– TABLES –

Final Draft

BASELINE ECOLOGICAL RISK ASSESSMENT

Upper Animas Mining District

San Juan County, COLORADO

April 2015

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Baseline Ecological Risk Assessment
Upper Animas River Mining District

| | Animas River | | | | | | | | | | | | | | | | Mainstem Cement Creek | | Mainstem Mineral Creek |
| | Above mainstem Cement Creek | | | | | | | Between Cement & Mineral Creeks | | Below mainstem Mineral Creek | | | | | | | | | |
Sample Date	A56[a]	A60	A61	A64	A65	A66	A68	A69A	A70B	A71B	A72	A73	A73B	A75D	A75B	Bbridge	CC48	CC49	M34
Feb-10							√				√						√		√
Mar-10							√				√						√		√
Apr-10							√				√						√		√
Mar-11							√				√						√		√
Apr-14	√						√					√		√		√			
May-09							√				√						√		√
Jun-09							√				√						√		√
Jun-10							√				√						√		√
Jun-11							√				√						√		√
May-12							√				√								√
May-13	√	√	√	√	√	√	√				√	√	√	√	√	√	√		√
May-14	√	√	√	√	√	√	√				√	√	√	√	√	√	√		√
Jul-09							√				√						√		√
Aug-09							√				√						√		√
Sep-09							√				√						√		√
Nov-09							√				√						√		√
Jul-10							√				√						√		√
Sep-10							√				√						√		√
Nov-10							√				√						√		√
Jul-11							√				√						√		√
Aug-11							√				√						√		√
Sep-11							√				√						√		√
Oct-11							√				√						√		√
Oct-12	√						√	√	√	√	√	√	√	√	√	√	√	√	√
Sep-14	√	√	√	√	√	√	√				√	√	√	√	√	√	√		√

[a] "upstream" location

Table 2.2
Summary of the 2009-2014 sediment sampling efforts at select locations in the Upper Animas River, Cement Creek, and Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

	Sample Date	Animas River																	Mainstem Cement Creek		Mainstem Mineral Creek
		Above mainstem Cement Creek							Between Cement & Mineral Creeks		Below mainstem Mineral Creek										
	Sample Date	A56[a]	A60	A61	A64	A65	A66	A68	A69A	A70B	A71B	A72	A73	A73B	A75D	A75B	Bbridge	CC48	CC49	M34
pre-runoff period	Feb-10																			
	Mar-10																			
	Apr-10																			
	Mar-11																			
	Apr-14	√	√	√	√	√	√	√				√	√		√		√			
runoff period	May-09																			
	Jun-09																			
	Jun-10																			
	Jun-11																			
	May-12							√				√								
	May-13	√	√	√	√	√	√	√				√	√	√	√	√	√			
	Jun-14																			
post-runoff period	Jul-09																			
	Aug-09																			
	Sep-09																			
	Nov-09																			
	Jul-10																			
	Sep-10																			
	Nov-10																			
	Jul-11																			
	Aug-11																			
	Sep-11																			
	Oct-11																			
	Oct-12	√						√				√	√	√	√	√	√		√	√
	Sep-14	√	√	√	√	√	√	√				√	√	√	√	√	√			√

[a] "upstream" location

Table 2.3

Summary of the 2009-2014 sediment pore water sampling efforts at select locations in the Upper Animas River, Cement Creek, and Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas River Mining District

Period	Sample Date	Animas River — Above mainstem Cement Creek							Animas River — Between Cement & Mineral Creeks		Animas River — Below mainstem Mineral Creek							Mainstem Cement Creek		Mainstem Mineral Creek
		A56[a]	A60	A61	A64	A65	A66	A68	A69A	A70B	A71B	A72	A73	A73B	A75D	A75B	Bbridge	CC48	CC49	M34
pre-runoff period	Feb-10																			
	Mar-10																			
	Apr-10																			
	Mar-11																			
	Apr-14	√	√	√	√	√	√	√				√	√		√		√			
runoff period	May-09																			
	Jun-09																			
	Jun-10																			
	Jun-11																			
	May-12																			
	May-13																			
	May-14																			
post-runoff period	Jul-09																			
	Aug-09																			
	Sep-09																			
	Nov-09																			
	Jul-10																			
	Sep-10																			
	Nov-10																			
	Jul-11																			
	Aug-11																			
	Sep-11																			
	Oct-11																			
	Oct-12																			
	Sep-14	√	√	√		√	√	√				√	√	√	√		√			√

[a] "upstream" location

prepared by: SJP (2/3/15)

reviewed by: EC (3/12/15)

Table 3.1
Surface water chronic benchmarks and sediment no effect and effect benchmarks
Baseline Ecological Risk Assessment
Upper Animas River Mining District

metals	surface water chronic benchmarks (µg/L)		sediment no effect benchmarks (mg/kg)				sediment effect benchmarks (mg/kg)			
	CDPHE (2013)	Buchman (2008)	MacDonald et al. (2000)	Ingersoll et al. (1996)	Long et al. (1995)	Thompson et al., 2005	MacDonald et al. (2000)	Ingersoll et al. (1996)	Long et al. (1995)	Thompson et al., 2005
pH	6.5	--	--	--	--	--	--	--	--	--
Aluminum	87 or $e^{(1.3695[ln(hardness)]-0.1158)}$, depending on pH and hardness	87	--	26,000	--	--	--	60,000	--	--
Arsenic	150	190	9.8	11	8.2	9.3	33	48	70	56
Beryllium	NA	0.66	--	--	--	--	--	--	--	--
Cadmium	$(1.101672-[ln(hardness) \times (0.041838)] \times e^{0.7998[ln(hardness)]-4.4451}$ (trout)	0.25	0.99	0.58	1.2	--	4.98	3.2	9.6	--
Chromium	$e^{(0.819[ln(hardness)]+0.5340)}$	74	43.4	36	81	36.7	111	120	370	69.2
Copper	$e^{(0.8545[ln(hardness)]-1.7428)}$	9	31.6	28	34	12	149	100	270	200
Iron	1,000	1,000	--	190,000	--	--	--	250,000	--	--
Lead	$(1.46203-[(ln(hardness) \times (0.145712)]) \times e^{(1.273[ln(hardness)]-4.705)}$	3	35.8	37	46.7	27.7	128	82	218	380
Manganese	$e^{(0.3331[ln(hardness)]+5.8743)}$	80	--	630	--	--	--	1,200	--	--
Mercury	0.01	0.77	0.18	--	0.15	--	1.06	--	0.71	--
Nickel	$e^{(0.846[ln(hardness)]+0.0554)}$	52	22.7	20	20.9	21	48.6	33	51.6	170
Selenium	4.6	5.0 total	--	--	--	0.9	--	--	--	4.7
Silver	$e^{(1.72[ln(hardness)]-10.51)}$(trout)	0.36	--	--	1.0	--	--	--	3.7	--
Zinc	$0.986 \times e^{(0.9094[ln(hardness)]+0.6235)}$	120	121	98	150	--	459	540	410	--

shading identifies the benchmarks retained for use in the BERA

NA = not available

Sources:

Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle WA, Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pages.

Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

Ingersoll, C.G. et al. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22:602-623.

Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.

prepared by: SJP (12/3/13)

reviewed by: EC (3/12/15)

Table 3.2
No effect and effect TRVs for birds
Baseline Ecological Risk Assessment
Upper Animas River Mining District

| Analyte[*] | No effect TRVs | | Effects TRVs | |
	Eco-SSL TRVs[a]	1996 toxicological benchmarks for wildlife[b]	Eco-SSL TRVs[c]	1996 toxicological benchmarks for wildlife[b]
Arsenic	2.24	5.1	4.51	12.8
Cadmium	1.47	1.45	6.35	20
Chromium III	2.66	1.0	15.6	5.0
Copper	4.05	47	34.9	61.7
Lead	1.63	1.13	44.6	11.3
Mercury (inorganic)	--	0.45	--	0.9
Nickel	6.71	77.4	18.6	107
Selenium	0.29	0.5	0.82	1.0
Silver	2.02	--	60.5	--
Zinc	66.1	14.5	171	131

[*] Only those analytes identified as "important bioaccumulatice compounds " in Table 4-2 of EPA (2000) are included in this table.

Footnotes:

All units are mg/kg bw-day

Shading identifies the TRVs selected for use in the BERA

[a] EPA Eco SSL reports (http://www.epa.gov/ecotox/ecossl), as follows:

    EPA, 2005. Ecological soil screening levels for **arsenic**. Interim final. OSWER Directive 9285.7-62.

    EPA, 2005. Ecological soil screening levels for **cadmium**. Interim final. OSWER Directive 9285.7-65.

    EPA, 2008. Ecological soil screening levels for **chromium**. Interim final. OSWER Directive 9285.7-66.

    EPA, 2007. Ecological soil screening levels for **copper**. Interim final. OSWER Directive 9285.7-68.

    EPA, 2005. Ecological soil screening levels for **lead**. Interim final. OSWER Directive 9285.7-70.

    EPA, 2007. Ecological soil screening levels for **nickel**. Interim final. OSWER Directive 9285.7-76.

    EPA, 2007. Ecological soil screening levels for **selenium**. Interim final. OSWER Directive 9285.7-72.

    EPA, 2006. Ecological soil screening levels for **silver**. Interim final. OSWER Directive 9285.7-77.

    EPA, 2007. Ecological soil screening levels for **zinc**. Interim final. OSWER Directive 9285.7-73.

[b] Sample *et al.* , 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values are the toxicities measured in the test species)

[c] The effect TRVs were obtained from Table C-8 in Remedial Investigation report for Lower Darby Creek Area Site, Clearview Landfill Operable Unit 1 (OU-1), Delaware and Philadelphia Counties, PA. May 2010. Prepared by TetraTech NUS, Inc. under EPA contract No. EP-S3-07-04.

-- not available

EcoSSL – ecological soil screening level

TRV – toxicity reference value

Table 3.3
No effect and effect TRVs for mammals
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analyte[*]	No effect TRVs		Effects TRVs	
	Eco-SSL TRVs[a]	1996 toxicological benchmarks for wildlife[b]	Eco-SSL TRVs[d]	1996 toxicological benchmarks for wildlife[b]
Arsenic	1.04	0.126	4.6	1.26
Cadmium	0.77	1.0	6.9	10.0
Chromium III	2.4	2737[e]	58.2	--
Copper	5.6	11.7	82.7	15.4
Lead	4.7	8.0	186.4	80
Mercury (inorganic)	--	1	--	3.0[c]
Nickel	1.7	40	14.8	80
Selenium	0.14	0.2	0.66	0.33
Silver	6.02	--	119	--
Zinc	75.4	160	298	320

[*] Only those analytes identified as "important bioaccumulatice compounds " in Table 4-2 of EPA (2000) are included in this attachment.

Footnotes:

All units are in mg/kg bw-day

Shading identifies TRVs selected for use in the SLERA

[a] USEPA Eco SSL reports (http://www.epa.gov/ecotox/ecossl), as follows:

  EPA, 2005. Ecological soil screening levels for **arsenic**. Interim final. OSWER Directive 9285.7-62.

  EPA, 2005. Ecological soil screening levels for **cadmium**. Interim final. OSWER Directive 9285.7-65.

  EPA, 2008. Ecological soil screening levels for **chromium**. Interim final. OSWER Directive 9285.7-66.

  EPA, 2007. Ecological soil screening levels for **copper**. Interim final. OSWER Directive 9285.7-68.

  EPA, 2005. Ecological soil screening levels for **lead**. Interim final. OSWER Directive 9285.7-70.

  EPA, 2007. Ecological soil screening levels for **nickel**. Interim final. OSWER Directive 9285.7-76.

  EPA, 2007. Ecological soil screening levels for **selenium**. Interim final. OSWER Directive 9285.7-72.

  EPA, 2006. Ecological soil screening levels for **silver**. Interim final. OSWER Directive 9285.7-77.

  EPA, 2007. Ecological soil screening levels for **zinc**. Interim final. OSWER Directive 9285.7-73.

[b] Sample *et al* ., 1996, Toxicological Benchmarks for Wildlife: 1996 Revision, ES/ER/TM-86/R3, http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf (values are the toxicities measured in the test species)

[c] The reference did not provide an effect benchmark. The value represents the no effect benchmark X 3

[d] The effect TRVs were obtained from Table C-8 in Remedial Investigation report for Lower Darby Creek Area Site, Clearview Landfill Operable Unit 1 (OU-1), Delaware and Philadelphia Counties, PA. May 2010. Prepared by TetraTech NUS, Inc. under EPA contract No. EP-S3-07-04.

[e] The no effect TRV for CrIII is as reported in the reference

-- not available

EcoSSL – ecological soil screening level

TRV – toxicity reference value

Table 3.4
Selection of surface water COPECs for community-level receptors in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Compound	Frequency of Detection	Minimum Detect (µg/L)	Flag	Maximum Detect (µg/L)[a]	Flag	Location of Maximum Detect[*]	Conc. used for Screening[b]	Benchmark (µg/L)[c,**]	Hardness (mg/L)[d]	Hardness-Adjusted Benchmark (µg/L)[e]	Bench-mark Source	Hazard Quotient[f]	COPEC?	Reason Code
pH	24/24	4.97		7.30		M34	4.97	6.50	--	--	1	>1[g]	yes	a
Aluminum	24/24	563		5950		M34	5950	87	--	--	1	68.4	yes	a
Arsenic	0/24	--		2.0	U	M34	2.0	150	--	--	1	<1	no	b
Beryllium	0/24	--		5.0	U	M34	5.0	0.66	--	--	2	7.6	yes	a
Cadmium	22/24	0.2		2.0		M34	2.0	--	150	0.58	1	3.4	yes	a
Chromium	0/24	--		2.5	U	M34	2.5	--	49	41	1	<1	no	b
Copper	12/24	1.5		16.2		M34	12.3	--	150	13.0	1	<1	no	a
Iron	24/24	754		8290		M34	8290	1,000	--	--	1	8.3	yes	a
Lead	6/24	0.1	J	4.2		M34	4.2	--	247	6.6	1	<1	no	b
Manganese	24/24	84.9		634		M34	592	--	238	2202	1	<1	no	b
Nickel	8/24	0.5	J	5.3		M34	2.0	--	49	28	1	<1	no	b
Selenium	0/24	--		1.3	U	M34	1.3	4.6	--	--	1	<1	no	b
Silver	2/24	0.5		0.6		M34	0.6	--	309	0.520	1	1.2	yes	a
Zinc	23/24	48.1		499		M34	499	--	150	175	1	2.8	yes	a

Notes:

Dissolved analytical data were used for all metals except aluminum and iron where total metals data were used.

[*] For pH, the location shown is the one with the lowest-measured pH

[**] The pH benchmark is unitless

[a] These values represent the maximum detected concentrations, or half the maximum detection limit for a non-detected analyte (except for pH which represents the lowest reported value) measured between May 2009 and September 2014 in mainstem Mineral Creek.

[b] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the maximum concentration

[c] These benchmarks are not sensitive to surface water hardness

[d] This hardness was associated with the detected analyte concentration that resulted in the highest HQ measured between May 2009 and September 2014 in mainstem Mineral Creek

[e] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[f] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[g] pH values are logarithmic and cannot be used to calculate an HQ because the HQ approach assumes linearity

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration,

Table 3.5
Selection of surface water COPECs for community-level receptors in mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Compound	Frequency of Detection	Minimum Detect (µg/L)	Flag	Maximum Detect (µg/L)[a]	Flag	Location of Maximum Detect[*]	Conc. used for Screening[b]	Benchmark (µg/L)[c,**]	Hardness (mg/L)[d]	Hardness-Adjusted Benchmark (µg/L)[e]	Bench-mark Source	Hazard Quotient[f]	COPEC?	Reason Code
pH	25/25	3.24		5.40		CC48	3.24	6.50	--	--	1	>1[g]	yes	a
Aluminum	25/25	1610		8610		CC48	8610	87	--	--	1	99.0	yes	a
Arsenic	0/25	--		2.0	U	CC48	2.0	150	--	--	1	<1	no	b
Beryllium	9/25	1.1		1.3		CC48	1.3	0.66	--	--	2	2.0	yes	a
Cadmium	25/25	2.0		7.00		CC48	5.1	--	67	0.31	1	16.4	yes	a
Chromium	0/25	--		5.0	U	CC48	2.5	--	67	53	1	<1	no	b
Copper	25/25	55.6		221		CC48	65.3	--	67	6.4	1	10.3	yes	a
Iron	25/25	3610		21700		CC48	21700	1000	--	--	1	21.7	yes	a
Lead	25/25	4.2		21.4		CC48	14.2	--	67	1.6	1	8.9	yes	a
Manganese	25/25	710		5300		CC49	5270	--	495	2810	1	1.9	yes	a
Nickel	22/25	2.2		19.4		CC48	5.9	--	67	37	1	<1	no	b
Selenium	1/25	3.2	J	3.2	J	CC48	3.2	4.6	--	--	1	<1	no	b
Silver	0/25	--		2.5	U	CC48	1.25	--	67	0.04	1	31.3	yes	a
Zinc	25/25	394		2890		CC48	1310	--	126	150	1	8.7	yes	a

Notes:

Dissolved analytical data were used for all metals except aluminum and iron where total metals data were used.

