Appendix H

Background Soil and Air

Appendix H – Background Soil and Air

Summary Statistics

- Hayden and Winkelman Background Soil
- Hayden and Winkelman Background Air (Organ Pipe)

Risk Calculations

- Hayden and Winkelman Background Soil
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Summary Statistics

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ASARCO LLC Hayden Plant Site, Hayden, Arizona

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Table H-1
Summary Statistics for Background Soils; Hayden and Winkelman
Baseline Human Health Risk Assessment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Location	Parameter	Number of Detects	Number of Analyses	Percent Detects	Units	Mean	Standard Deviation	Minimum	Maximum (w/o outliers)	95% UTL	Distribution	Exposure Point Conc.	Basis
Hayden (Ts + WSCL)	Arsenic	34	34	100%	mg/kg	6.30	2.85	1.9	14	12.5	Gamma	12.5	95% UTL
Hayden (Ts + WSCL)	Copper	31	31	100%	mg/kg	460.53	349.12	49.3	1,380	1,270	Gamma	1,270	95% UTL
Hayden (Ts + WSCL)	Lead	30	30	100%	mg/kg	28.29	14.90	9.6	84.4	47.9	Gamma	47.9	95% UTL
Winkelman (Qo)	Arsenic	6	6	100%	mg/kg	6.35	2.31	2.99	9.1	9.1	Nonparametric	9.1	Maximum
Winkelman (Qo)	Copper	6	6	100%	mg/kg	500.83	282.15	145	882	882	Nonparametric	882	Maximum
Winkelman (Qo)	Lead	6	6	100%	mg/kg	31.67	10.94	18.1	45.8	45.8	Nonparametric	45.8	Maximum

Notes
UTLs calculated using ProUCL v4.0
UTL values for Winkelman (Qo) data are equivalent to the maximum in ProUCL v4 due to the nonparametric nature of the distribution.

