		**428.25**	158.74	92
NK03		**550.50**	**299.82**	59
S4CF15		**511.00**	**507.74**	1
S4FIS04		**466.25**	**382.63**	20
S4GV01	**396.60**		**202.32**	65
S4HOF02		**403.13**	**393.61**	2
S4LAN20		**364.67**	128.37	96
S4WV05		**495.93**	**321.70**	43
SB01[c]		**516.26**	**446.41**	15
SR01		**442.50**	**406.11**	9
SU01		**531.13**	**570.60**	7
TA04		**540.58**	**466.04**	15
TA09	**485.75**	**506.43**	**517.04**	6
TA10		**564.78**	**287.23**	65
TA12		**542.75**	*678.08*	22
TB03		*616.33*	**559.79**	10
TC13	**434.50**	**551.57**	**420.07**	3
TD08		**410.00**	**252.91**	47
TE03		**381.00**	**317.96**	18
TE15	**493.83**		*802.78*	48
TJ04	**579.00**		**449.02**	25
XA05		**448.50**	*702.16*	44

Table 5. Comparison of Historic and Current EPCs

Property ID	RBA-adjusted Soil Lead Exposure Point Concentration (EPC) (mg/kg)[†]			Relative Percent Difference (RPD) of Historic Sampling EPCs and 2023 EPCs (%) [d]
	1995 Asarco HHRA[a]	1994-2016[a]	2023[b]	
XB07		**357.88**	**419.65**	16
XC14		**323.00**	**529.23**	48
ZA02		**281.08**	**268.52**	5
ZB03		**315.79**	**229.14**	32
ZD05		**319.28**	**216.64**	38

[a] The soil lead RBA used was the default value in the IEUBK model (60%).
[b] The soil lead RBA used was based on a site-specific (property-specific) estimate calculated from the 2023 residential soil sampling IVBA results.
[c] The average result for 1994-2016 for property SB01 is based on 16 samples that includes 1 sample that reported lead as not detected (the reported concentration in Scribe is 1.1 mg/kg).
[d] RPDs compare the 1995 Asarco HHRA data with the 2023 data, unless the property was not sampled in 1995. In those cases the 1994-2016 data were used in the RPD calculations.
[†] All properties from all three time periods have soil lead concentrations that exceed P3.5. Bold indicates the soil lead concentration exceeds **P5**, bold blue italics indicates the soil lead concentration exceeds ***P10***.