[*] For pH, the location shown is the one with the lowest-measured pH

[**] The pH benchmark is unitless

[a] These values represent the maximum detected concentrations, or half the maximum detection limit for a non-detected analyte (except for pH which represents the lowest reported value) measured between May 2009 and September 2014 in mainstem Cement Creek.

[b] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the maximum concentration

[c] These benchmarks are not sensitive to surface water hardness

[d] This hardness was associated with the detected analyte concentration that resulted in the highest HQ measured between May 2009 and September 2014 in mainstem Cement Creek

[e] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[f] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[g] pH values are logarithmic and cannot be used to calculate an HQ because the HQ approach assumes linearity

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration,

Table 3.6
Selection of SW COPECs for community-level receptors in the Animas River above Mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Compound	Frequency of Detection	Minimum Detect (µg/L)	Flag	Maximum Detect (µg/L)[a]	Flag	Location of Maximum Detect[*]	Conc. used for Screening[b]	Benchmark (µg/L)[c,**]	Hardness (mg/L)[d]	Hardness-Adjusted Benchmark (µg/L)[e]	Bench-mark Source	Hazard Quotient[f]	COPEC?	Reason Code
pH	39/39	6.26		7.71		A68	6.26	6.50	--	--	1	<1[g]	no	b
Aluminum	35/40	101		1010		A68	1010	--	49	184	1	**5.5**	**yes**	a
Arsenic	0/40	--		2.0	U	multiple	2.0	150	--	--	1	<1	no	b
Beryllium	0/40	--		1.0	U	multiple	1.0	0.66	--	--	2	**1.5**	**yes**	a
Cadmium	40/40	0.7		4.1		A68	4.1	--	148	0.57	1	**7.2**	**yes**	a
Chromium	0/40	--		2.5	U	A68	2.5	--	50	42	1	<1	no	b
Copper	24/40	2.7		16.5		A61	16.5	--	80	7.4	1	**2.2**	**yes**	a
Iron	31/40	111	J	1100		A68	1100	1000	--	--	1	**1.1**	**yes**	a
Lead	20/40	0.1	J	1.5		A66	1.5	--	64	1.5	1	**1.0**	**yes**	a
Manganese	40/40	153		3730		A68	3730	--	148	1880	1	**2.0**	**yes**	a
Nickel	0/40	--		2.0	U	A68	2.0	--	50	29	1	<1	no	b
Selenium	0/40	--		0.5	U	multiple	0.5	4.6	--	--	1	<1	no	b
Silver	0/40	--		0.25	U	multiple	0.25	--	49	0.02	1	**11.4**	**yes**	a
Zinc	40/40	237		1030		A68	1030	--	151	176	1	**5.8**	**yes**	a

Notes:

Dissolved analytical data were used for all metals except aluminum and iron where total metals data were used.

[*] For pH, the location shown is the one with the lowest-measured pH

[**] The pH benchmark is unitless

[a] These values represent the maximum detected concentrations, or half the maximum detection limit for a non-detected analyte (except for pH which represents the lowest reported value) measured between May 2009 and September 2014 in the Animas River above mainstem Cement Creek

[b] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the maximum concentration

[c] These benchmarks are not sensitive to surface water hardness

[d] This hardness was associated with the analyte concentration that resulted in the highest HQ measured between May 2009 and September 2014 in the Animas River above mainstem Cement Creek

[e] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[f] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[g] pH values are logarithmic and cannot be used to calculate an HQ because the HQ approach assumes linearity

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration,

Table 3.7
Selection of surface water COPECs for community-level receptors in the Animas River between mainstem Cement Creek and mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Compound	Frequency of Detection	Minimum Detect (µg/L)	Flag	Maximum Detect (µg/L)[a]	Flag	Location of Maximum Detect[*]	Conc. used for Screening[b]	Benchmark (µg/L)[c,**]	Hardness (mg/L)[d]	Hardness-Adjusted Benchmark (µg/L)[e]	Bench-mark Source	Hazard Quotient[f]	COPEC?	Reason Code
pH	2/2	5.54		6.05		A69A	5.54	6.50	--	--	1	>1[g]	**yes**	a
Aluminum	2/2	2460	D	2520	D	A69A	2520	87	--	--	1	**29.0**	**yes**	a
Arsenic	0/2	--		0.25	U	multiple	0.25	150	--	--	1	<1	no	b
Beryllium	0/2	--		1.0	U	multiple	1.0	0.66	--	--	2	**1.5**	**yes**	a
Cadmium	2/2	2.7		2.7		multiple	2.7	--	295	0.95	1	**2.8**	**yes**	a
Chromium	0/2	--		0.5	U	multiple	0.5	--	295	180	1	<1	no	b
Copper	2/2	16.3		24.8		A70B	24.8	--	295	23.0	1	**1.1**	**yes**	a
Iron	2/2	4890	D	5100	D	A69A	5100	1000	--	--	1	**5.1**	**yes**	a
Lead	2/2	0.2	J	3.0		A70B	3.0	--	295	8.0	1	<1	no	b
Manganese	2/2	2540		2590		A69A	2540	--	295	2365	1	**1.1**	**yes**	a
Nickel	2/2	4.8		5.2		A70B	5.2		295	130	1	<1	no	b
Selenium	0/2	--		0.25	U	multiple	0.25	4.6	--	--	1	<1	no	b
Silver	0/2	--		0.25	U	multiple	0.25	--	295	0.48	1	<1	no	b
Zinc	2/2	1160		1160		multiple	1160	--	295	324	1	**3.6**	**yes**	a

Notes:

Dissolved analytical data were used for all metals except aluminum and iron where total metals data were used.

[*] For pH, the location shown is the one with the lowest-measured pH

[**] The pH benchmark is unitless

[a] These values represent the maximum detected concentrations, or half the maximum detection limit for a non-detected analyte (except for pH which represents the lowest reported value) measured between May 2009 and September 2014 in the Animas River between mainstem Cement Creek and mainstem Mineral Creek

[b] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the maximum concentration

[c] These benchmarks are not sensitive to surface water hardness

[d] This hardness was associated with the analyte concentration that resulted in the highest HQ measured between May 2009 and September 2014 in the Animas River between mainstem Cement Creek and mainstem Mineral Creek

[e] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[f] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[g] pH values are logarithmic and cannot be used to calculate an HQ because the HQ approach assumes linearity

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration,

prepared by: SJP (1/27/14)   reviewed by: RI (2/10/14)

updated by: BB (2/17/15)   reviewed by: EC (2/18/15)

Table 3.8
Selection of surface water COPECs for community-level receptors in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Compound	Frequency of Detection	Minimum Detect (µg/L)	Flag	Maximum Detect (µg/L)[a]	Flag	Location of Maximum Detect[*]	Conc. used for Screening[b]	Benchmark (µg/L)[c,**]	Hardness (mg/L)[d]	Hardness-Adjusted Benchmark (µg/L)[e]	Bench-mark Source	Hazard Quotient[f]	COPEC?	Reason Code
pH	45/45	5.04		7.64		A72	5.04	6.50	--	--	1	>1[g]	**yes**	a
Aluminum	48/48	234	JD	4440		A72	4440	87	--	--	1	**51.0**	**yes**	a
Arsenic	0/48	--		2.0	U	multiple	2.0	150	--	--	1	<1	no	b
Beryllium	0/48	--		1.0	U	multiple	1.0	0.66	--	--	2	**1.5**	**yes**	a
Cadmium	48/48	0.3		2.9		A72	2.9	--	177	0.65	1	**4.5**	**yes**	a
Chromium	1/48	2.3		2.3		A72	2.3	--	261	163	1	<1	no	b
Copper	40/48	0.6	J	36.9		A72	36.9	--	296	23.0	1	**1.6**	**yes**	a
Iron	47/48	317		7710		A72	7710	1000	--	--	1	**7.7**	**yes**	a
Lead	16/48	0.1	J	2.7		A72	0.8	--	60	1.4	1	<1	no	b
Manganese	48/48	109		2920		A72	2920	--	337	2472	1	**1.2**	**yes**	a
Nickel	29/48	0.5	J	8.2		A72	1.4	--	37	22	1	<1	no	b
Selenium	0/48	--		1.25	U	multiple	1.30	4.6	--	--	1	<1	no	b
Silver	0/48	--		1.25	U	multiple	1.25	--	71	0.04	1	**31.3**	**yes**	a
Zinc	48/48	66.5		1230		A72	864	--	177	204	1	**4.2**	**yes**	a

Notes:

Dissolved analytical data were used for all metals except aluminum and iron where total metals data were used.

[*] For pH, the location shown is the one with the lowest-measured pH

[**] The pH benchmark is unitless

[a] These values represent the maximum detected concentrations, or half the maximum detection limit for a non-detected analyte (except for pH which represents the lowest reported value) measured between May 2009 and September 2014 in the Animas River below mainstem Mineral Creek

[b] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the maximum concentration

[c] These benchmarks are not sensitive to surface water hardness

[d] This hardness was associated with the analyte concentration that resulted in the highest HQ measured between May 2009 and September 2014 in the Animas River below mainstem Mineral Creek

[e] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[f] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[g] pH values are logarithmic and cannot be used to calculate an HQ because the HQ approach assumes linearity

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34

prepared by: SJP (1/27/14) reviewed by: RI (2/10/14)

updated by: BB (2/17/15) reviewed by: EC (2/18/15)

Table 3.9
Summary of the surface water COPECs for community-level receptors
Baseline Ecological Risk Assessment
Upper Animas River District

Analyte	mainstem Mineral Creek	mainstem Cement Creek	Animas River above mainstem Cement Creek	Animas River between mainstem Cement and Mineral Creeks	Animas River below mainstem Mineral Creek
pH	√	√		√	√
Aluminum	√	√	√	√	√
Arsenic					
Beryllium	(√)	√	(√)	(√)	(√)
Cadmium	√	√	√	√	√
Chromium					
Copper		√	√	√	√
Iron	√	√	√	√	√
Lead		√	√		
Manganese		√	√	√	√
Nickel					
Selenium					
Silver	√	(√)	(√)		(√)
Zinc	√	√	√	√	√

(√) = analyte was not detected but was retained as a COPEC because 1/2 the max detection limit exceeded the benchmark

prepared by: SJP (1/31/14)

checked by: RI (2/10/14)

updated by: BB (2/17/15)

reviewed by: EC (2/18/15)

Table 3.10
Selection of sediment COPECS for the benthic invertebrate community in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analyte	Frequency of Detection	Minimum Detect (mg/kg)	Flag	Max Detect or 1/2 Max DL (mg/kg)	Flag	Location of Maximum	Conc. used for Screening	Benchmark (mg/kg)	Bench-mark Source	Hazard Quotient[a]	COPEC?	Reason Code
Aluminum	2 / 2	22,400	D	29,100	D	M34	29,100	26,000	2	**1.1**	**yes**	a
Arsenic	2 / 2	21.1	D	32.7	D	M34	32.7	9.8	1	**3.3**	**yes**	a
Beryllium	0 / 2	--		2.0	U	M34	2.0	NA	--	--	**yes**	c
Cadmium	2 / 2	0.9	D	1.9	D	M34	1.9	0.99	1	**1.9**	**yes**	a
Chromium	2 / 2	2.8	D	3.4	D	M34	3.4	43.4	1	<1	no	b
Copper	2 / 2	53.8	D	127	D	M34	127	31.6	1	**4.0**	**yes**	a
Iron	2 / 2	46,500	D	89,000	D	M34	89,000	190,000	2	<1	no	b
Lead	2 / 2	129	D	237	D	M34	237	35.8	1	**6.6**	**yes**	a
Manganese	2 / 2	1,160	D	1,430	D	M34	1,430	630	2	**2.3**	**yes**	a
Mercury	2 / 2	0.02	D	0.05	D	M34	0.05	0.18	1	<1	no	b
Nickel	2 / 2	4.6	D	5.9	BD	M34	5.9	22.7	1	<1	no	b
Selenium	1 / 2	1.7	D	1.7	D	M34	1.7	0.9	4	**1.9**	**yes**	a
Silver	2 / 2	0.7	D	0.9	JD	M34	0.9	1.0	3	<1	no	b
Zinc	2 / 2	270	D	666	D	M34	666	121	1	**5.5**	**yes**	a

[a] the hazard quotient is calculated by dividing a maximum concentration by its sediment screening benchmark
D = sample was diluted before analysis
U = not detected

COPEC = contaminant of potential ecological concern
DL = detection limit

Reason codes:
a = the maximum concentration exceeds the sediment screening benchmark
b = the maximum concentration falls below the sediment screening benchmark
c = a benchmark is not available

Benchmark sources:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

2. Ingersoll, C.G. *et al*. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22:602-623.

3. Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

4. Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.

prepared by: SJP (1/29/14)

reviewed by: RI (2/10/14)

revised by: BB (2/10/15)

reviewed by: ES (2/11/15)

Table 3.11
Selection of sediment COPECS for the benthic invertebrate community in mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analyte	Frequency of Detection	Minimum Detect (mg/kg)	Flag	Max Detect or 1/2 Max DL (mg/kg)	Flag	Location of Maximum	Conc. used for Screening	Benchmark (mg/kg)	Bench-mark Source	Hazard Quotient[a]	COPEC?	Reason Code
Aluminum	1 / 1	5310	D	5,310	D	CC49	5,310	26,000	2	<1	no	b
Arsenic	1 / 1	40.6	D	40.6	D	CC49	40.6	9.8	1	**4.1**	**yes**	a
Beryllium	0 / 1	--		1.0	U	CC49	1.0	NA	--	--	**yes**	c
Cadmium	1 / 1	0.6	D	0.6	D	CC49	0.6	0.99	1	<1	no	b
Chromium	1 / 1	4.6	D	4.6	D	CC49	4.6	43.4	1	<1	no	b
Copper	1 / 1	55.6	D	55.6	D	CC49	55.6	31.6	1	**1.8**	**yes**	a
Iron	1 / 1	143,000	D	143,000	D	CC49	143,000	190,000	2	<1	no	b
Lead	1 / 1	282	D	282	D	CC49	282	35.8	1	**7.9**	**yes**	a
Manganese	1 / 1	478	D	478	D	CC49	478	630	2	<1	no	b
Mercury	1 / 1	0.06	D	0.06	D	CC49	0.06	0.18	1	<1	no	b
Nickel	1 / 1	2.9	D	2.9	D	CC49	2.9	22.7	1	<1	no	b
Selenium	1 / 1	0.7	JD	0.7	JD	CC49	0.7	0.9	4	<1	no	b
Silver	1 / 1	2.0	D	2.0	D	CC49	2.0	1.0	3	**2.0**	**yes**	a
Zinc	1 / 1	195	D	195	D	CC49	195	121	1	**1.6**	**yes**	a

[a] the hazard quotient is calculated by dividing a maximum concentration by its sediment screening benchmark

J = estimated concentration

D = sample was diluted before analysis

U = not detected

COPEC = contaminant of potential ecological concern

DL = detection limit

Reason codes:

a = the maximum concentration exceeds the sediment screening benchmark

b = the maximum concentration falls below the sediment screening benchmark

c = a benchmark is not available

DL = detection limit

Benchmark sources:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

2. Ingersoll, C.G. *et al* . 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius* . J. Great Lakes Res. 22:602-623.

3. Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

4. Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.