Table H-2
Summary Statistics for Air Monitoring Data; Organ Pipe Background
Baseline Human Health Risk Assessment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Site	Parameter	Number of Detects	Number of Analyses	Percent Detects	Units	Minimum Detected Value	Maximum Detected Value	Minimum DL for Non-detects	Maximum DL for Non-detects	Arithmetic Mean Value	Standard Deviation	Exposure Point Concentration	EPC Basis	Exposure Point Concentration (may be Max)	EPC Basis (may be Max)
Organ Pipe	Aluminum	15	15	100	ug/m3	0.188	2.74	NA	NA	0.503	0.628	1.21	95% Chebyshev (Mean, Sd) UCL	1.21	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Barium	12	15	80	ug/m3	0.0025	0.022	0.0021	0.0051	0.0049	0.005	0.0077	95% KM (BCA) UCL	0.0077	95% KM (BCA) UCL
Organ Pipe	Bromine	15	15	100	ug/m3	0.0007	0.007	NA	NA	0.0029	0.0016	0.0036	95% Student's-t UCL	0.0036	95% Student's-t UCL
Organ Pipe	Calcium	15	15	100	ug/m3	0.25	1.15	NA	NA	0.468	0.22	0.567	95% Approximate Gamma UCL	0.567	95% Approximate Gamma UCL
Organ Pipe	Chlorine	13	15	87	ug/m3	0.0056	1.73	0.0021	0.0063	0.291	0.486	0.842	95% KM (Chebyshev) UCL	0.842	95% KM (Chebyshev) UCL
Organ Pipe	Chromium	11	15	73	ug/m3	0.0003	0.0017	0.0003	0.0003	0.0005	0.0004	0.0007	95% KM (BCA) UCL	0.0007	95% KM (BCA) UCL
Organ Pipe	Copper	14	15	93	ug/m3	0.0005	0.0043	0.0003	0.0003	0.0014	0.0012	0.0028	95% KM (Chebyshev) UCL	0.0028	95% KM (Chebyshev) UCL
Organ Pipe	Gallium	3	15	20	ug/m3	0.0002	0.0006	0.0003	0.0003	0.0002	0.0001	0.0003	95% KM (t) UCL	0.0003	95% KM (t) UCL
Organ Pipe	Iron	15	15	100	ug/m3	0.132	1.47	NA	NA	0.332	0.327	0.699	95% Chebyshev (Mean, Sd) UCL	0.699	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Lead	14	15	93	ug/m3	0.0008	0.0027	0.0006	0.0006	0.0013	0.0006	0.0016	95% KM (BCA) UCL	0.0016	95% KM (BCA) UCL
Organ Pipe	Magnesium	15	15	100	ug/m3	0.0367	0.299	NA	NA	0.0862	0.0658	0.115	95% Approximate Gamma UCL	0.115	95% Approximate Gamma UCL
Organ Pipe	Manganese	15	15	100	ug/m3	0.0028	0.0444	NA	NA	0.0083	0.0102	0.0198	95% Chebyshev (Mean, Sd) UCL	0.0198	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Nickel	15	15	100	ug/m3	0.0004	0.0021	NA	NA	0.0009	0.0004	0.0011	95% Approximate Gamma UCL	0.0011	95% Approximate Gamma UCL
Organ Pipe	PM10	15	15	100	ug/m3	6.58	71.9	NA	NA	16.0	15.9	33.9	95% Chebyshev (Mean, Sd) UCL	33.9	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Potassium	15	15	100	ug/m3	0.0944	1.11	NA	NA	0.261	0.247	0.539	95% Chebyshev (Mean, Sd) UCL	0.539	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Rubidium	15	15	100	ug/m3	0.0003	0.0058	NA	NA	0.0011	0.0013	0.0026	95% Chebyshev (Mean, Sd) UCL	0.0026	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Selenium	7	15	47	ug/m3	0.0002	0.0003	0.0000	0.0003	0.0002	0.0001	0.0003	99% KM (Chebyshev) UCL	0.0003	Maximum Result
Organ Pipe	Silicon	15	15	100	ug/m3	0.499	5.87	NA	NA	1.23	1.31	2.71	95% Chebyshev (Mean, Sd) UCL	2.71	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Sodium	13	15	87	ug/m3	0.128	1.63	0.0468	0.43	0.393	0.394	0.572	95% KM (BCA) UCL	0.572	95% KM (BCA) UCL
Organ Pipe	Strontium	15	15	100	ug/m3	0.0016	0.0106	NA	NA	0.0037	0.0023	0.0047	95% Approximate Gamma UCL	0.0047	95% Approximate Gamma UCL
Organ Pipe	Sulfur	15	15	100	ug/m3	0.137	0.697	NA	NA	0.383	0.168	0.459	95% Student's-t UCL	0.459	95% Student's-t UCL
Organ Pipe	Tin	6	15	40	ug/m3	0.0008	0.0012	0.0006	0.0009	0.0006	0.0003	0.0009	95% KM (t) UCL	0.0009	95% KM (t) UCL
Organ Pipe	Titanium	15	15	100	ug/m3	0.0135	0.141	NA	NA	0.0329	0.0309	0.0677	95% Chebyshev (Mean, Sd) UCL	0.0677	95% Chebyshev (Mean, Sd) UCL
Organ Pipe	Vanadium	8	15	53	ug/m3	0.0011	0.0091	0.0006	0.0054	0.0020	0.0023	0.0032	95% KM (t) UCL	0.0032	95% KM (t) UCL
Organ Pipe	Yttrium	9	15	60	ug/m3	0.0002	0.002	0.0003	0.0003	0.0004	0.0005	0.0006	95% KM (t) UCL	0.0006	95% KM (t) UCL
Organ Pipe	Zinc	15	15	100	ug/m3	0.0018	0.0114	NA	NA	0.0044	0.0027	0.0057	95% Approximate Gamma UCL	0.0057	95% Approximate Gamma UCL
Organ Pipe	Zirconium	15	15	100	ug/m3	0.0003	0.005	NA	NA	0.0012	0.0011	0.0016	95% Approximate Gamma UCL	0.0016	95% Approximate Gamma UCL

Notes
Only detected analytes are shown. Arsenic and cadmium were not detected in the background samples

Risk Calculations

Table H-3
Risk Calculation Worksheet for Surface Soil - Carcinogenic Effects - Residential Exposure Scenario - Hayden Background - Tertiary Sediment (Ts)
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Exposure Scenario Information		
	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Surface Soil
	Exposure Point:	OnSite
	Receptor Population:	Adult/Child Resident
	Receptor Age:	Adult/Child