Table 3.12
Selection of sediment COPECs for the benthic invertebrate community in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River District

Analyte	Frequency of Detection	Minimum Detect (mg/kg)	Flag	Maximum Detect (mg/kg)	Flag	Location of Maximum Detect	Conc. used for Screening	Benchmark (mg/kg)	Bench-mark Source	Hazard Quotient[a]	COPEC?	Reason Code
Aluminum	20 / 20	7650	D	15300	D	A68	15300	26000	2	<1	no	b
Arsenic	20 / 20	16.4	D	89.5	D	A68	89.5	9.8	1	**9.1**	**yes**	a
Beryllium	9 / 20	2.1	JD	6.8	D	A68	6.8	NA	--	--	**yes**	c
Cadmium	20 / 20	5.0	D	24.2	D	A68	24.2	0.99	1	**24.4**	**yes**	a
Chromium	20 / 20	3.6	D	6.4	D	A60	6.4	43.4	1	<1	no	b
Copper	20 / 20	166	D	745	D	A68	745	31.6	1	**23.6**	**yes**	a
Iron	20 / 20	22800	D	45300	D	A68	45300	190000	2	<1	no	b
Lead	20 / 20	554	D	3030	D	A68	3030	35.8	1	**84.6**	**yes**	a
Manganese	20 / 20	3400	D	22300	D	A68	22300	630	2	**35.4**	**yes**	a
Mercury	14 / 14	0.02	JD	0.19	D	A68	0.19	0.18	1	**1.1**	**yes**	a
Nickel	20 / 20	5.9	D	16.5	D	A68	16.5	22.7	1	<1	no	b
Selenium	4 / 20	0.91	JD	2.9	D	A68	2.9	0.9	4	**3.2**	**yes**	a
Silver	20 / 20	2.9	D	13.3	D	A68	13.3	1.0	3	**13.3**	**yes**	a
Zinc	20 / 20	1530	D	11500	D	A68	11500	121	1	**95.0**	**yes**	a

[a] the hazard quotient is calculated by dividing a maximum concentration by its sediment screening benchmark

B = analyte was also detected in the blank

J = estimated concentration

D = sample was diluted before analysis

COPEC = contaminant of potential ecological concern

Reason codes:

a = the maximum concentration exceeds the sediment screening benchmark

b = the maximum concentration falls below the sediment screening benchmark

c = a benchmark is not available

Benchmark sources:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

2. Ingersoll, C.G. *et al*. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J. Great Lakes Res. 22:602-623.

3. Long, E.R., D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

4. Thompson, P.A., J. Kurias, and S. Mihok. 2005. Derivation and use of sediment guidelines for ecological risk assessment of metals and radionuclides released to the environment from uranium mining and milling activities in Canada. Environ. Monit. Assess. 110:71-85.

prepared by: SJP (1/29/14)

reviewed by: RI (2/10/14)

revised by: BB (2/10/15)

reviewed by: ES (2/11/15)

Table 3.13

Selection of sediment COPECS for the benthic invertebrate community in the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas River Mining District

Analyte	Frequency of Detection	Minimum Detect (mg/kg)	Flag	Maximum Detect (mg/kg)[a]	Flag	Location of Maximum Detect	Concentration used for Screening	Benchmark (mg/kg)	Benchmark Source	Hazard Quotient[a]	COPEC?	Reason Code
Aluminum	23 / 23	6,620	D	48,600	D	A75B	48,600	26,000	2	**1.9**	**yes**	a
Arsenic	23 / 23	9.2	D	40.6	D	A72	40.6	9.8	1	**4.1**	**yes**	a
Beryllium	9 / 23	3.2	JD	6.0	D	A75B	6.0	--	--	NA	**yes**	c
Cadmium	23 / 23	1.2	D	18.6	D	Bbridge	18.6	0.99	1	**18.8**	**yes**	a
Chromium	23 / 23	2.8	D	7.4	BD	BBridge	7.4	43.4	1	< 1	no	b
Copper	23 / 23	67	D	413	D	A75B	413	31.6	1	**13.1**	**yes**	a
Iron	23 / 23	20,100	D	109,000	D	A73	109,000	190,000	2	< 1	no	b
Lead	23 / 23	98	D	729	D	A73	729	35.8	1	**20.4**	**yes**	a
Manganese	23 / 23	1,210	D	13,100	D	BBridge	13,100	630	2	**20.8**	**yes**	a
Mercury	15 / 17	0.02	JD	0.09	D	A73B	0.09	0.18	1	< 1	no	b
Nickel	23 / 23	4.33	D	31.6	D	BBridge	31.6	22.7	1	**1.4**	**yes**	a
Selenium	13 / 23	0.59	JD	3.3	D	A75B	3.3	0.9	4	**3.7**	**yes**	a
Silver	23 / 23	0.512	JD	3.1	D	A73B	3.1	1.0	3	**3.1**	**yes**	a
Zinc	23 / 23	386	D	8,670	D	BBridge	8,670	121	1	**71.7**	**yes**	a

[a] the hazard quotient is calculated by dividing a maximum concentration by its sediment screening benchmark

B = analyte was also detected in the blank

D = sample was diluted prior to analysis

J = estimated value

COPEC = contaminant of potential ecological concern

reason code:

a = the maximum detected concentration exceeds the screening benchmark

b = the maximum detected concentration does not exceed the screening benchmark

c = the analyte does not have a benchmark

Benchmark sources:

1. MacDonald, D.D., C.G. Ingersoll, and T.A. Berger. 2000. Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems. Arch. Environ. Contam. Toxicol. 39:20-31.

2. Ingersoll, C.G. *et al*. 1996. Calculation and evaluation of sediment effect concentrations for the amphipod *Hyalella azteca* and the midge *Chironomus riparius*. J, Great Lakes Res. 22:602-623.

3. Long, E.R, D.D. MacDonald, S.L. Smith, and F.D. Calder. 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Manag. 19:81-97.

milling activities in Canada. Environ. Monit. Assess. 110:71-85.

Table 3.14
Summary of the sediment COPECs for the benthic invertebrate community
Baseline Ecological Risk Assessment
Upper Animas River District

Analyte	mainstem Mineral Creek	mainstem Cement Creek	Animas River above mainstem Cement Creek	Animas River between mainstem Cement and Mineral Creeks[a]	Animas River below mainstem Mineral Creek
Aluminum	√				√
Arsenic	√	√	√		√
Beryllium	√	√	√		√
Cadmium	√		√		√
Chromium					
Copper	√	√	√		√
Iron					
Lead	√	√	√		√
Manganese	√		√		√
Mercury			√		
Nickel					√
Selenium	√		√		√
Silver		√	√		√
Zinc	√	√	√		√

[a] this reach of the Animas River was not sampled for sediment

Table 3.15
Selection of pore water COPECs for the benthic invertebrate community in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Compound	Frequency of Detection	Minimum Detect (µg/L)[a]	Flag	Maximum Detect (µg/L)[b]	Flag	Location of Maximum Detect	Conc. used for Screening[c]	Benchmark (µg/L)[d]	Hardness (mg/L)[e]	Hardness-Adjusted Benchmark (µg/L)[f]	Bench-mark Source	Hazard Quotient[g]	COPEC?	Reason Code
Aluminum	8/11	21	J	6170	D	A61	6170	87[h]	--	--	1	**70.9**	**yes**	a
Arsenic	1/11	0.55	J	0.55	J	A60	0.55	150	--	--	1	<1	no	b
Beryllium	0/11	2.0	U	10.0	U	A61	10.0	0.66	--	--	2	**15.2**	**yes**	a
Cadmium	11/11	0.28		107	D	A61	107	--	497	1.42	1	**75.4**	**yes**	a
Chromium	2/11	0.8	J	1.8	J	A66	1.8	--	141	98	1	<1	no	b
Copper	11/11	1.3		2250	D	A61	2250	--	853	56.0	1	**40.2**	**yes**	a
Iron	0/11	100	U	500	U	A61	500	1000	--	--	1	<1	no	b
Lead	6/11	0.123	J	65.6	D	A61	65.6	--	497	13.6	1	**4.8**	**yes**	a
Manganese	10/11	2.6	J	78300	D	A61	78300	--	497	3369	1	**23.2**	**yes**	a
Nickel	4/11	11.3		77.5	D	A61	77.5	--	853	319	1	<1	no	b
Selenium	0/11	1.0	U	5.0	U	A61	5.0	4.6	--	--	1	**1.1**	**yes**	a
Silver	0/11	0.5	U	2.5	U	A61	0.25	--	118	0.10	1	**2.5**	**yes**	a
Zinc	11/11	179		29900	D	A61	18490	--	497	520	1	**35.6**	**yes**	a

[a] These values represent the minimum detected dissolved metals concentrations, or the minimum detection limit for a non-detected analyte, measured in April and September 2014 in pore water samples collected from the Animas River upstream from mainstem Cement Creek

[b] These values represent the maximum detected dissolved metals concentrations, or half the maximum detection limit for a non-detected analyte, measured in April and September 2014 in the Animas River upstream from mainstem Cement Creek

[c] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the one associated with the maximum concentration

[d] These benchmarks are not sensitive to surface water hardness

[e] This hardness was associated with the analyte concentration that resulted in the highest HQ measured in April or September 2014 in the Animas River between mainstem Cement Creek and mainstem Mineral Creek

[f] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[g] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[h] CDPHE developed a benchmark equation for Al based on total Al, hardness, and pH. The latter parameter was not available. Instead, EPA's National Recommneded Water Quality Criterion of 87 µg/L was used to calculate the hazard quotients

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

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Table 3.16
Selection of pore water COPECs for the benthic invertebrate community in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Compound	Frequency of Detection	Minimum Detect (µg/L)[a]	Flag	Maximum Detect (µg/L)[b]	Flag	Location of Maximum Detect	Conc. used for Screening[c]	Benchmark (µg/L)[d]	Hardness (mg/L)[e]	Hardness-Adjusted Benchmark (µg/L)[f]	Bench-mark Source	Hazard Quotient[g]	COPEC?	Reason Code
Aluminum	8/9	23	J	517		A72	517	87[h]	--	--	1	**5.9**	**yes**	a
Arsenic	1/9	3.7		3.7		BBridge	3.74	150	--	--	1	<1	no	b
Beryllium	0/9	2.0	U	1.0	U	multiple	1.0	0.66	--	--	2	**1.5**	**yes**	a
Cadmium	7/9	0.33		3.0		A72	3.0	--	256	0.86	1	**3.5**	**yes**	a
Chromium	2/9	1.2	J	3.2		BBridge	3.2	--	271	168	1	<1	no	b
Copper	8/9	0.92	J	8.1		A72	8.1	--	256	20.0	1	<1	no	b
Iron	4/9	107	J	1260		BBridge	1260	1000	--	--	1	**1.3**	**yes**	**a**
Lead	3/9	0.19	J	0.45		A72	0.45	--	256	6.9	1	<1	no	b
Manganese	9/9	2.5	J	5870		BBridge	5870	--	271	2299	1	**2.6**	**yes**	a
Nickel	7/9	0.58	J	2.0		A72	2.0	--	256	115	1	<1	no	b
Selenium	0/9	1.0	U	0.5	U	multiple	0.5	4.6	--	--	1	<1	no	b
Silver	0/9	0.5	U	0.25	U	multiple	0.25	--	49	0.02	1	**12.5**	**yes**	a
Zinc	9/9	13.3	J	1630		A72	1630	--	256	285	1	**5.7**	**yes**	a

[a] These values represent the minimum detected dissolved metals concentrations, or the minimum detection limit for a non-detected analyte, measured in April and September 2014 in pore water samples collected from the Animas River upstream from mainstem Cement Creek

[b] These values represent the maximum detected dissolved metals concentrations, or half the maximum detection limit for a non-detected analyte, measured in April and September 2014 in the Animas River upstream from mainstem Cement Creek

[c] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the one associated with the maximum concentration

[d] These benchmarks are not sensitive to surface water hardness

[e] This hardness was associated with the analyte concentration that resulted in the highest HQ measured in April or September 2014 in the Animas River between mainstem Cement Creek and mainstem Mineral Creek

[f] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[g] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[h] CDPHE developed a benchmark equation for Al based on total Al, hardness, and pH. The latter parameter was not available. Instead, EPA's National Recommneded Water Quality Criterion of 87 µg/L was used to calculate the hazard quotient

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

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prepared by: SJP (2/24/15)

checked by: EC (2/26/15)

Table 3.17
Selection of pore water COPECs for the benthic invertebrate community in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Compound	Frequency of Detection	Minimum Detect (µg/L)[a]	Flag	Maximum Detect (µg/L)[b]	Flag	Location of Maximum Detect	Conc. used for Screening[c]	Benchmark (µg/L)[d]	Hardness (mg/L)[e]	Hardness-Adjusted Benchmark (µg/L)[f]	Benchmark Source	Hazard Quotient[g]	COPEC?	Reason Code
Aluminum	1/1	45.7	J	45.7	J	M34	45.7	87[h]	--	--	1	<1	no	b
Arsenic	0/1	0.5	U	0.25	U	M34	0.25	150	--	--	1	<1	no	b
Beryllium	0/1	2.0	U	1.0	U	M34	1.0	0.66	--	--	2	**1.5**	**yes**	a
Cadmium	1/1	0.13	J	0.13	J	M34	0.13	--	139	0.54	1	<1	no	b
Chromium	0/1	1.0	U	0.5	U	M34	0.5	--	139	97	1	<1	no	b
Copper	1/1	1.2		1.2		M34	1.2	--	139	12	1	<1	no	b
Iron	0/1	100	U	50	U	M34	50	1000	--	--	1	<1	no	b
Lead	0/1	0.1	U	0.05	U	M34	0.05	--	139	3.6	1	<1	no	b
Manganese	1/1	27.6		27.6		M34	27.6	--	139	1841	1	<1	no	b
Nickel	0/1	0.5	U	0.25	U	M34	0.25	--	139	69	1	<1	no	b
Selenium	0/1	1.0	U	0.5	U	M34	0.5	4.6	--	--	1	<1	no	b
Silver	0/1	0.5	U	0.25	U	M34	0.25	--	139	0.10	1	**2.5**	**yes**	a
Zinc	1/1	48.2		48.2		M34	48.2	--	139	163	1	<1	no	b

[a] These values represent the minimum detected dissolved metals concentrations, or the minimum detection limit for a non-detected analyte, measured in April and September 2014 in pore water samples collected from the Animas River upstream from mainstem Cement Creek

[b] These values represent the maximum detected dissolved metals concentrations, or half the maximum detection limit for a non-detected analyte, measured in April and September 2014 in the Animas River upstream from mainstem Cement Creek

[c] For hardness-dependent metals, the concentration used for screening may differ from the maximum concentration if hardness caused another concentration to yield a higher hazard quotient than the one associated with the maximum concentration

[d] These benchmarks are not sensitive to surface water hardness

[e] This hardness was associated with the analyte concentration that resulted in the highest HQ measured between in April or September 2014 in the Animas River between mainstem Cement Creek and mainstem Mineral Creek

[f] The formulae used to adjust the benchmarks for hardness were obtained from CDPHE, 2013 (see "benchmark sources" below)

[g] the hazard quotient is calculated by dividing a screening concentration by its benchmark

[h] CDPHE developed a benchmark equation for Al based on total Al, hardness, and pH. The latter parameter was not available. Instead, EPA's National Recommneded Water Quality Criterion of 87 µg/L was used in the calculations

Reason codes:

a = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, exceeds its chronic surface water benchmark

b = the maximum concentration, or 1/2 the maximum detection limit for a non-detected analyte, falls below the chronic surface water benchmark

Benchmark sources:

1 = Colorado Department of Public Health and the Environment (CDPHE), 2013. Regulation no. 31 – The basic standards and methodologies for surface water (5 CCR 1002 – 31): Denver, Water Quality Control Commission.

2 = Buchman, M.F. 2008. NOAA Screening Quick Reference Tables, NOAA OR&R Report 08-1, Seattle, WA. Office of Response and Restoration Division, National Oceanic and Atmospheric Administration, 34 pp

prepared by: SJP (2/24/15)

checked by: EC (2/26/15)

Table 3.18
Summary of the pore water COPECs for the benthic invertebrate community
Baseline Ecological Risk Assessment
Upper Animas River District

Analyte	mainstem Mineral Creek	mainstem Cement Creek[a]	Animas River above mainstem Cement Creek	Animas R. between Cement and Mineral Creeks[a]	Animas River below mainstem Mineral Creek
Aluminum			√		√
Arsenic					
Beryllium	(√)		(√)		(√)
Cadmium			√		√
Chromium					
Copper			√		
Iron					√
Lead			√		
Manganese			√		√
Mercury					
Nickel					
Selenium			(√)		
Silver	(√)		(√)		(√)
Zinc			√		√

[a] this reach was not sampled for pore water

(√) = analyte was not detected but was retained as a COPEC because 1/2 the max detection limit exceeded the benchmark

prepared by: SJP (2/26/15)

checked by: EC (2/26/15)

Table 3.19
October 2012 acute surface water toxicity test results for juvenile rainbow trout
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample ID	Diluent	Sample Strength	Survival	Signif.?
Site-specific acute toxicity test results				
A56 ("upstream")	none	100%	100%	NS
A68	none	100%	100%	NS
A72	none	100%	0%	S
A73B	none	100%	100%	NS
A75B	none	100%	100%	NS
Bakers Bridge	none	100%	100%	NS
Serial dilution #1 acute toxicity test results				
M34/CC48	A56	6.25%	100%	NS
M34/CC48	A56	12.5%	100%	NS
M34/CC48	A56	25%	100%	NS
M34/CC48	A56	50%	97.5%	NS
M34/CC48	A56	100%	0%	S
Serial dilution #2 acute toxicity test results				
M34/CC48	A68	6.25%	100%	NS
M34/CC48	A68	12.5%	100%	NS
M34/CC48	A68	25%	100%	NS
M34/CC48	A68	50%	37.5%	S

S = significant; NS = non significant

Statistical significance was tested against the laboratory control water sample

Table 3.20

November 2012 acute surface water toxicity test results for juvenile rainbow trout
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample ID	Diluent	Sample Strength	Survival	Signif.?
Site-specific acute toxicity test results				
A68	none	100%	92.5%	NS
M34	none	100%	0%	S
Serial dilution #1 acute toxicity test results				
A72	A68	5%	92.5%	NS
A72	A68	10%	94.7%	NS
A72	A68	25%	92.2%	NS
A72	A68	50%	100%	NS
A72	A68	75%	100%	NS
A72	A68	100%	2.5%	S
Serial dilution #2 acute toxicity test results				
CC48	A68	1%	85%	NS
CC48	A68	3%	97.5%	NS
CC48	A68	6%	97.5%	NS
CC48	A68	12%	90%	NS
CC48	A68	25%	90%	NS
CC48	A68	50%	0%	S
Serial dilution #3 acute toxicity test results				
M34/CC48	A68	4%	97.5%	NS
M34/CC48	A68	9%	95%	NS
M34/CC48	A68	20%	100%	NS
M34/CC48	A68	40%	92.5%	NS
M34/CC48	A68	65%	0%	S
M34/CC48	A68	85%	0%	S

S = significant; NS = non significant

The statistical significance of the three serial dilution results was tested against the laboratory control water sample, whereas the statistical significance of survival in samples A68 and M34 was determined using a t-test

Table 3.21
April 2013 acute surface water toxicity test results for juvenile rainbow trout
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample ID	Diluent	Sample Strength	Survival	Signif.?
Site-specific acute toxicity test results				
A68	none	100%	67.5%	S
A72	none	100%	0%	S
A73	none	100%	98%	NS
A73B	none	100%	97.5%	NS
A75B	none	100%	100%	NS
M34	none	100%	15%	S
Serial dilution #1 acute toxicity test results				
A72	HRW	12%	100%	NS
A72	HRW	25%	100%	NS
A72	HRW	35%	100%	NS
A72	HRW	50%	100%	NS
A72	HRW	75%	100%	NS
A72	HRW	88%	97.5%	NS
Serial dilution #2 acute toxicity test results				
CC48/M34	A68	25%	100%	NS
CC48/M34	A68	50%	90%	NS
CC48/M34	A68	75%	0%	S
CC48/M34	A68	80%	0%	S
CC48/M34	A68	90%	0%	S
CC48/M34	A68	95%	0%	S
Serial dilution #3 acute toxicity test results				
CC48/M34	HRW	25%	100%	NS
CC48/M34	HRW	50%	100%	NS
CC48/M34	HRW	75%	100%	NS
CC48/M34	HRW	90%	0%	S
CC48/M34	HRW	95%	0%	S

HRW = hard reconstituted water

S = significant; NS = non significant

Statistical significance was tested against the laboratory control water sample

Table 3.22
Summary of the acute surface water toxicity test results for juvenile rainbow trout
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample Location	Oct. 2012	signif.?	Nov. 2012	signif.?	April 2013	signif.?
Animas River						
A56 ("upstream")	100%	NS	nt	--	nt	--
A68	100%	NS	92.5%	NS	67.5%	S
A72	0%	S	2.5%	S	0%	S
A73	nt	--	nt	--	98%	NS
A73B	100%	NS	nt	--	97.5%	NS
A75B	100%	NS	nt	--	100%	NS
Bakers Bridge	100%	NS	nt	--	nt	--
Mineral Creek						
M34	nt	--	0%	S	15%	S
Cement Creek						
CC48	nt	--	0%	S	nt	--

(The top header spans "Sampling Timeframe" over the Oct. 2012 / Nov. 2012 / April 2013 columns.)

value shown is survival

nt = not tested

S = significant; NS = non significant

Table 3.23
Toxicity in the amphipod *H. azteca* exposed to sediment in the laboratory
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample ID	Dec. 2012 test Survival (mean±SE)	Signif?[a]	Nov. 2014 test Survival (mean±SE)	Signif?[a]	Dec. 2012 test Biomass[b] (mean±SE)	Signif?[a]	Nov. 2014 test Biomass[b] (mean±SE)	Signif?[a]
Laboratory control sample								
Lab	97.5±1.6%	--	92.5±3.1%	--	69.8±3.5 µg/org	--	78.1±4.2 µg/org	--
Animas River "upstream"								
A56	62.5±8.2%	Y	43.8±9.2%	Y	20.3±1.9 µg/org	Y	14.3±3.2 µg/org	Y
Animas River above main stem Cement Creek								
A60	not tested	--	77.5±6.5%	N	not tested	--	23.1±1.9 µg/org	Y
A68	56.3±3.2%	Y	70.0±10.0%	N	22.6±1.6 µg/org	Y	23.2±3.3 µg/org	Y
Mainstem Cement Creek								
CC49	0%	Y	not tested	--	no survival	--	not tested	--
Mainstem Mineral Creek								
M34	8.8±3.5%	Y	not tested	--	5.1±2.0 µg/org	Y	not tested	--
Animas River below mainstem Mineral Creek								
A72	36.3±4.2%	Y	70.0±4.6%	N	16.1±1.7 µg/org	Y	27.9±2.4 µg/org	Y
A73	not tested	--	73.8±7.8%	N	not tested	--	21.2±2.4 µg/org	Y
A73B	5.0±1.9%	Y	not tested	--	4.0±1.7 µg/org	Y	not tested	--
A75D	not tested	--	76.3±7.5%	N	not tested	--	24.9±3.2 µg/org	Y
A75B	48.8±5.2%	Y	not tested	--	17.8±1.9 µg/org	Y	not tested	--
Bbridge	76.3±3.8%	Y	86.3±3.8%	N	26.2±1.0 µg/org	Y	30.7±2.2 µg/org	Y

SE = standard error

[a] is the response statistically significant from that observed in the test-specific laboratory control sample?

[b] biomass = total dry weight of surviving organisms on day 10/number of organisms originally introduced on day 0

Table 3.24
Summary of select benthic invertebrate community data from the Animas River, mainstem Cement Creek, and mainstem Mineral Creek (Sep. 2014)
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Sample Location	MMI	total # of taxa	# of EPT taxa	# of intolerant taxa	H'	HBI	EPT Index[a]	Ephemeroptera Abundance[b]	%EPT[c]	Tolerant Organisms[d]	Filterers[d]	Scrapers[d]	Clingers[d]
Animas River above mains stem Cement Creek													
A56 ("upstream")	45.8	18	13	12	2.24	4.28	72.2%	10.8%	37.8%	1.3%	73.0%	8.3%	90.8%
A60	45.5	25	14	16	3.21	3.67	56.0%	11.3%	39.1%	3.4%	44.9%	12.3%	64.8%
A68	36.3	17	10	9	2.83	4.19	58.8%	15.5%	32.6%	2.7%	38.7%	11.9%	48.8%
Animas River below main stem Mineral Creek													
A72	14.8	9	4	3	2.19	1.87	44.4%	3.4%	54.3%	2.6%	38.8%	0.9%	53.4%
A73	30.7	11	7	8	1.61	1.28	63.6%	3.9%	96.1%	0.0%	71.3%	7.8%	92.2%
A75D	54.0	21	9	12	3.27	2.46	42.9%	24.8%	64.4%	15.8%	32.7%	15.8%	61.4%
Bakers Bridge	49.4	17	8	8	2.33	3.94	47.1%	52.9%	77.1%	2.7%	37.7%	1.3%	39.9%
James Ranch	57.2	20	10	3	2.51	4.26	50.0%	45.7%	67.5%	3.0%	41.0%	0.8%	44.6%
main stem Cement Creek													
CC49	0.6	2	0	0	0.72	8.00	0.0%	0.0%	0.0%	20.0%	0.0%	0.0%	0.0%
main stem Mineral Creek													
M34	22.9	12	7	6	2.1	1.66	58.3%	3.9%	86.3%	3.9%	62.7%	3.9%	86.3%
Animas River reference locations													
A73EC[e]	58.2	31	25	25	2.8	1.58	80.6%	18.1%	97.9%	0.3%	1.2%	82.8%	32.3%
A75CC[f]	64.1	25	17	15	3.48	2.57	68.0%	54.9%	84.2%	0.7%	16.4%	29.9%	57.2%

sources: Appendix 20 (for the MMI scores) and Appendix 11 (for all the other metrics) in the 2015 BERA report.

H' = Shannon Weaver Diversity

HBI = Hilsendorf Biotic Index

EPT = Ephemeroptera, Plecoptera, Trichoptera

MMI = multi-metric index

[a] % of total number of taxa

[b] Ephemeroptera abundance = % of total number

[c] % of total number of organisms consisiting of EPT

[d] % of total number of organisms

[e] A73EC is located on Elk Creek (a tributary to the Animas River) before its confluence with the Animas River

[f] A73CC is located on Cascade Creek (a tributary to the Animas River) before its confluence with the Animas River

Table 4.1
Surface water EPCs for community-level receptors in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Max Detect or 1/2 max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs RME	Surface Water EPCs CTE
PRE-RUNOFF PERIOD							
Aluminum (total)	4 / 4	4,575	5,950	6,544	95% Student's-t UCL	5,950	4,575
Cadmium (dissolved)	4 / 4	1.3	2.0	1.852	95% Student's-t UCL	1.9	1.3
Iron (total)	4 / 4	5,868	6,830	7,240	95% Student's-t UCL	6,830	5,868
Silver (dissolved)	2 / 4	0.4	0.6	NA	NA	0.6	0.4
Zinc (dissolved)	4 / 4	358	499	470	95% Student's-t UCL	470	358
RUNOFF PERIOD							
Aluminum (total)	7 / 7	1353	2610	1910	95% Student's-t UCL	1,910	1,353
Cadmium (dissolved)	5 / 7	0.3	0.6	0.403	95% KM (t) UCL	0.4	0.3
Iron (total)	7 / 7	2,664	6,330	4,119	95% Student's-t UCL	4,119	2,664
Silver (dissolved)	0 / 7	0.4	1.3 U	NA	NA	1.3	0.4
Zinc (dissolved)	6 / 7	83.9	146	104.4	95% KM (t) UCL	104	83.9
POST-RUNOFF PERIOD							
Aluminum (total)	13 / 13	2,267	4,590	2,826	95% Student's-t UCL	2,826	2,267
Cadmium (dissolved)	13 / 13	0.61	1.0	0.724	95% Student's-t UCL	0.7	0.6
Iron (total)	13 / 13	3,339	8,290	4,316	95% Student's-t UCL	4,316	3,339
Silver (dissolved)	0 / 13	0.3	1.3 U	NA	NA	1.3	0.3
Zinc (dissolved)	13 / 13	160	317	194	95% Student's-t UCL	194	160

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.2
Surface water EPCs for community-level receptors in mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Max Detect or 1/2 max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs RME	CTE
PRE-RUNOFF PERIOD							
Aluminum (total)	4 / 4	7,318	8,610	9,192	95% Student's-t UCL	8,610	7,318
Beryllium (dissolved)	3 / 4	1.2	1.3	1.311	95% KM (t) UCL	1.3	1.2
Cadmium (dissolved)	4 / 4	5.3	5.5	5.546	95% Student's-t UCL	5.5	5.3
Copper (dissolved)	4 / 4	107	119	122	95% Student's-t UCL	119	107
Iron (total)	4 / 4	17,150	21,700	22,006	95% Student's-t UCL	21,700	17,150
Lead (dissolved)	4 / 4	14.2	15.1	15.1	95% Student's-t UCL	15.1	14.2
Manganese (dissolved)	4 / 4	4,618	5,290	5,867	95% Student's-t UCL	5,290	4,618
Zinc (dissolved)	4 / 4	2,303	2,670	2,878	95% Student's-t UCL	2,670	2,303
RUNOFF PERIOD							
Aluminum (total)	7 / 7	2,389	3,280	2,876	95% Student's-t UCL	2,876	2,389
Beryllium (dissolved)	0 / 7	0.7	1.0 U	NA	NA	1.0	0.7
Cadmium (dissolved)	7 / 7	2.8	3.8	3.3	95% Student's-t UCL	3.3	2.8
Copper (dissolved)	7 / 7	68.6	90.6	78.1	95% Student's-t UCL	78.1	68.6
Iron (total)	7 / 7	8,067	17,200	12,554	95% Student's-t UCL	12,554	8,067
Lead (dissolved)	7 / 7	8.4	13.1	10.4	95% Student's-t UCL	10.4	8.4
Manganese (dissolved)	7 / 7	1,268	1,770	1,620	95% Student's-t UCL	1,620	1,268
Zinc (dissolved)	7 / 7	929.3	1,310	1,144	95% Student's-t UCL	1,144	929
POST-RUNOFF PERIOD							
Aluminum (total)	14 / 14	6,360	7,930	7,110	95% Student's-t UCL	7,110	6,360
Beryllium (dissolved)	6 / 14	1.1	1.2	1.0	95% KM(t) UCL	1.0	1.1
Cadmium (dissolved)	14 / 14	5.6	7.0	6.1	95% Student's-t UCL	6.1	5.6
Copper (dissolved)	14 / 14	130	221	152	95% Student's-t UCL	152	130
Iron (total)	14 / 14	10,801	18,600	12,725	95% Student's-t UCL	12,725	10,801
Lead (dissolved)	14 / 14	15.5	21.4	17.1	95% Student's-t UCL	17.1	15.5
Manganese (dissolved)	14 / 14	4,112	5,300	5,801	95% Chebyshev (Mean, Sd) UCL	5,300	4,112
Zinc (dissolved)	14 / 14	2,190	2,890	3,033	95% Chebyshev (Mean, Sd) UCL	2,890	2,190

µg/L = microgram per liter
CTE = central tendency exposure
COPEC = contaminant of potential ecological concern
EPC = exposure point concentration
NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL
RME = reasonable maximum exposure
95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.3
Surface water EPCs for community-level receptors in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Max Detect or 1/2 max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
PRE-RUNOFF PERIOD							
Aluminum (total)	5 / 5	305	438	401	95% Student's-t UCL	401	305
Cadmium (dissolved)	5 / 5	2.6	4.1	3.6	95% Student's-t UCL	3.6	2.6
Copper (dissolved)	2 / 5	7.2	8.3	8.435	95% KM (t) UCL	8.3	7.2
Iron (total)	5 / 5	259	334	309.3	95% Student's-t UCL	309	259
Lead (dissolved)	0 / 5	0.4	0.5 U	NA	NA	0.5	0.4
Manganese (dissolved)	5 / 5	3,300	3,730	3,676	95% Student's-t UCL	3,676	3,300
Zinc (dissolved)	5 / 5	840	1,030	1,012	95% Student's-t UCL	1,012	840
RUNOFF PERIOD							
Aluminum (total)	17 / 17	480	1,010	566	95% Student's-t UCL	566	480
Cadmium (dissolved)	17 / 17	1.04	1.5	1.15	95% Modified-t UCL	1.1	1.0
Copper (dissolved)	15 / 17	10.0	16.5	11.3	95% KM (t) UCL	11.3	10.0
Iron (total)	16 / 17	469	1,100	556	95% KM(t) UCL	556	469
Lead (dissolved)	13 / 17	1.0	1.5	1.08	95% KM(t) UCL	1.1	1.0
Manganese (dissolved)	17 / 17	514	1,220	633	95% Student's-t UCL	633	514
Zinc (dissolved)	17 / 17	344.2	509	381	95% Modified-t UCL	381	344
POST-RUNOFF PERIOD							
Aluminum (total)	13 / 18	153	217	154	95% KM (t) UCL	154	153
Cadmium (dissolved)	18 / 18	1.1	1.7	1.2	95% Student's-t UCL	1.2	1.1
Copper (dissolved)	7 / 18	3.17	3.5	3.223	95% KM (Percentile Bootstrap) UCL	3.2	3.2
Iron (total)	10 / 18	154	234	149	95% KM (Percentile Bootstrap) UCL	149	154
Lead (dissolved)	7 / 18	0.308	0.4	0.339	95% KM (Percentile Bootstrap) UCL	0.3	0.3
Manganese (dissolved)	18 / 18	1,031	2,380	1,247	95% Student's-t UCL	1,247	1,031
Zinc (dissolved)	18 / 18	327	567	362	95% Student's-t UCL	362	327

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95% UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.4
Surface water EPCs for community-level receptors in the Animas River between mainstem Cement Creek and mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	2 / 2	2,490	2,520	NA	NA	2,520	2,490
Cadmium (dissolved)	2 / 2	2.7	2.7	NA	NA	2.7	2.7
Copper (dissolved)	2 / 2	20.6	24.8	NA	NA	24.8	20.6
Iron (total)	2 / 2	4,995	5,100	NA	NA	5,100	4,995
Manganese (dissolved)	2 / 2	2,565	2,590	NA	NA	2,590	2,565
Zinc (dissolved)	2 / 2	1,160	1,160	NA	NA	1,160	1,160

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.5

Surface water EPCs for community-level receptors at sampling location A71B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	1 / 1	2,780	2,780	NA	NA	2,780	2,780
Cadmium (dissolved)	1 / 1	1.9	1.9	NA	NA	1.9	1.9
Copper (dissolved)	1 / 1	8.7	8.7	NA	NA	8.7	8.7
Iron (total)	1 / 1	4,640	4,640	NA	NA	4,640	4,640
Manganese (dissolved)	1 / 1	1,660	1,660	NA	NA	1,660	1,660
Zinc (dissolved)	1 / 1	743	743	NA	NA	743	743