Exposure Scenario/Exposure Area Description

Site Risks

Hayden Background, Residential Property

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	350	350	day/yr
Exposure Duration	ED	24	6	yr
Soil Ingestion Rate	IR	100	200	mg/day
Inhalation Rate (Soil Particulate Inhalation)	InR	20	10	m3/day
Particulate Emission Factor	PEF	1.32E+09	1.32E+09	m3/kg
Skin Surface Area (Soil Contact; 1 event per day)	SA_s	5.70E+03	2.80E+03	cm2/day [soil]
Body Weight	BW	70	15	kg
Averaging Time for carcinogens	ATc	70	70	yr
Averaging Time for noncarcinogens	ATnc	24	6	yr
Conversion Factor (yr to day)	CF_1	2.74E-03	2.74E-03	yrs/day
Conversion Factor (mg to kg)	CF_2	1.00E-06	1.00E-06	kg/mg
Bioavailability Factor for Arsenic	BAF_As	0.8	0.8	unitless
Bioavailabiity Factor for Copper	BAF_Cu	1.0	1.0	unitless
Dermal Absorption Arsenic	ABS_As	0.03	0.03	unitless
Dermal Absorption Copper	ABS_Cu	0.01	0.01	unitless
Adherence Factor	AF	0.07	0.2	mg/cm2

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Adult Resident											
Arsenic	1.25E+01	4.70E-06	1.50E+00	7.05E-06	7.03E-07	1.50E+00	1.05E-06	8.92E-10	1.51E+01	1.34E-08	8.11E-06
Copper	1.27E+03	5.96E-04	NA		2.38E-05	NA		9.07E-08	NA		
Child Resident											
Arsenic	1.25E+01	1.10E-05	1.50E+00	1.64E-05	1.15E-06	1.50E+00	1.73E-06	5.20E-10	1.51E+01	7.83E-09	1.82E-05
Copper	1.27E+03	1.39E-03	NA		3.90E-05	NA		5.29E-08	NA		
Total Adult Resident				7.0E-06			1.1E-06			1.3E-08	8.1E-06
Total Child Resident				1.6E-05			1.7E-06			7.8E-09	1.8E-05
Total Adult/Child Resident		(89.3% Contribution)		2.3E-05	(10.6% Contribution)		2.8E-06	(0.1% Contribution)		2.1E-08	2.6E-05

Notes:
NA = no data; this toxicity value is not available in the standard U.S. EPA toxicity value databases.
RME = reasonable maximum exposure.
EPC = exposure point concentration.

Table H-4
Risk Calculation Worksheet for Surface Soil - Noncarcinogenic Effects - Residential Exposure Scenario - Hayden Background - Tertiary Sediment (Ts)
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Exposure Scenario Information		
	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Surface Soil
	Exposure Point:	OnSite
	Receptor Population:	Adult/Child Resident
	Receptor Age:	Adult/Child

Exposure Scenario/Exposure Area Description

Site Risks

Hayden Background, Residential Property

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	350	350	day/yr
Exposure Duration	ED	24	6	yr
Soil Ingestion Rate	IR	100	200	mg/day
Inhalation Rate (Soil Particulate Inhalation)	InR	20	10	m3/day
Particulate Emission Factor	PEF	1.32E+09	1.32E+09	m3/kg
Skin Surface Area (Soil Contact; 1 event per day)	SA_s	5.70E+03	2.80E+03	cm2/day [soil]
Body Weight	BW	70	15	kg
Averaging Time for carcinogens	ATc	70	70	yr
Averaging Time for noncarcinogens	ATnc	24	6	yr
Conversion Factor (yr to day)	CF_1	2.74E-03	2.74E-03	yrs/day
Conversion Factor (mg to kg)	CF_2	1.00E-06	1.00E-06	kg/mg
Bioavailability Factor for Arsenic	BAF_As	0.8	0.8	unitless
Bioavailabiity Factor for Copper	BAF_Cu	1.0	1.0	unitless
Dermal Absorption Arsenic	ABS_As	0.03	0.03	unitless
Dermal Absorption Copper	ABS_Cu	0.01	0.01	unitless
Adherence Factor	AF	0.07	0.2	mg/cm2