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.6
Surface water EPCs for community-level receptors at sampling location A72 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Max Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs RME	CTE
PRE-RUNOFF PERIOD							
Aluminum (total)	4 / 4	3,455	4,440	4,739	95% Student's-t UCL	4,440	3,455
Cadmium (dissolved)	4 / 4	2.7	2.9	2.9	95% Student's-t UCL	2.9	2.7
Copper (dissolved)	4 / 4	28.9	35.9	38	95% Student's-t UCL	35.9	28.9
Iron (total)	4 / 4	6,018	7,710	7,967	95% Student's-t UCL	7,710	6,018
Manganese (dissolved)	4 / 4	2,435	2,920	3,028	95% Student's-t UCL	2,920	2,435
Zinc (dissolved)	4 / 4	1,044	1,230	1,232	95% Student's-t UCL	1,230	1,044
RUNOFF PERIOD							
Aluminum (total)	7 / 7	1,359	3,060	2,065	95% Student's-t UCL	2,065	1,359
Cadmium (dissolved)	7 / 7	0.9	1.4	1.0	95% Student's-t UCL	1.0	0.9
Copper (dissolved)	5 / 7	5.2	7.6	6.7	95% KM(t) UCL	6.7	5.2
Iron (total)	7 / 7	2,905	7,200	4,687	95% Student's-t UCL	4,687	2,905
Manganese (dissolved)	7 / 7	427	823	578	95% Student's-t UCL	578	427
Zinc (dissolved)	7 / 7	273	453	352	95% Student's-t UCL	352	273
POST-RUNOFF PERIOD							
Aluminum (total)	13 / 13	1,777	2,750	2,129	95% Student's-t UCL	2,129	1,777
Cadmium (dissolved)	13 / 13	1.6	2.8	1.9	95% Student's-t UCL	1.9	1.6
Copper (dissolved)	8 / 13	14.2	36.9	17.3	95% KM(t) UCL	17.3	14.2
Iron (total)	13 / 13	2,701	5,490	3,409	95% Student's-t UCL	3,409	2,701
Manganese (dissolved)	13 / 13	1,242	2,490	1,514	95% Student's-t UCL	1,514	1,242
Zinc (dissolved)	13 / 13	579	1,120	696	95% Student's-t UCL	696	579

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.7
Surface water EPCs for community-level receptors at sampling location A73 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	5 / 5	1,461	2,420	2,030	95% Student's-t UCL	2,030	1,461
Cadmium (dissolved)	5 / 5	1.3	1.8	1.704	95% Student's-t UCL	1.7	1.3
Copper (dissolved)	5 / 5	3.7	5.0	5.082	95% Student's-t UCL	5.0	3.7
Iron (total)	5 / 5	2,986	4,210	4,163	95% Student's-t UCL	4,163	2,986
Manganese (dissolved)	5 / 5	1,009	1,830	1,592	95% Student's-t UCL	1,592	1,009
Zinc	5 / 5	463	701	666	95% Student's-t UCL	666	463

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.8
Surface water EPCs for community-level receptors at sampling location A73B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	4 / 4	975	1,980	1,764	95% Students (t) UCL	1,764	975
Cadmium (dissolved)	4 / 4	0.7	1.4	1.271	95% Students (t) UCL	1.3	0.7
Copper (dissolved)	4 / 4	2.6	3.8	3.844	95% Students (t) UCL	3.8	2.6
Iron (total)	4 / 4	1,570	2,790	2,649	95% Students (t) UCL	2,649	1,570
Manganese (dissolved)	4 / 4	508	1,210	1,079	95% Students (t) UCL	1,079	508
Zinc (dissolved)	4 / 4	250	561	500.1	95% Students (t) UCL	500	250

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.9

Surface water EPCs for community-level receptors at sampling location A75D in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	5 / 5	1,255	1,790	1,728	95% Student's-t UCL	1,728	1,255
Cadmium (dissolved)	5 / 5	0.8	1.1	1.036	95% Student's-t UCL	1.0	0.8
Copper (dissolved)	5 / 5	2.5	4.2	3.887	95% Student's-t UCL	3.9	2.5
Iron (total)	5 / 5	2,556	4,610	3,922	95% Student's-t UCL	3,922	2,556
Manganese (dissolved)	5 / 5	590	1,090	935.1	95% Student's-t UCL	935	590
Zinc	5 / 5	261	427	384.2	95% Student's-t UCL	384	261

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

prepared by: SJP (2/2/14)

reviewed by: RI (2/10/14)

updated by: EC (2/24/15)

reviewed by: BB (2/26/15)

Table 4.10

Surface water EPCs for community-level receptors at sampling location A75B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (total)	4 / 4	1,021	1,650	1,565	95% Student's-t UCL	1,565	1,021
Cadmium (dissolved)	4 / 4	0.7	1.1	1.031	95% Student's-t UCL	1.0	0.7
Copper (dissolved)	4 / 4	2.6	4.1	4.476	95% Student's-t UCL	4.1	2.6
Iron (total)	4 / 4	2,224	4,810	4,454	95% Student's-t UCL	4,454	2,224
Manganese (dissolved)	4 / 4	462	856	781.7	95% Student's-t UCL	782	462
Zinc	4 / 4	235	442	401.5	95% Student's-t UCL	402	235

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.11

Surface water EPCs for community-level receptors at sampling location Bakers Bridge in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs RME	CTE
Aluminum (total)	5 / 5	704	1,310	1103	95% Student's-t UCL	1,103	704
Cadmium (dissolved)	5 / 5	0.5	0.7	0.613	95% Student's-t UCL	0.6	0.5
Copper (dissolved)	4 / 5	2.9	3.7	3.701	95% KM (t) UCL	3.7	2.9
Iron (total)	4 / 5	1,717	3,560	2,742	95% KM (t) UCL	2,742	1,717
Manganese (dissolved)	5 / 5	356	584	542.5	95% Student's-t UCL	543	356
Zinc	5 / 5	136	241	203.9	95% Student's-t UCL	204	136

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.12
Sediment EPCs for mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	CTE
Metals (mg/kg)								
Arsenic	2 / 2	26.9	32.7 D	--	NA	NA	32.7	26.9
Copper	2 / 2	90.4	127 D	--	NA	NA	127	90.4
Lead	2 / 2	183	237 D	--	NA	NA	237	183
Manganese	2 / 2	1,295	1,430 D	--	NA	NA	1,430	1,295
Selenium	1 / 2	1.7	1.7 D	--	NA	NA	1.7	1.7
Zinc	2 / 2	468	666 D	--	NA	NA	666	468

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

NC = not calculated because of small sample size.

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

prepared by: SJP (2/2/14)

reviewed by: RI (2/10/14)

updated by: EC (2/24/15)

reviewed by: BB (2/26/15)

Table 4.13
Sediment EPCs for mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	Sediment EPCs CTE
Metals (mg/kg)								
Arsenic	1 / 1	40.6	40.6 D	--	NA	NA	40.6	40.6
Copper	1 / 1	55.6	55.6 D	--	NA	NA	55.6	55.6
Lead	1 / 1	282	282 D		NA	NA	282	282
Silver	1 / 1	2.0	2.0 D	--	NA	NA	2.0	2.0
Zinc	1 / 1	195	195 D	--	NA	NA	195	195

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

NC = not calculated because of small sample size.

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

Table 4.14
Sediment EPCs for the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC?		Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs	
	benthos	wildlife							RME	CTE
Metals (mg/kg)										
Arsenic[a]	yes	yes	20 / 20	27.4	89.5 D	--	34.24	95% Modified-tUCL	34.2	27.4
Cadmium[a]	yes	yes	20 / 20	11.1	24.2 D	--	12.91	95% Student's-t UCL	12.9	11.1
Chromium[a]	no	yes	20 / 20	4.7	6.4 D	--	4.971	95% Student's-t UCL	5.0	4.7
Copper[a]	yes	yes	20 / 20	339	745 D	--	399.3	95% Adjusted Gamma UCL	399	339
Lead[a]	yes	yes	20 / 20	1,508	3,030 D	--	1,733	95% Student's-t UCL	1,733	1,508
Manganese	yes	no	20 / 20	10,617	22,300 D	--	12,566	95% Student's-t UCL	12,566	10,617
Mercury[a]	yes	yes	14 / 14	0.07	0.19 D	--	0.0914	95% Student's-t UCL	0.1	0.07
Nickel[a]	no	yes	20 / 20	8.2	16.5 D	--	9.2	95% Modified-t UCL	9.2	8.2
Selenium[a]	yes	yes	4 / 20	1.54	2.9 D	--	0.998	95%KM (t) UCL	0.998	1.5
Silver[a]	yes	yes	20 / 20	5.5	13.3 D	--	6.43	95% Student's-t UCL	6.4	5.5
Zinc[a]	yes	yes	20 / 20	3,172	11,500 D	--	4,054	95% Modified-t UCL	4,054	3,172

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

NC = not calculated because of small sample size.

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.15
Sediment EPCs at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC? benthos	COPEC? wildlife	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	Sediment EPCs CTE
Metals (mg/kg)										
Aluminum	yes	no	5 / 5	14,872	21,500 D	--	19,659	95% Student's-t UCL	19,659	14,872
Arsenic[a]	yes	yes	5 / 5	33.4	40.6 D	--	39.58	95% Student's-t UCL	39.6	33.4
Cadmium[a]	yes	yes	5 / 5	2.1	3.03 D	--	2.852	95% Student's-t UCL	2.9	2.1
Chromium[a]	no	yes	5 / 5	4.6	6.41 BD	--	6.087	95% Student's-t UCL	6.1	4.6
Copper[a]	yes	yes	5 / 5	137	179 D	--	172.9	95% Student's-t UCL	173	137
Lead[a]	yes	yes	5 / 5	478	581 D	--	581.8	95% Student's-t UCL	581	478
Manganese	yes	no	5 / 5	2,100	3,400 D	--	2979	95% Student's-t UCL	2,979	2,100
Mercury[a]	no	yes	4 / 4	0.055	0.072 D	--	0.072	95% Student's-t UCL	0.07	0.06
Nickel[a]	yes	yes	5 / 5	5.1	6.4 D	--	5.884	95% Student's-t UCL	5.9	5.1
Selenium[a]	yes	yes	4 / 5	1.5	2.0 D	--	1.881	95% KM (t) UCL	1.9	1.5
Silver[a]	yes	yes	5 / 5	1.9	2.8 D	--	2.425	95% Student's-t UCL	2.4	1.9
Zinc[a]	yes	yes	5 / 5	650.8	858 D	--	818.5	95% Student's-t UCL	819	651

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram
COPEC = chemicals of potential ecological concern
CTE = central tendency exposure
D = sample was diluted before analysis
EPC = exposure point concentration
NA = not applicable
RME = reasonable maximum exposure
The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.16
Sediment EPCs at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analytes	COPEC? benthos	COPEC? wildlife	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	Sediment EPCs CTE
Metals (mg/kg)										
Aluminum	yes	no	4 / 4	17,123	40,700 D	--	35,775	95% Student's-t UCL	35,775	17,123
Arsenic[a]	yes	yes	4 / 4	27.9	33.8 D	--	35.09	95% Student's-t UCL	33.8	27.9
Cadmium[a]	yes	yes	4 / 4	4.0	5.6 D	--	5.433	95% Student's-t UCL	5.4	4.0
Chromium[a]	no	yes	4 / 4	4.0	5.6 BD	--	5.376	95% Student's-t UCL	5.4	4.0
Copper[a]	yes	yes	4 / 4	199	284 D	--	284.2	95% Student's-t UCL	284	199
Lead[a]	yes	yes	4 / 4	513	729 D	--	733.6	95% Student's-t UCL	729	513
Manganese	yes	no	4 / 4	4,340	7,120 D	--	6,618	95% Student's-t UCL	6,618	4,340
Mercury[a]	no	yes	3 / 3	0.04	0.05 D	--	0.0606	95% Student's-t UCL	0.05	0.04
Nickel[a]	yes	yes	4 / 4	6.4	7.2 D	--	7.295	95% Student's-t UCL	7.2	6.4
Selenium[a]	yes	yes	2 / 4	1.1	1.4 D	--	1.409	95% KM (t) UCL	1.4	1.1
Silver[a]	yes	yes	4 / 4	1.9	2.8 D	--	2.805	95% Student's-t UCL	2.8	1.9
Zinc[a]	yes	yes	4 / 4	1049	1,450 D	--	1,393	95% Student's-t UCL	1,393	1,049

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.17
Sediment EPCs at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC?		Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs	
	benthos	wildlife							RME	CTE
Metals (mg/kg)										
Aluminum	yes	no	3 / 3	16,373	31,900 D	--	39,289	95% Student's-t UCL	31,900	16,373
Arsenic[a]	yes	yes	3 / 3	29.9	39.4 D	--	46.35	95% Student's-t UCL	39.4	29.9
Cadmium[a]	yes	yes	3 / 3	3.5	4.2 D	--	4.79	95% Student's-t UCL	4.2	3.5
Chromium[a]	no	yes	3 / 3	4.5	5.02 D	--	5.659	95% Student's-t UCL	5.0	4.5
Copper[a]	yes	yes	3 / 3	177	292 D	--	348.5	95% Student's-t UCL	292	177
Lead[a]	yes	yes	3 / 3	534	593 BD	--	639.4	95% Student's-t UCL	593	534
Manganese	yes	no	3 / 3	3,143	4,340 D	--	4,894	95% Student's-t UCL	4,340	3,143
Mercury[a]	no	yes	2 / 2	0.07	0.09 D	--	NA	NA	0.09	0.07
Nickel[a]	yes	yes	3 / 3	10.0	12.1 D	--	13.35	95% Student's-t UCL	12.1	10.0
Selenium[a]	yes	yes	1 / 3	2.9	2.9 D	--	NA	NA	2.9	2.9
Silver[a]	yes	yes	3 / 3	2.0	3.1 D	--	3.628	95% Student's-t UCL	3.1	2.0
Zinc[a]	yes	yes	3 / 3	1,114	1,720 D	--	2,035	95% Student's-t UCL	1,720	1,114

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram
COPEC = chemicals of potential ecological concern
CTE = central tendency exposure
D = sample was diluted before analysis
EPC = exposure point concentration
NA = not applicable
RME = reasonable maximum exposure
The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.18
Sediment EPCs at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC?		Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs	
	benthos	wildlife							RME	CTE
Metals (mg/kg)										
Aluminum	yes	no	4 / 4	15,428	29,900 D	--	27,525	95% Student's-t UCL	27,525	15,428
Arsenic[a]	yes	yes	4 / 4	19.4	28.5 D	--	26.98	95% Student's-t UCL	27.0	19.4
Cadmium[a]	yes	yes	4 / 4	4.8	6.75 D	--	6.443	95% Student's-t UCL	6.4	4.8
Chromium[a]	no	yes	4 / 4	4.2	4.99 BD	--	4.924	95% Student's-t UCL	4.9	4.2
Copper[a]	yes	yes	4 / 4	147	223 D	--	211.9	95% Student's-t UCL	212	147
Lead[a]	yes	yes	4 / 4	300	367 BD	--	374.8	95% Student's-t UCL	367	300
Manganese	yes	no	4 / 4	4,348	6,900 D	--	6,390	95% Student's-t UCL	6,390	4,348
Mercury[a]	no	yes	2 / 3	0.04	0.04 D	--	NA	NA	0.04	0.04
Nickel[a]	yes	yes	4 / 4	9.4	13.1 D	--	12.44	95% Student's-t UCL	12.4	9.4
Selenium[a]	yes	yes	2 / 4	1.2	1.4 D	--	1.505	95% KM (t) UCL	1.4	1.2
Silver[a]	yes	yes	4 / 4	1.1	1.4 D	--	1.427	95% Student's-t UCL	1.4	1.1
Zinc[a]	yes	yes	4 / 4	1,738	2,910 D	--	2,778	95% Student's-t UCL	2,778	1,738

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

B = analyte was also detected in the blank

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.19
Sediment EPCs at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC? benthos	COPEC? wildlife	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	Sediment EPCs CTE
Metals (mg/kg)										
Aluminum	yes	no	3 / 3	20,820	48,600 D	--	61,382	95% Student's-t UCL	48,600	20,820
Arsenic[a]	yes	yes	3 / 3	19.9	37.2 D	--	45.39	95% Student's-t UCL	37.2	19.9
Cadmium[a]	yes	yes	3 / 3	5.0	10.5 D	--	13.03	95% Student's-t UCL	10.5	5.0
Chromium[a]	no	yes	3 / 3	5.2	5.45 BD	--	5.584	95% Student's-t UCL	5.5	5.2
Copper[a]	yes	yes	3 / 3	188	413 D	--	517	95% Student's-t UCL	413	188
Lead[a]	yes	yes	3 / 3	296	435 D	--	592.2	95% Student's-t UCL	435	296
Manganese	yes	no	3 / 3	2,743	3,820 D	--	4,332	95% Student's-t UCL	3,820	2,743
Mercury[a]	no	yes	2 / 2	0.07	0.07 D	--	NA	NA	0.07	0.07
Nickel[a]	yes	yes	3 / 3	9.7	16.5 D	--	19.64	95% Student's-t UCL	16.5	9.7
Selenium[a]	yes	yes	2 / 3	1.9	3.3 D	--	7.901	97.5% KM (Chebyshev) UCL	3.3	1.9
Silver[a]	yes	yes	3 / 3	1.4	2.2 D	--	2.816	95% Student's-t UCL	2.2	1.4
Zinc[a]	yes	yes	3 / 3	2,190	5,320 D	--	6,760	95% Student's-t UCL	5,320	2,190

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram
COPEC = chemicals of potential ecological concern
CTE = central tendency exposure
B = analyte was also detected in the blank
D = sample was diluted before analysis
EPC = exposure point concentration
NA = not applicable
RME = reasonable maximum exposure
95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

prepared by: SJP (1/31/14)

reviewed by: RI (2/10/14)

updated by: EC (2/20/15)

reviewed by: BB(2/25/15)

Table 4.20
Sediment EPCs at sampling location Bakers Bridge on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	COPEC? benthos	COPEC? wildlife	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	1/2 Maximum non-detect	95% UCL of mean	UCL Calculation Method	Sediment EPCs RME	Sediment EPCs CTE
Metals (mg/kg)										
Aluminum	yes	no	4 / 4	20,025	37,400 D	--	37,463	95% Student's-t UCL	37,400	20,025
Arsenic[a]	yes	yes	4 / 4	21.9	29.7 D	--	30.11	95% Student's-t UCL	29.7	21.9
Cadmium[a]	yes	yes	4 / 4	10.1	18.6 D	--	19.21	95% Student's-t UCL	18.6	10.1
Chromium[a]	no	yes	4 / 4	5.4	7.38 BD	--	7.017	95% Student's-t UCL	7.0	5.4
Copper[a]	yes	yes	4 / 4	191	357 D	--	331.9	95% Student's-t UCL	332	191
Lead[a]	yes	yes	4 / 4	300	378 D	--	376.1	95% Student's-t UCL	376	300
Manganese	yes	no	4 / 4	7,425	13,100 D	--	13,563	95% Student's-t UCL	13,100	7,425
Mercury[a]	no	yes	3 / 3	0.04	0.06 D	--	0.07	95% Student's-t UCL	0.06	0.04
Nickel[a]	yes	yes	4 / 4	18.3	31.6 D	--	30.95	95% Student's-t UCL	31.0	18.3
Selenium[a]	yes	yes	2 / 4	2.1	3.1 D	--	3.088	95% Student's-t UCL	3.1	2.1
Silver[a]	yes	yes	4 / 4	1.3	1.7 D	--	1.654	95% Student's-t UCL	1.7	1.3
Zinc[a]	yes	yes	4 / 4	4,620	8,670 D	--	8,544	95% Student's-t UCL	8,544	4,620

[a] This analyte is an "important bioaccumulative compound" (Table 4-2 in EPA-823-R-00-001) and is retained for use in food chain modeling

mg/kg = milligram per kilogram

COPEC = chemicals of potential ecological concern

CTE = central tendency exposure

B = analyte was also detected in the blank

D = sample was diluted before analysis

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.21
Pore water EPCs for community-level receptors for mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)		95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
							RME	CTE
Beryllium (dissolved)	0 / 1	1.0	1.0	U	NA	NA	1.0	1.0
Silver (dissolved)	0 / 1	0.25	0.25	U	NA	NA	0.25	0.25

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.22
Pore water EPCs for community-level receptors in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (μg/L)	Frequency of Detection	Arithmetic Mean*	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolved)	8 / 11	1,259	6,170 D	4,514	95% Adjusted Gamma KM-UCL	4,514	1,259
Beryllium (dissolved)	0 / 11	2.2	10 U	NA	NA	10	2.2
Cadmium (dissolved)	11 / 11	23.6	106.5 D	93.35	95% Adjusted Gamma-UCL	93	24
Copper (dissolved)	11 / 11	224	2,250 D	2,242	95% Chebyshev (Mean, Sd) UCL	2,242	224
Lead (dissolved)	6 / 11	13.7	65.6 D	19.22	95% KM (Percentile Bootstrap) UCL	19	14
Manganese (dissolved)	10 / 11	17,912	78,300 D	115,211	95% GROS Adjusted Gamma-UCL	78,300	17,912
Selenium (dissolved)	0 / 11	1.6	5.0 U	NA	NA	5.0	1.6
Silver (dissolved)	0 / 11	0.8	2.5 U	NA	NA	2.5	0.8
Zinc (dissolved)	11 / 11	5,735	29,900 D	19,367	95% Adjusted Gamma-UCL	19,367	5,735

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

μg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95% UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.23
Pore water EPCs for community-level receptors at sampling location A72 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolved)	2 / 2	282	517	NA	NA	517	282
Beryllium (dissolved)	0 / 2	1.0	1.0 U	NA	NA	1.0	1.0
Cadmium (dissolved)	2 / 2	2.19	2.98	NA	NA	3.0	2.2
Iron (dissolved)	1 / 2	338	338	NA	NA	338	338
Manganese (dissolved)	2 / 2	722	995	NA	NA	995	722
Silver (dissolved)	0 / 2	0.25	0.25 U	NA	NA	0.25	0.25
Zinc (dissolved)	2 / 2	1,019	1,630	NA	NA	1,630	1,019

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.24
Pore water EPCs for community-level receptors at sampling location A73 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolvedl)	2 / 2	26	29 J	NA	NA	29	26
Beryllium(dissolved)	0 / 2	1.0	1.0 U	NA	NA	1.0	1.0
Cadmium (dissolved)	2 / 2	1.2	2.03	NA	NA	2.03	1.2
Iron (dissolved)	1 / 2	341	341	NA	NA	341	341
Manganese (dissolved)	2 / 2	936	1,870	NA	NA	1,870	936
Silver (dissolved)	0 / 2	0.25	0.25 U	NA	NA	0.25	0.25
Zinc (dissolved)	2 / 2	536	709	NA	NA	709	536

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

Table 4.25
Pore water EPCs for community-level receptors at sampling location A73B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolved)	0 / 1	10	10 U	NA	NA	10	10
Beryllium (dissolved)	0 / 1	1.0	1.0 U	NA	NA	1.0	1.0
Cadmium (dissolved)	0 / 1	0.05	0.05 U	NA	NA	0.05	0.05
Iron (dissolved)	0 / 1	50	50 U	NA	NA	50	50
Manganese (dissolved)	1 / 1	3.37	3.37 J	NA	NA	3.37	3.37
Silver (dissolved)	0 / 1	0.25	0.25 U	NA	NA	0.25	0.25
Zinc (dissolved)	1 / 1	32.9	32.9	NA	NA	33	33

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95% UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

prepared by: EC (3/6/15)
reviewed by: BB (3/9/15)

Table 4.26
Pore water EPCs for community-level receptors at sampling location A75D in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolved)	2 / 2	34	40 J	NA	NA	40	34
Beryllium (dissolved)	0 / 2	1.0	1.0 U	NA	NA	1.0	1.0
Cadmium (dissolved)	2 / 2	0.59	0.79	NA	NA	0.79	0.59
Iron (dissolved)	1 / 2	107	107 J	NA	NA	107	107
Manganese (dissolved)	2 / 2	238	290	NA	NA	290	238
Silver (dissolved)	0 / 2	0.25	0.25 U	NA	NA	0.25	0.25
Zinc (dissolved)	2 / 2	182	190	NA	NA	190	182

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95% UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

prepared by: EC (3/6/15)
reviewed by: BB (3/9/15)

Table 4.27

Pore water EPCs for community-level receptors at Bakers Bridge in the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas River Mining District

COPECs (µg/L)	Frequency of Detection	Arithmetic Mean	Maximum Detect or 1/2 Max DL (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Aluminum (dissolvedl)	2 / 2	41	47 J	NA	NA	47	41
Beryllium(dissolved)	0 / 2	1.0	1.0 U	NA	NA	1.0	1.0
Cadmium (dissolved)	1 / 2	0.33	0.33	NA	NA	0.33	0.33
Iron (dissolved)	1 / 2	1,260	1,260	NA	NA	1,260	1,260
Manganese (dissolved)	2 / 2	3,098	5,870	NA	NA	5,870	3,098
Silver (dissolved)	0 / 2	0.25	0.25 U	NA	NA	0.25	0.25
Zinc (dissolved)	2 / 2	64	115	NA	NA	115	64

* when a COPEC is not detected in at least 1 sample the arthmetic mean is calculated using 1/2 the DL values.

µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable because either the the dataset is too small and/or it contains too many non-detect values to calculate a 95%UCL

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

prepared by: EC (3/6/15)
reviewed by: BB (3/9/15)

Table 4.28
Surface water EPCs for wildlife receptors foraging on the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (µg/L)							
Cadmium	40 / 40	1.4	4.0	1.557	95% Modified-t UCL	1.6	1.4
Copper	32 / 40	15.5	33.5	16.2	95% KM (BCA) UCL	16.2	15.5
Lead	40 / 40	11.6	52.3	21.93	95% Chebyshev (Mean, SD) UCL	21.9	11.6
Zinc	40 / 40	432	1180	487.8	95% Modified-t UCL	488	432

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.29

Surface water EPCs for wildlife receptors foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs RME	CTE
Total Metals (µg/L)							
Arsenic	1 / 24	5.0	5.0	NA	NA	5.0	5.0
Cadmium	24 / 24	1.6	2.9	1.9	95% Student's-t UCL	1.9	1.6
Copper	23 / 24	27.4	46.7	30.66	95% KM (t) UCL	30.7	27.4
Lead	24 / 24	12.8	99.8	30.46	95% Chebyshev (MEAN, Sd) UCL	30.5	12.8
Nickel	9 / 24	5.0	7.0	3.713	95% KM (Percentile Bootstrap) UCL	3.7	5.0
Zinc	24 / 24	600	1320	711.4	95% Student's-t UCL	711	600

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.30
Surface water EPCs for wildlife receptors foraging at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (µg/L)							
Cadmium	5 / 5	1.5	2.2	2.1	95% Student's-t UCL	2.1	1.5
Copper	5 / 5	17.8	22.8	23.46	95% Student's-t UCL	22.8	17.8
Lead	5 / 5	11.1	33.7	23.41	95% Student's-t UCL	23.4	11.1
Nickel	1 / 5	3.8	3.8	NA	NA	3.8	3.8
Zinc	5 / 5	521	768	703.8	95% Student's-t UCL	704	521

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

prepared by: SJP (1/29/14)
reviewed by: RI (2/10/14)
updated by: EC (2/20/15)
reviewed by: BB(2/25/15)

Table 4.31
Surface water EPCs for wildlife receptors foraging at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (µg/L)							
Cadmium	2 / 4	1.0	1.5	NA	NA	1.5	1.0
Chromium	1 / 4	5.8	5.8	NA	NA	5.8	5.8
Copper	4 / 4	9.4	13.1	14.1	95% Student's-t UCL	13.1	9.4
Lead	4 / 4	5.5	11.7	10.6	95% Student's-t UCL	10.6	5.5
Nickel	1 / 4	2.9	2.9	NA	NA	2.9	2.9
Zinc	4 / 4	265	557	498	95% Student's-t UCL	498	265

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

Table 4.32
Surface water EPCs for wildlife receptors foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (μg/L)							
Cadmium	5 / 5	1.0	1.4	1.4	95% Student's-t UCL	1.4	1.0
Copper	5 / 5	13.8	20.6	19.7	95% Student's-t UCL	19.7	13.8
Lead	5 / 5	11.2	32.6	23.1	95% Student's-t UCL	23.1	11.2
Zinc	5 / 5	361	545	503.2	95% Student's-t UCL	503	361

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling μg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

prepared by: SJP (1/29/14)

reviewed by: RI (2/10/14)

updated by: EC (2/20/15)

reviewed by: BB(2/25/15)

Table 4.33

Surface water EPCs for wildlife receptors foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (µg/L)							
Cadmium	4 / 4	0.9	1.1	1.2	95% Student's-t UCL	1.1	0.9
Copper	4 / 4	12.2	21.5	22.6	95% Student's-t UCL	21.5	12.2
Lead	4 / 4	12.1	34.5	30.3	95% Student's-t UCL	30.3	12.1
Zinc	4 / 4	302	445	428.9	95% Student's-t UCL	429	302

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

prepared by: SJP (1/29/14)

reviewed by: RI (2/10/14)

updated by: EC (2/20/15)

reviewed by: BB(2/25/15)

Table 4.34

Surface water EPCs for wildlife foraging at sampling location Bakers Bridge on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs[a]	Frequency of Detection	Arithmetic Mean	Maximum Detect (qualifier)	95% UCL of mean	UCL Calculation Method	Surface Water EPCs	
						RME	CTE
Total Metals (µg/L)							
Cadmium	4 / 5	0.7	0.8	0.8	95% KM (t) UCL	0.8	0.7
Copper	4 / 5	9.5	16.3	13.8	95% KM (t) UCL	13.8	9.5
Lead	5 / 5	7.8	26.0	17.7	95% Student's-t UCL	17.7	7.8
Zinc	5 / 5	216	273	272.4	95% Student's-t UCL	272	216

[a] Only those analytes identified as "important bioaccumulative compounds" (Table 4-2 in EPA-823-R-00-001) and detected in at least one surface water sample are retained for food chain modeling µg/L = microgram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

NA = not applicable

RME = reasonable maximum exposure

95% UCL - 95% Upper Confidence Limit of the mean concentration

The RME value is the lesser of the maximum detected value and the 95% UCL value.

prepared by: SJP (1/29/14)

reviewed by: RI (2/10/14)

updated by: EC (2/20/15)

reviewed by: BB(2/25/15)

Table 4.35
EDD formulas for the targeted wildlife receptors
Baseline Ecological Risk Assessment
Upper Animas Mining District

Avian insectivore - American dipper						
estimated daily dose (EDD_x)	=	**aquatic insect exposure** $FIR*FC_{inverts}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$	+	**sediment exposure** $SIR*SC_x*AUF$
mg/kg BW-day		mg/kg BW-day		L/kg BW-day		mg/kg BW-day
Avian omnivore - mallard[#]						
estimated daily dose (EDD_x)	=	**invertebrate and plant exposure[#]** $FIR[(FC_{invert}*PDF)+(FC_{plant}*PDF)]*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$	+	**sediment exposure** $SIR*SC_x*AUF$
mg/kg BW-day		mg/kg BW-day		L/kg BW-day		mg/kg BW-day
Avian piscivore - belted kingfisher						
estimated daily dose (EDD_x)	=	**fish exposure** $FIR*FC_{fish}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$		**sediment exposure** $SIR*SC_x*AUF$
mg/kg BW-day		mg/kg BW-day		L/kg BW-day		mg/kg BW-day
Mammalian herbivore - muskrat						
estimated daily dose (EDD_x)	=	**aquatic plant exposure** $FIR*FC_{plant}*PDF*AUF$	+	**surface water exposure** $WIR*WC_x*AUF$	+	**sediment exposure** $SIR*SC_x*AUF$
mg/kg BW-day		mg/kg BW-day		L/kg BW-day		mg/kg BW-day

[#] The mallard is modeled for two diets: 100% benthic invertebrates to represent feeding by females during the egg-laying season, and an equal diet of benthic invertebrates (50%) and aquatic plants (50%) for the rest of the year.

$$FC_{xi} = SC_x*AF_x$$

Where:
EDD_x = estimated daily dose of COPEC "x" (mg COPEC/kg BW-day)
FIR = food ingestion rate (kg dw/kg BW-day)
FC_{xi} = concentration of COPEC "x" in food item "i" (mg/kg dw)
PDF = proportion of diet composed of food type "i" (unitless)
WIR = water ingestion rate (L/day)
WC_x = concentration of COPEC "x" in surface water (mg/L)
SIR = sediment ingestion rate (kg dw/day)
SC_x = concentration of COPEC"x" in sediment (mg/kg [calculated as a receptor-specific fraction of the FIR])
BW = body weight (kg)
AUF = area use factor (unitless; assumed 1.0)

Table 4.36
Exposure parameters for the four wildlife receptors used in food chain modeling
Baseline Ecological Risk Assessment
Upper Animas Mining District

wildlife species	body weight (kg)	food (kg/kg BW-day, dw)	water (L/kg BW-day)	sediment (kg/kg BW-day, dw)	aquatic invert.	fish	aquatic plants	home range
Aquatic Insectivorous Birds								
American dipper (*Cinclus mexicanus*)	0.0565[g]	0.2173[a]	0.152[e]	0.02173[n]	100[j]	--	--	759 m (along a water course)
Aquatic Herbivorous Mammals								
muskrat (*Ondatra zibethicus*)	1.17[h]	0.0839[b]	0.0975[f]	0.00839[n]	--	--	100[j]	0.13 hectares
Piscivorous Birds								
belted kingfisher (*Ceryle alcyon*)	0.147[i]	0.0869[c]	0.111[e]	0.00174 [o]	--	100[j]	--	2.25 km
Omnivorous Birds								
mallard (*Anas platyrhynchos*)	1.162[i]	0.0519[d]	0.056[e]	0.00104[m]	100[k] / 50[l]	-- / --	-- / 50[l]	111 hectares

[a] Calculated using IR_{food} (g dw/day) = $0.398*BW(g)^{0.850}$, adjusted to 1.0 kg of receptor (see eq. 3-4 [passerines] on p. 3-4 in EPA, 1993)

[b] Calculated using IR_{food} (g dw/day) = $0.577*BW(g)^{0.727}$, adjusted to 1.0 kg of receptor (see eq. 3-9 [herbivores] on p. 3-6 in EPA, 1993)

[c] Calculated using IR_{food} (g dw/day) = $0.301*BW(g)^{0.751}$, adjusted to 1.0 kg of receptor (see eq. 3-5 [non-passerines] on p. 3-5 in EPA, 1993)

[d] Calculated using IR_{food} (g dw/day) = $0.301*BW(g)^{0.751}$, adjusted to 1.0 kg of receptor (see eq. 3-5 [non-passerines] on p. 3-5 in EPA, 1993)

[e] Calculated using IR_{water} (L/day) = $0.059*BW(kg)^{0.67}$, adjusted to 1.0 kg of receptor (see eq. 3-15 [all birds] on p. 3-8 in EPA, 1993)

[f] Calculated using IR_{water} (L/day) = $0.099*BW(kg)^{0.90}$, adjusted to 1.0 kg of receptor (see eq. 3-17 [all mammals] on p. 3-10 in EPA, 1993)

[g] Ealey, D., 1977

[h] Silva and Downing, 1995

[i] EPA, 1993

[j] Conservative assumption

[k] the100% aquatic invertebrate diet is for females foraging prior to egg production in the spring

[l] the 50% aquatic invertebrates + 50% aquatic plants represents an average mallard diet for the rest of the year.