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Adult Resident											
Arsenic	1.25E+01	1.37E-05	3.00E-04	4.57E-02	2.05E-06	3.00E-04	6.83E-03	2.60E-09	8.57E-06	3.04E-04	5.28E-02
Copper	1.27E+03	1.74E-03	4.00E-02	4.35E-02	6.94E-05	4.00E-02	1.74E-03	2.64E-07	NA		4.52E-02
Child Resident											
Arsenic	1.25E+01	1.28E-04	3.00E-04	4.26E-01	1.34E-05	3.00E-04	4.47E-02	6.07E-09	8.57E-06	7.08E-04	4.72E-01
Copper	1.27E+03	1.62E-02	4.00E-02	4.06E-01	4.55E-04	4.00E-02	1.14E-02	6.17E-07	NA		4.17E-01
Total Adult Resident				8.9E-02			8.6E-03			3.0E-04	0.10
Total Child Resident		(93.6% Contribution)		8.3E-01	(6.3% Contribution)		5.6E-02	(0.08% Contribution)		7.1E-04	0.9

Notes:
NA = no data; this toxicity value is not available in the standard U.S. EPA toxicity value databases.
RME = reasonable maximum exposure.
EPC = exposure point concentration.

Table H-5
Detailed Summary of Residential Cancer Risks and Noncancer Hazards - Hayden Background
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Property	Receptor	COPC	RME Medium EPC Value (mg/kg)	Carcinogenic Risk				Noncarcinogenic HI			
				Oral	Dermal	Inhalation	Total	Oral	Dermal	Inhalation	Total
Tertiary Sediment (Ts)	**Adult Resident**	Arsenic	1.25E+01	7.05E-06	1.05E-06	1.34E-08	8.11E-06	4.57E-02	6.83E-03	3.04E-04	5.28E-02
		Copper	1.27E+03					4.35E-02	1.74E-03		4.52E-02
		Total					8.1E-06				0.1
	Child Resident	Arsenic	1.25E+01	1.64E-05	1.73E-06	7.83E-09	1.82E-05	4.26E-01	4.47E-02	7.08E-04	4.72E-01
		Copper	1.27E+03					4.06E-01	1.14E-02		4.17E-01
		Total					1.8E-05				0.9
	Adult/Child Resident	Arsenic	1.25E+01	2.35E-05	2.78E-06	2.13E-08	2.63E-05				
		Copper	1.27E+03								
		Total					2.6E-05				NA

Notes:
NA = Not applicable

Table H-6
Summary of Residential Cancer Risks and Noncancer Hazards - Hayden Background
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Property	Adult plus Child Cancer Risks	Child Noncancer Hazards
Tertiary Sediment (Ts)	2.6E-05	0.9

Table H-7
Hayden Background Soil (Upper Tolerance Limit Values); Tertiary Sediment (Ts) - Summary of Residential Cancer Risks and Noncancer Hazards (including EPCs and lead screening levels)
Baseline Human Health Risk Assesment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Grouping Name	Arsenic Exposure Point Conc. (mg/kg)	Copper Exposure Point Conc. (mg/kg)	Residential Cancer Risks	Residential Noncancer Hazards	Lead Exposure Point Conc. (mg/kg)	Does Lead Concentration Exceed Screening Level of 212 mg/kg (excluding homegrown produce)?	Does Lead Concentration Exceed Screening Level of 122 mg/kg (including homegrown produce)?
Tertiary Sediment (Ts)	12.5	1,270	3E-05	0.9	48	No	No

Table H-8
Risk Calculation Worksheet for Surface Soil - Carcinogenic Effects - Residential Exposure Scenario - Winkelman Background - Older Quatenary Deposits (Qo)
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Exposure Scenario Information		
	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Surface Soil
	Exposure Point:	OnSite
	Receptor Population:	Adult/Child Resident
	Receptor Age:	Adult/Child