[m] Table 4-4 in EPA, 1993 (value represents 2% of food intake on a dry-weight basis)

[n] best professional judgment (value represents 10% of food intake on a dry-weight basis)

[o] best professional judgment (value represents 2% of food intake on a dry-weight basis)

BW - Body weight
dw - dry weight

created by: SJP (1/9/14)
reviewed by:

Table 4.37
Soil-to-plant regression models and uptake factors for use in food chain modeling
Baseline Ecological Risk Assessment
Upper Animas River Mining District

| Analyte | soil-to-plant regression models (dry weight)[a] | | soil-to-plant uptake factors (dry weight)[a] | | |
	model	reference	value	basis	reference
arsenic	$C_p = e^{(-1.992 + 0.564(\ln Cs))}$	Bechtel Jacobs, 1998 (Table 7)	regression model available		
cadmium	$C_p = e^{(-0.476 + 0.546(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		
chromium	--		0.041	median	USEPA, 2007 (Table 4a)
copper	$C_p = e^{(0.669 + 0.394(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		
lead	$C_p = e^{(-1.328 + 0.561(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		
mercury	$C_p = e^{(-0.996 + 0.544(\ln Cs))}$	Bechtel Jacobs, 1998 (Table 7)	regression model available		
nickel	$C_p = e^{(-2.224 + 0.748(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		
selenium	$C_p = e^{(-0.678 + 1.104(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		
silver	--		0.014	median	USEPA, 2007 (Table 4a)
zinc	$C_p = e^{(1.575 + 0.555(\ln Cs))}$	USEPA, 2007 (Table 4a)	regression model available		

[a] Tissue residue levels in the above-ground vegetative portion of rooted aquatic plants were estimated using the methods developed for terrestrial plants, except that sediment exposure point concentrations were used in the calculations

[b] C_p = concentration of an analyte in the plant; C_s = concentration of an analyte in the sediment

References:

Bechtel Jacobs. 1998. Empirical models for the uptake of inorganic chemicals from soil by plants. Prepared for the U.S. Department of Energy. BJC/OR-133. September 1998.

U.S. Environmental Protection Agency (USEPA). 2007j. Guidance for developing ecological soil screening levels. Attachment 4-1. OSWER Directive 9285.7-55. April

prepared by: SJP (12/2/13)

reviewed by:

Table 4.38
Sediment-to-benthic invertebrate regression models and uptake factors for use in food chain modeling
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analyte	sediment-to-benthic invert. regression models (dry weight)		sediment-to-benthic invertebrate uptake factors (dry weight)		
	model[a]	reference	value	basis	reference
arsenic	$C_i = 10^{(-0.292 + 0.754(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - all)	regression model available		
cadmium	$C_i = 10^{(-0.314 + 0.513(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - dep)	regression model available		
chromium	$C_i = 10^{(0.2092 + 0.365(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - all)	regression model available		
copper	--		0.824	geometric mean	Bechtel Jacobs, 1998 (Table 2 - dep)
lead	$C_i = 10^{(-0.515 + 0.653(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - dep)	regression model available		
mercury	--		1.186	geometric mean	Bechtel Jacobs, 1998 (Table 2 - all)
nickel	$C_i = 10^{(-0.440 + 0.695(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - dep)	regression model available		
selenium	--		1.00	assumed	
silver	--		0.18	mean	Hirsch, 1998
zinc	$C_i = 10^{(1.89 + 0.126(\log Csd))}$	Bechtel Jacobs, 1998 (Table 3 - dep)	regression model available		

[a] C_p = concentration of an analyte in the plant; C_s = concentration of an analyte in the sediment

References:

Bechtel Jacobs, 1998. Biota sediment accumulation factors for invertebrates: review and recommendations for Oak Ridge Reservation. Prepared for U.S. Department of Energy. BJC/OR-112. August 1998.

Hirsch, M.P. 1998. Bioaccumulation of silver from laboratory-spiked sediments in the oligochaete (*Lumbriculus variegatus*). Environ. Toxicol. Chem. 17:605-609.

prepared by: SJP (12/2/13)

reviewed by:

Table 4.39
Sediment-to-fish uptake factors for use in food chain modeling
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Analyte	sediment-to-fish regression models (dry weight)		Sediment bioaccumulation factors for fish (dry weight)		
	model	reference	value	basis	reference
arsenic	no regression model available		0.126	average	Pascoe *et al* ., 1996
cadmium	no regression model available		0.164	average	Pascoe *et al.* , 1996
chromium	no regression model available		0.038	average	Krantzberg and Boyd, 1992
copper	no regression model available		0.100	average	Krantzberg and Boyd, 1992
lead	no regression model available		0.070	average	Krantzberg and Boyd, 1992
mercury	no regression model available		3.25	average	Cope *et al.* , 1990
nickel	no regression model available		1.00	assumed	--
selenium	no regression model available		1.00	assumed	--
silver	no regression model available		1.00	assumed	--
zinc	no regression model available		0.147	average	Pascoe *et al.* , 1996

References:

Cope, W.G., J.G. Wiener, and R.G. Rada. 1990. Mercury accumulation in yellow perch in Wisconsin seepage lakes: relation to lake characteristics. Environ. Toxicol. Chem. 9:931-940.

Krantzberg, G. and D. Boyd. 1992. The biological significance of contaminants in sediment from Hamilton Harbour, Lake Ontario. Environ. Toxicol. Chem. 11:1527-1540.

Pascoe, G.A., R.J. Blanchet, and G. Linder. 1996. Food chain analysis of exposures and risks to wildlife at a metals-contaminated wetland. Arch. Environ. Contam. Toxicol. 30:306-318.

prepared by: SJP (2/2/14)

reviewed by:

Table 4.40
Estimated daily doses for the American dipper foraging on the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day)							CTE** Exposure Point Concentration		EDD (mg/kg bw-day)						
			Diet			Sediment	Water					Diet			Sediment	Water		
	Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	34.2	0.000	2.10	0.9	0.1	4.11E-01	7.43E-02	0.00E+00	4.85E-01	27.4	0.000	1.27	0.9	0.1	2.48E-01	5.95E-02	0.00E+00	3.07E-01
Cadmium	12.9	0.0016	3.86	0.9	0.1	7.55E-01	2.80E-02	2.43E-04	7.84E-01	11.1	0.0014	2.84	0.9	0.1	5.55E-01	2.41E-02	2.13E-04	5.80E-01
Chromium	5.0	0.000	2.78	0.9	0.1	5.43E-01	1.09E-02	0.00E+00	5.54E-01	4.7	0.000	2.56	0.9	0.1	5.00E-01	1.02E-02	0.00E+00	5.11E-01
Copper	399	0.0162	64.9	0.9	0.1	1.27E+01	8.67E-01	2.46E-03	1.36E+01	339	0.0155	62.4	0.9	0.1	1.22E+01	7.37E-01	2.36E-03	1.30E+01
Lead	1733	0.0219	25.2	0.9	0.1	4.93E+00	3.77E+00	3.33E-03	8.70E+00	1508	0.0116	21.3	0.9	0.1	4.17E+00	3.28E+00	1.76E-03	7.45E+00
Mercury	0.10	0.000	0.09	0.9	0.1	1.72E-02	2.17E-04	0.00E+00	1.74E-02	0.07	0.000	0.09	0.9	0.1	1.66E-02	1.52E-04	0.00E+00	1.68E-02
Nickel	9.2	0.000	0.52	0.9	0.1	1.01E-01	2.00E-02	0.00E+00	1.21E-01	8.2	0.000	0.52	0.9	0.1	1.01E-01	1.78E-02	0.00E+00	1.19E-01
Selenium	1.0	0.000	0.88	0.9	0.1	1.72E-01	2.17E-03	0.00E+00	1.75E-01	1.5	0.000	0.88	0.9	0.1	1.72E-01	3.26E-03	0.00E+00	1.76E-01
Silver	6.4	0.000	0.22	0.9	0.1	4.30E-02	1.39E-02	0.00E+00	5.69E-02	5.5	0.000	0.21	0.9	0.1	4.15E-02	1.20E-02	0.00E+00	5.34E-02
Zinc	4054	0.488	799	0.9	0.1	1.56E+02	8.81E+00	7.42E-02	1.65E+02	3172	0.432	579	0.9	0.1	1.13E+02	6.89E+00	6.57E-02	1.20E+02

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.41
EDDs for the American dipper foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	Sediment $Dose_{sed}$[2]	Water $Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	Sediment $Dose_{sed}$[2]	Water $Dose_{water}$[3]	Total EDD[4]
Arsenic	39.6	0.0050	0.27	0.9	0.1	5.20E-02	8.61E-02	7.60E-04	1.39E-01	33.4	0.0050	0.27	0.9	0.1	5.20E-02	7.26E-02	7.60E-04	1.25E-01
Cadmium	2.9	0.0019	0.68	0.9	0.1	1.33E-01	6.30E-03	2.89E-04	1.39E-01	2.1	0.0016	0.68	0.9	0.1	1.33E-01	4.56E-03	2.43E-04	1.38E-01
Chromium	6.1	0.000	2.16	0.9	0.1	4.23E-01	1.33E-02	0.00E+00	4.36E-01	4.6	0.000	2.16	0.9	0.1	4.23E-01	1.00E-02	0.00E+00	4.33E-01
Copper	173	0.0307	38	0.9	0.1	7.49E+00	3.76E-01	4.67E-03	7.87E+00	137	0.0274	38	0.9	0.1	7.49E+00	2.98E-01	4.16E-03	7.79E+00
Lead	581	0.0305	7.6	0.9	0.1	1.48E+00	1.26E+00	4.64E-03	2.75E+00	478	0.0128	7.6	0.9	0.1	1.48E+00	1.04E+00	1.95E-03	2.52E+00
Mercury	0.070	0.000	0.11	0.9	0.1	2.09E-02	1.52E-04	0.00E+00	2.11E-02	0.06	0.000	0.11	0.9	0.1	2.09E-02	1.30E-04	0.00E+00	2.11E-02
Nickel	5.9	0.0037	0.27	0.9	0.1	5.20E-02	1.28E-02	5.62E-04	6.54E-02	5.1	0.0050	0.27	0.9	0.1	5.20E-02	1.11E-02	7.60E-04	6.39E-02
Selenium	1.9	0.000	0.53	0.9	0.1	1.04E-01	4.13E-03	0.00E+00	1.09E-01	1.5	0.000	0.53	0.9	0.1	1.04E-01	3.26E-03	0.00E+00	1.08E-01
Silver	2.4	0.000	0.27	0.9	0.1	5.20E-02	5.22E-03	0.00E+00	5.72E-02	1.9	0.000	0.27	0.9	0.1	5.20E-02	4.13E-03	0.00E+00	5.62E-02
Zinc	819	0.711	166	0.9	0.1	3.25E+01	1.78E+00	1.08E-01	3.44E+01	651	0.600	166	0.9	0.1	3.25E+01	1.41E+00	9.12E-02	3.40E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.42
EDDs for the American dipper foraging at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day) Diet				EDD Sediment	EDD Water		CTE** Exposure Point Concentration		EDD (mg/kg bw-day) Diet				EDD Sediment	EDD Water	
	Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4	Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4
Arsenic	33.8	0.000	0.69	0.9	0.1	1.36E-01	7.34E-02	0.00E+00	2.09E-01	27.9	0.000	0.69	0.9	0.1	1.36E-01	6.06E-02	0.00E+00	1.96E-01
Cadmium	5.4	0.0021	0.94	0.9	0.1	1.83E-01	1.17E-02	3.19E-04	1.95E-01	4.0	0.0015	0.94	0.9	0.1	1.83E-01	8.69E-03	2.28E-04	1.92E-01
Chromium	5.4	0.000	2.03	0.9	0.1	3.97E-01	1.17E-02	0.00E+00	4.09E-01	4.0	0.000	2.03	0.9	0.1	3.97E-01	8.69E-03	0.00E+00	4.06E-01
Copper	284	0.0228	33	0.9	0.1	6.50E+00	6.17E-01	3.47E-03	7.12E+00	199	0.0178	33	0.9	0.1	6.50E+00	4.32E-01	2.71E-03	6.93E+00
Lead	729	0.0234	6.7	0.9	0.1	1.32E+00	1.58E+00	3.56E-03	2.90E+00	513	0.0111	6.7	0.9	0.1	1.32E+00	1.11E+00	1.69E-03	2.43E+00
Mercury	0.05	0.000	0.11	0.9	0.1	2.15E-02	1.09E-04	0.00E+00	2.16E-02	0.04	0.000	0.11	0.9	0.1	2.15E-02	8.69E-05	0.00E+00	2.16E-02
Nickel	7.2	0.0038	0.58	0.9	0.1	1.13E-01	1.56E-02	5.78E-04	1.29E-01	6.4	0.0038	0.58	0.9	0.1	1.13E-01	1.39E-02	5.78E-04	1.27E-01
Selenium	1.4	0.000	0.55	0.9	0.1	1.07E-01	3.04E-03	0.00E+00	1.10E-01	1.1	0.000	0.55	0.9	0.1	1.07E-01	2.39E-03	0.00E+00	1.10E-01
Silver	2.8	0.000	0.28	0.9	0.1	5.38E-02	6.08E-03	0.00E+00	5.99E-02	1.9	0.000	0.28	0.9	0.1	5.38E-02	4.13E-03	0.00E+00	5.79E-02
Zinc	1393	0.704	197	0.9	0.1	3.86E+01	3.03E+00	1.07E-01	4.18E+01	1049	0.521	197	0.9	0.1	3.86E+01	2.28E+00	7.92E-02	4.10E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Created by:EC 1/20/14
Reviewed by: SJP 2/8/14
updated by: EC 2/27/15
QC'd by: RI 3/3/15

Table 4.43
EDDS for the American dipper foraging at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Invert tissue concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	Sediment $Dose_{sed}$[2]	Water $Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Invert tissue concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	Sediment $Dose_{sed}$[2]	Water $Dose_{water}$[3]	Total EDD[4]
Arsenic	39.4	0.000	Equation	8.15	0.9	0.1	1.59E+00	8.56E-02	0.00E+00	1.68E+00	29.9	0.000	Equation	6.62	0.9	0.1	1.29E+00	6.50E-02	0.00E+00	1.36E+00
Cadmium	4.2	0.0015	Equation	1.01	0.9	0.1	1.98E-01	9.13E-03	2.28E-04	2.08E-01	3.5	0.0010	Equation	0.92	0.9	0.1	1.80E-01	7.61E-03	1.52E-04	1.88E-01
Chromium	5.0	0.0058	Equation	2.91	0.9	0.1	5.70E-01	1.09E-02	8.82E-04	5.81E-01	4.5	0.0058	Equation	2.80	0.9	0.1	5.48E-01	9.78E-03	8.82E-04	5.59E-01
Copper	292	0.0131	0.824	241	0.9	0.1	4.71E+01	6.35E-01	1.99E-03	4.77E+01	177	0.0094	0.824	145.848	0.9	0.1	2.85E+01	3.85E-01	1.43E-03	2.89E+01
Lead	593	0.0106	Equation	19.8	0.9	0.1	3.86E+00	1.29E+00	1.61E-03	5.15E+00	534	0.0055	Equation	18.5	0.9	0.1	3.61E+00	1.16E+00	8.36E-04	4.77E+00
Mercury	0.09	0.000	1.186	0.11	0.9	0.1	2.09E-02	1.96E-04	0.00E+00	2.11E-02	0.07	0.000	1.186	0.08	0.9	0.1	1.62E-02	1.52E-04	0.00E+00	1.64E-02
Nickel	12.1	0.0029	Equation	2.05	0.9	0.1	4.02E-01	2.63E-02	4.41E-04	4.28E-01	10.0	0.0029	Equation	1.80	0.9	0.1	3.52E-01	2.17E-02	4.41E-04	3.74E-01
Selenium	2.9	0.000	1.00	2.90	0.9	0.1	5.67E-01	6.30E-03	0.00E+00	5.73E-01	2.9	0.000	1.00	2.90	0.9	0.1	5.67E-01	6.30E-03	0.00E+00	5.73E-01
Silver	3.1	0.000	0.18	0.56	0.9	0.1	1.09E-01	6.74E-03	0.00E+00	1.16E-01	2.0	0.000	0.18	0.36	0.9	0.1	7.04E-02	4.35E-03	0.00E+00	7.48E-02
Zinc	1720	0.498	Equation	198	0.9	0.1	3.88E+01	3.74E+00	7.57E-02	4.26E+01	1114	0.265	Equation	188	0.9	0.1	3.67E+01	2.42E+00	4.03E-02	3.92E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-to-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