Exposure Scenario/Exposure Area Description

Site Risks

Winkelman Background, Residential Property

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	350	350	day/yr
Exposure Duration	ED	24	6	yr
Soil Ingestion Rate	IR	100	200	mg/day
Inhalation Rate (Soil Particulate Inhalation)	InR	20	10	m3/day
Particulate Emission Factor	PEF	1.32E+09	1.32E+09	m3/kg
Skin Surface Area (Soil Contact; 1 event per day)	SA_s	5.70E+03	2.80E+03	cm2/day [soil]
Body Weight	BW	70	15	kg
Averaging Time for carcinogens	ATc	70	70	yr
Averaging Time for noncarcinogens	ATnc	24	6	yr
Conversion Factor (yr to day)	CF_1	2.74E-03	2.74E-03	yrs/day
Conversion Factor (mg to kg)	CF_2	1.00E-06	1.00E-06	kg/mg
Bioavailability Factor for Arsenic	BAF_As	0.8	0.8	unitless
Bioavailabiity Factor for Copper	BAF_Cu	1.0	1.0	unitless
Dermal Absorption Arsenic	ABS_As	0.03	0.03	unitless
Dermal Absorption Copper	ABS_Cu	0.01	0.01	unitless
Adherence Factor	AF	0.07	0.2	mg/cm2

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Chronic Daily Intake [mg/kg/day]**	**Cancer Slope Factor, SF [mg/kg/day]$^{-1}$**	**Cancer Risk [-]**	**Total Cancer Risk [-]**
Adult Resident											
Arsenic	9.10E+00	3.42E-06	1.50E+00	5.13E-06	5.12E-07	1.50E+00	7.67E-07	6.50E-10	1.51E+01	9.78E-09	5.91E-06
Copper	8.82E+02	4.14E-04	NA		1.65E-05	NA		6.30E-08	NA		
Child Resident											
Arsenic	9.10E+00	7.98E-06	1.50E+00	1.20E-05	8.38E-07	1.50E+00	1.26E-06	3.79E-10	1.51E+01	5.70E-09	1.32E-05
Copper	8.82E+02	9.67E-04	NA		2.71E-05	NA		3.67E-08	NA		
Total Adult Resident				5.1E-06			7.7E-07			9.8E-09	5.9E-06
Total Child Resident				1.2E-05			1.3E-06			5.7E-09	1.3E-05
Total Adult/Child Resident		(89.3% Contribution)		1.7E-05	(10.6% Contribution)		2.0E-06	(0.1% Contribution)		1.5E-08	1.9E-05

Notes:
NA = no data; this toxicity value is not available in the standard U.S. EPA toxicity value databases.
RME = reasonable maximum exposure.
EPC = exposure point concentration.

Table H-9
Risk Calculation Worksheet for Surface Soil - Noncarcinogenic Effects - Residential Exposure Scenario - Winkelman Background - Older Quatenary Deposits (Qo)
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Exposure Scenario Information		
	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Surface Soil
	Exposure Point:	OnSite
	Receptor Population:	Adult/Child Resident
	Receptor Age:	Adult/Child

Exposure Scenario/Exposure Area Description

Site Risks

Winkelman Background, Residential Property

Exposure Parameter	Variable	Adult Value	Child Value	Units
Exposure Frequency	EF	350	350	day/yr
Exposure Duration	ED	24	6	yr
Soil Ingestion Rate	IR	100	200	mg/day
Inhalation Rate (Soil Particulate Inhalation)	InR	20	10	m3/day
Particulate Emission Factor	PEF	1.32E+09	1.32E+09	m3/kg
Skin Surface Area (Soil Contact; 1 event per day)	SA_s	5.70E+03	2.80E+03	cm2/day [soil]
Body Weight	BW	70	15	kg
Averaging Time for carcinogens	ATc	70	70	yr
Averaging Time for noncarcinogens	ATnc	24	6	yr
Conversion Factor (yr to day)	CF_1	2.74E-03	2.74E-03	yrs/day
Conversion Factor (mg to kg)	CF_2	1.00E-06	1.00E-06	kg/mg
Bioavailability Factor for Arsenic	BAF_As	0.8	0.8	unitless
Bioavailabiity Factor for Copper	BAF_Cu	1.0	1.0	unitless
Dermal Absorption Arsenic	ABS_As	0.03	0.03	unitless
Dermal Absorption Copper	ABS_Cu	0.01	0.01	unitless
Adherence Factor	AF	0.07	0.2	mg/cm2

Risk Calculations

		Exposure Route = Oral			Exposure Route = Dermal			Exposure Route = Inhalation			
Chemical of Potential Concern	**RME Medium EPC Value, Cs [mg/kg]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Chronic Daily Intake [mg/kg/day]**	**Reference Dose RfD [mg/kg/day]**	**Hazard Quotient [-]**	**Total Hazard Quotient [-]**
Adult Resident											
Arsenic	9.10E+00	9.97E-06	3.00E-04	3.32E-02	1.49E-06	3.00E-04	4.97E-03	1.89E-09	8.57E-06	2.21E-04	3.84E-02
Copper	8.82E+02	1.21E-03	4.00E-02	3.02E-02	4.82E-05	4.00E-02	1.21E-03	1.84E-07	NA		3.14E-02
Child Resident											
Arsenic	9.10E+00	9.31E-05	3.00E-04	3.10E-01	9.77E-06	3.00E-04	3.26E-02	4.42E-09	8.57E-06	5.16E-04	3.43E-01
Copper	8.82E+02	1.13E-02	4.00E-02	2.82E-01	3.16E-04	4.00E-02	7.89E-03	4.28E-07	NA		2.90E-01
Total Adult Resident				6.3E-02			6.2E-03			2.2E-04	0.07
Total Child Resident		(93.5% Contribution)		5.9E-01	(6.4% Contribution)		4.0E-02	(0.08% Contribution)		5.2E-04	0.6

Notes:
NA = no data; this toxicity value is not available in the standard U.S. EPA toxicity value databases.
RME = reasonable maximum exposure.
EPC = exposure point concentration.

Table H-10
Detailed Summary of Residential Cancer Risks and Noncancer Hazards - Winkelman Background
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Property	Receptor	COPC	RME Medium EPC Value (mg/kg)	Carcinogenic Risk				Noncarcinogenic HI			
				Oral	Dermal	Inhalation	Total	Oral	Dermal	Inhalation	Total
Older Quatenary Deposits (Qo)	**Adult Resident**	Arsenic	9.10E+00	5.13E-06	7.67E-07	9.78E-09	5.91E-06	3.32E-02	4.97E-03	2.21E-04	3.84E-02
		Copper	8.82E+02					3.02E-02	1.21E-03		3.14E-02
		Total					5.9E-06				0.1
	Child Resident	Arsenic	9.10E+00	1.20E-05	1.26E-06	5.70E-09	1.32E-05	3.10E-01	3.26E-02	5.16E-04	3.43E-01
		Copper	8.82E+02					2.82E-01	7.89E-03		2.90E-01
		Total					1.3E-05				0.6
	Adult/Child Resident	Arsenic	9.10E+00	1.71E-05	2.02E-06	1.55E-08	1.91E-05				
		Copper	8.82E+02								
		Total					1.9E-05				NA

Notes:
NA = Not applicable

Table H-11
Summary of Residential Cancer Risks and Noncancer Hazards - Winkelman Background
Baseline Human Health Risk Assessment
Asarco LLC Hayden Plant Site, Hayden, Arizona

Property	Adult plus Child Cancer Risks	Child Noncancer Hazards
Older Quatenary Deposits (Qo)	1.9E-05	0.6

Table H-12
Winkelman Background Soil (Upper Tolerance Limit Values); Older Quatenary Deposits (Qo) - Summary of Residential Cancer Risks and Noncancer Hazards (including EPCs and lead screening levels)
Baseline Human Health Risk Assesment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Grouping Name	Arsenic Exposure Point Conc. (mg/kg)	Copper Exposure Point Conc. (mg/kg)	Residential Cancer Risks	Residential Noncancer Hazards	Lead Exposure Point Conc. (mg/kg)	Does Lead Concentration Exceed Screening Level of 212 mg/kg (excluding homegrown produce)?	Does Lead Concentration Exceed Screening Level of 122 mg/kg (including homegrown produce)?
Older Quatenary Deposits (Qo)	9.1	882	2E-05	0.6	46	No	No

Table H-13
Risk Calculation Worksheet for Air - Carcinogenic Effects - Residential Exposure Scenario - Organ Pipe National Park - Background
Baseline Human Health Risk Assessment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Exposure Scenario Information		
	Exposure Scenario:	Residential
	Scenario Timeframe:	Chronic
	Exposure Medium:	Air
	Exposure Point:	OnSite
	Receptor Population:	Adult/Child Resident
	Receptor Age:	Adult/Child

Exposure Scenario/Exposure Area Description

Site Risks
Organ Pipe National Park - Background

Exposure Parameter	Variable		Adult Value	Child Value	Units
Exposure Frequency	EF		350	350	day/yr
Exposure Duration	ED		24	6	yr
Inhalation Rate	InhR		20	10	m^3/day
Body Weight	BW		70	15	kg
Averaging Time for carcinogens	ATc		70	70	yr
Conversion Factor (yr to day)	CF		2.74E-03	2.74E-03	yrs/day
Conversion Factor (ug to mg)	CF		1.00E+03	1.00E+03	ug/mg

Risk Calculations

Exposure Route = Inhalation

Chemical of Potential Concern	EPC Value [ug/m^3]	Chronic Daily Intake [mg/kg/day]	Cancer Slope Factor, SF [mg/kg/day]$^{-1}$	Cancer Risk [-]
Adult Resident				
Arsenic	4.00E-04	3.76E-08	1.51E+01	5.65E-07
Cadmium	6.00E-04	5.64E-08	6.30E+00	3.55E-07
Chromium	7.20E-04	6.76E-08	4.20E+01	2.84E-06
Copper	2.80E-03	2.63E-07	NA	
Lead	1.64E-03	1.54E-07	NA	
Child Resident				
Arsenic	4.00E-04	2.19E-08	1.51E+01	3.30E-07
Cadmium	6.00E-04	3.29E-08	6.30E+00	2.07E-07
Chromium	7.20E-04	3.95E-08	4.20E+01	1.66E-06
Copper	2.80E-03	1.53E-07	NA	
Lead	1.64E-03	8.99E-08	NA	
Total Adult Resident				3.8E-06
Total Child Resident				2.2E-06
Total Adult/Child Resident				6.0E-06

Notes:

Arsenic and cadmium were not detected in the background samples. The EPC value shown is an average of the method detection limits (MDLs) found in the 15 samples analyzed for those metals.

NA = no data; this toxicity value is not available in the standard U.S. EPA toxicity value databases.

RME = reasonable maximum exposure.

EPC = exposure point concentration.

Table H-14
Summary of Inhalation Cancer Risks from Exposure to Air - Organ Pipe National Park - Background
Baseline Human Health Risk Assessment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Location	Receptor	COPC	EPC Value (ug/m^3)	Carcinogenic Risk
Organ Pipe National Park - Background	**Adult Resident**	Arsenic	4.00E-04	5.65E-07
		Cadmium	6.00E-04	3.55E-07
		Chromium	7.20E-04	2.84E-06
		Copper	2.80E-03	NA
		Lead	1.64E-03	NA
		Total		3.8E-06
	Child Resident	Arsenic	4.00E-04	3.30E-07
		Cadmium	6.00E-04	2.07E-07
		Chromium	7.20E-04	1.66E-06
		Copper	2.80E-03	NA
		Lead	1.64E-03	NA
		Total		2.2E-06
	Adult/Child Resident	Arsenic	4.00E-04	8.95E-07
		Cadmium	6.00E-04	5.62E-07
		Chromium	7.20E-04	4.50E-06
		Copper	2.80E-03	NA
		Lead	1.64E-03	NA
		Total		6.0E-06

Notes:

Arsenic and cadmium were not detected in the background samples. The EPC value shown is an average of the method detection limits (MDLs) found in the 15 samples analyzed for those metals. Oral and dermal exposure was not calculated for these COPCs in air.
NA = Not applicable

Table H-15
Organ Pipe National Park Air Monitoring Data Residential Cancer Risks - Background
Baseline Human Health Risk Assessment
ASARCO LLC Hayden Plant Site, Hayden, Arizona

Chemical	EPC Value (ug/m^3)	Adult plus Child Cancer Risks
Arsenic	4.0E-04	9.0E-07
Cadmium	6.0E-04	5.6E-07
Chromium	7.2E-04	4.5E-06
Copper	2.8E-03	NA
Lead	1.6E-03	NA
Total		6E-06

Notes:
Arsenic and cadmium were not detected in the background samples. The EPC value shown is an average of the method detection limits (MDLs) found in the 15 samples analyzed for those metals.
NA = Not applicable