Where $C_{invert} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.44
EDDS for the American dipper foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Sediment (mg/kg, dw)	RME* Surface Water (mg/L)	EDD Diet Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD^{4}	CTE** Sediment (mg/kg, dw)	CTE** Surface Water (mg/L)	EDD Diet Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD^{4}
Arsenic	27.0	0.000	0.61	0.9	0.1	1.20E-01	5.87E-02	0.00E+00	1.79E-01	19.4	0.000	0.61	0.9	0.1	1.20E-01	4.22E-02	0.00E+00	1.62E-01
Cadmium	6.4	0.0014	0.78	0.9	0.1	1.53E-01	1.39E-02	2.13E-04	1.67E-01	4.8	0.0010	0.78	0.9	0.1	1.53E-01	1.04E-02	1.52E-04	1.64E-01
Chromium	4.9	0.000	3.26	0.9	0.1	6.37E-01	1.06E-02	0.00E+00	6.48E-01	4.2	0.000	3.26	0.9	0.1	6.37E-01	9.13E-03	0.00E+00	6.46E-01
Copper	212	0.0197	15	0.9	0.1	2.94E+00	4.61E-01	2.99E-03	3.41E+00	147	0.0138	15	0.9	0.1	2.94E+00	3.19E-01	2.10E-03	3.27E+00
Lead	367	0.0231	2.3	0.9	0.1	4.49E-01	7.97E-01	3.51E-03	1.25E+00	300	0.0112	2.3	0.9	0.1	4.49E-01	6.52E-01	1.70E-03	1.10E+00
Mercury	0.04	0.000	0.25	0.9	0.1	4.79E-02	8.69E-05	0.00E+00	4.80E-02	0.04	0.000	0.25	0.9	0.1	4.79E-02	8.69E-05	0.00E+00	4.80E-02
Nickel	12.4	0.000	0.61	0.9	0.1	1.20E-01	2.69E-02	0.00E+00	1.47E-01	9.4	0.000	0.61	0.9	0.1	1.20E-01	2.04E-02	0.00E+00	1.40E-01
Selenium	1.4	0.000	1.22	0.9	0.1	2.39E-01	3.04E-03	0.00E+00	2.42E-01	1.20	0.000	1.22	0.9	0.1	2.39E-01	2.61E-03	0.00E+00	2.42E-01
Silver	1.4	0.000	0.61	0.9	0.1	1.20E-01	3.04E-03	0.00E+00	1.23E-01	1.1	0.000	0.61	0.9	0.1	1.20E-01	2.39E-03	0.00E+00	1.22E-01
Zinc	2778	0.503	187	0.9	0.1	3.66E+01	6.04E+00	7.65E-02	4.27E+01	1738	0.361	187	0.9	0.1	3.66E+01	3.78E+00	5.49E-02	4.04E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 $Total\ EDD = Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.45
EDDs for the American dipper foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Invert tissue concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	Sediment $Dose_{sed}^2$	Water $Dose_{water}^3$	Total EDD^4	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Invert tissue concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	Sediment $Dose_{sed}^2$	Water $Dose_{water}^3$	Total EDD^4
Arsenic	37.2	0.000	Equation	7.80	0.9	0.1	1.53E+00	8.08E-02	0.00E+00	1.61E+00	19.9	0.000	Equation	4.87	0.9	0.1	9.52E-01	4.32E-02	0.00E+00	9.95E-01
Cadmium	10.5	0.0011	Equation	1.62	0.9	0.1	3.17E-01	2.28E-02	1.67E-04	3.40E-01	5.0	0.0009	Equation	1.11	0.9	0.1	2.17E-01	1.09E-02	1.37E-04	2.28E-01
Chromium	5.5	0.000	Equation	3.02	0.9	0.1	5.90E-01	1.20E-02	0.00E+00	6.02E-01	5.2	0.000	Equation	2.95	0.9	0.1	5.78E-01	1.13E-02	0.00E+00	5.89E-01
Copper	413	0.0215	0.824	340	0.9	0.1	6.66E+01	8.97E-01	3.27E-03	6.75E+01	188	0.0122	0.824	154.912	0.9	0.1	3.03E+01	4.09E-01	1.85E-03	3.07E+01
Lead	435	0.0303	Equation	16.1	0.9	0.1	3.16E+00	9.45E-01	4.61E-03	4.11E+00	296	0.0121	Equation	12.6	0.9	0.1	2.46E+00	6.43E-01	1.84E-03	3.10E+00
Mercury	0.07	0.000	1.186	0.08	0.9	0.1	1.62E-02	1.52E-04	0.00E+00	1.64E-02	0.07	0.000	1.186	0.08	0.9	0.1	1.62E-02	1.52E-04	0.00E+00	1.64E-02
Nickel	16.5	0.000	Equation	2.55	0.9	0.1	4.98E-01	3.59E-02	0.00E+00	5.34E-01	9.7	0.000	Equation	1.76	0.9	0.1	3.44E-01	2.11E-02	0.00E+00	3.66E-01
Selenium	3.3	0.000	1.00	3.30	0.9	0.1	6.45E-01	7.17E-03	0.00E+00	6.53E-01	1.9	0.000	1.00	1.90	0.9	0.1	3.72E-01	4.13E-03	0.00E+00	3.76E-01
Silver	2.2	0.000	0.18	0.40	0.9	0.1	7.74E-02	4.78E-03	0.00E+00	8.22E-02	1.4	0.000	0.18	0.25	0.9	0.1	4.93E-02	3.04E-03	0.00E+00	5.23E-02
Zinc	5320	0.429	Equation	229	0.9	0.1	4.47E+01	1.16E+01	6.52E-02	5.64E+01	2190	0.302	Equation	205	0.9	0.1	4.00E+01	4.76E+00	4.59E-02	4.48E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-to-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

Where $C_{invert} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.46
EDDs for the American dipper foraging at the Bakers Bridge sampling location on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4	CTE** Sediment (mg/kg, dw)	Surface Water (mg/L)	Invert tissue concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4
Arsenic	29.7	0.000	0.23	0.9	0.1	4.52E-02	6.45E-02	0.00E+00	1.10E-01	21.9	0.000	0.23	0.9	0.1	4.52E-02	4.76E-02	0.00E+00	9.28E-02
Cadmium	18.6	0.0008	1.59	0.9	0.1	3.11E-01	4.04E-02	1.22E-04	3.52E-01	10.1	0.0007	1.59	0.9	0.1	3.11E-01	2.19E-02	1.06E-04	3.33E-01
Chromium	7.0	0.000	2.05	0.9	0.1	4.01E-01	1.52E-02	0.00E+00	4.16E-01	5.4	0.000	2.05	0.9	0.1	4.01E-01	1.17E-02	0.00E+00	4.12E-01
Copper	332	0.0138	17.6	0.9	0.1	3.44E+00	7.21E-01	2.10E-03	4.16E+00	191	0.0095	17.6	0.9	0.1	3.44E+00	4.15E-01	1.44E-03	3.85E+00
Lead	376	0.0177	2.53	0.9	0.1	4.96E-01	8.17E-01	2.69E-03	1.32E+00	300	0.0078	2.53	0.9	0.1	4.96E-01	6.52E-01	1.19E-03	1.15E+00
Mercury	0.06	0.000	0.09	0.9	0.1	1.82E-02	1.30E-04	0.00E+00	1.83E-02	0.04	0.000	0.09	0.9	0.1	1.82E-02	8.69E-05	0.00E+00	1.83E-02
Nickel	31.0	0.000	1.59	0.9	0.1	3.11E-01	6.74E-02	0.00E+00	3.78E-01	18.3	0.000	1.59	0.9	0.1	3.11E-01	3.98E-02	0.00E+00	3.50E-01
Selenium	3.1	0.000	0.47	0.9	0.1	9.09E-02	6.74E-03	0.00E+00	9.77E-02	2.1	0.000	0.47	0.9	0.1	9.09E-02	4.56E-03	0.00E+00	9.55E-02
Silver	1.7	0.000	0.23	0.9	0.1	4.52E-02	3.69E-03	0.00E+00	4.89E-02	1.3	0.000	0.23	0.9	0.1	4.52E-02	2.82E-03	0.00E+00	4.80E-02
Zinc	8544	0.272	353	0.9	0.1	6.90E+01	1.86E+01	4.13E-02	8.76E+01	4620	0.216	353	0.9	0.1	6.90E+01	1.00E+01	3.28E-02	7.91E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{invert} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{diet} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.0565
IR_{diet} (kg/kg BW-day, dw)	0.2173
IR_{water} (L/kg BW-day)	0.152
$IR_{sediment}$ (kg/kg BW-day, dw)	0.02173

Table 4.47
EDDs for the Mallard foraging on the Animas River above Cement Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day)							CTE** Exposure Point Concentration		EDD (mg/kg bw-day)						
			Diet				Sediment	Water				Diet				Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Metals																		
Arsenic	34.2	0.000	2.10	0.98	0.02	1.07E-01	7.11E-04	0.00E+00	1.08E-01	27.4	0.000	1.27	0.98	0.02	6.44E-02	5.70E-04	0.00E+00	6.50E-02
Cadmium	12.9	0.0016	3.86	0.98	0.02	1.96E-01	2.68E-04	8.96E-05	1.97E-01	11.1	0.0014	2.84	0.98	0.02	1.44E-01	2.31E-04	7.84E-05	1.45E-01
Chromium	5.0	0.000	2.78	0.98	0.02	1.41E-01	1.04E-04	0.00E+00	1.41E-01	4.7	0.000	2.56	0.98	0.02	1.30E-01	9.78E-05	0.00E+00	1.30E-01
Copper	399	0.0162	64.9	0.98	0.02	3.30E+00	8.30E-03	9.07E-04	3.31E+00	339	0.0155	62.4	0.98	0.02	3.18E+00	7.05E-03	8.68E-04	3.18E+00
Lead	1733	0.0219	25.2	0.98	0.02	1.28E+00	3.60E-02	1.23E-03	1.32E+00	1508	0.0116	21.3	0.98	0.02	1.09E+00	3.14E-02	6.50E-04	1.12E+00
Mercury	0.10	0.000	0.09	0.98	0.02	4.48E-03	2.08E-06	0.00E+00	4.48E-03	0.07	0.000	0.09	0.98	0.02	4.32E-03	1.46E-06	0.00E+00	4.32E-03
Nickel	9.2	0.000	0.52	0.98	0.02	2.62E-02	1.91E-04	0.00E+00	2.64E-02	8.2	0.000	0.52	0.98	0.02	2.62E-02	1.71E-04	0.00E+00	2.64E-02
Selenium	1.0	0.000	0.88	0.98	0.02	4.49E-02	2.08E-05	0.00E+00	4.49E-02	1.5	0.000	0.88	0.98	0.02	4.49E-02	3.12E-05	0.00E+00	4.49E-02
Silver	6.4	0.000	0.22	0.98	0.02	1.12E-02	1.33E-04	0.00E+00	1.13E-02	5.5	0.000	0.21	0.98	0.02	1.08E-02	1.14E-04	0.00E+00	1.09E-02
Zinc	4054	0.488	799	0.98	0.02	4.06E+01	8.43E-02	2.73E-02	4.08E+01	3172	0.432	579	0.98	0.02	2.95E+01	6.60E-02	2.42E-02	2.96E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert}$ + $Dose_{plant}$ + $Dose_{sed}$ + $Dose_{water}$

Area Use Factor (AUF) 1.0

Body Weight (BW) (kg) 1.162

IR_{diet} (kg/kg BW-day, dw) 0.0519

IR_{water} (L/kg BW-day) 0.056

IR_{sed} (kg/kg DW-day,dw) 0.00104

Table 4.48
EDDs for mallards foraging at sampling location A72 on the Animas River below Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day)							CTE** Exposure Point Concentration		EDD (mg/kg bw-day)						
			Diet				Sediment	Water				Diet				Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	39.6	0.0050	0.27	0.98	0.02	1.35E-02	8.24E-04	2.80E-04	1.46E-02	33.4	0.0050	0.27	0.98	0.02	1.35E-02	6.95E-04	2.80E-04	1.45E-02
Cadmium	2.9	0.0019	0.68	0.98	0.02	3.45E-02	6.03E-05	1.06E-04	3.47E-02	2.1	0.0016	0.68	0.98	0.02	3.45E-02	4.37E-05	8.96E-05	3.47E-02
Chromium	6.1	0.000	2.16	0.98	0.02	1.10E-01	1.27E-04	0.00E+00	1.10E-01	4.6	0.000	2.16	0.98	0.02	1.10E-01	9.57E-05	0.00E+00	1.10E-01
Copper	173	0.0307	38	0.98	0.02	1.95E+00	3.60E-03	1.72E-03	1.95E+00	137	0.0274	38	0.98	0.02	1.95E+00	2.85E-03	1.53E-03	1.95E+00
Lead	581	0.0305	7.6	0.98	0.02	3.84E-01	1.21E-02	1.71E-03	3.98E-01	478	0.0128	7.6	0.98	0.02	3.84E-01	9.94E-03	7.17E-04	3.95E-01
Mercury	0.07	0.000	0.11	0.98	0.02	5.44E-03	1.46E-06	0.00E+00	5.44E-03	0.06	0.000	0.11	0.98	0.02	5.44E-03	1.25E-06	0.00E+00	5.44E-03
Nickel	5.9	0.0037	0.27	0.98	0.02	1.35E-02	1.23E-04	2.07E-04	1.39E-02	5.1	0.0050	0.27	0.98	0.02	1.35E-02	1.06E-04	2.80E-04	1.39E-02
Selenium	1.9	0.000	0.53	0.98	0.02	2.72E-02	3.95E-05	0.00E+00	2.72E-02	1.5	0.000	0.53	0.98	0.02	2.72E-02	3.12E-05	0.00E+00	2.72E-02
Silver	2.4	0.000	0.27	0.98	0.02	1.35E-02	4.99E-05	0.00E+00	1.36E-02	1.9	0.000	0.27	0.98	0.02	1.35E-02	3.95E-05	0.00E+00	1.36E-02
Zinc	819	0.711	166	0.98	0.02	8.45E+00	1.70E-02	3.98E-02	8.51E+00	651	0.600	166	0.98	0.02	8.45E+00	1.35E-02	3.36E-02	8.50E+00

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD $= Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
IR_{sed} (kg/kg DW-day,dw)	0.00104

Table 4.49
EDDs for mallards foraging at sampling location A73 on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	EDD (mg/kg bw-day) Diet Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	Dose $_{invert}^1$	Sediment Dose $_{sed}^2$	Water Dose$_{water}^3$	Total EDD^4	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	EDD (mg/kg bw-day) Diet Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	Dose $_{invert}^1$	Sediment Dose $_{sed}^2$	Water Dose$_{water}^3$	Total EDD^4
Arsenic	33.8	0.0000	0.69	0.98	0.02	3.52E-02	7.03E-04	0.00E+00	3.60E-02	27.9	0.0000	0.69	0.98	0.02	3.52E-02	5.80E-04	0.00E+00	3.58E-02
Cadmium	5.4	0.0021	0.94	0.98	0.02	4.76E-02	1.12E-04	1.18E-04	4.78E-02	4.0	0.0015	0.94	0.98	0.02	4.76E-02	8.32E-05	8.40E-05	4.78E-02
Chromium	5.4	0.000	2.03	0.98	0.02	1.03E-01	1.12E-04	0.00E+00	1.03E-01	4.0	0.000	2.03	0.98	0.02	1.03E-01	8.32E-05	0.00E+00	1.03E-01
Copper	284	0.0228	33.2	0.98	0.02	1.69E+00	5.91E-03	1.28E-03	1.70E+00	199	0.0178	33.2	0.98	0.02	1.69E+00	4.14E-03	9.97E-04	1.70E+00
Lead	729	0.0234	6.7	0.98	0.02	3.42E-01	1.52E-02	1.31E-03	3.59E-01	513	0.0111	6.7	0.98	0.02	3.42E-01	1.07E-02	6.22E-04	3.53E-01
Mercury	0.05	0.000	0.11	0.98	0.02	5.59E-03	1.04E-06	0.00E+00	5.60E-03	0.04	0.000	0.11	0.98	0.02	5.59E-03	8.32E-07	0.00E+00	5.60E-03
Nickel	7.2	0.0038	0.58	0.98	0.02	2.93E-02	1.50E-04	2.13E-04	2.97E-02	6.4	0.0038	0.58	0.98	0.02	2.93E-02	1.33E-04	2.13E-04	2.96E-02
Selenium	1.4	0.000	0.55	0.98	0.02	2.79E-02	2.91E-05	0.00E+00	2.80E-02	1.1	0.000	0.55	0.98	0.02	2.79E-02	2.29E-05	0.00E+00	2.79E-02
Silver	2.8	0.000	0.28	0.98	0.02	1.40E-02	5.82E-05	0.00E+00	1.40E-02	1.9	0.000	0.28	0.98	0.02	1.40E-02	3.95E-05	0.00E+00	1.40E-02
Zinc	1393	0.704	197	0.98	0.02	1.00E+01	2.90E-02	3.94E-02	1.01E+01	1049	0.521	197	0.98	0.02	1.00E+01	2.18E-02	2.92E-02	1.01E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 $Total\ EDD = Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
IR_{sed} (kg/kg DW-day,dw)	0.00104

Table 4.50

EDDs for mallards foraging at sampling location A73B on the Animas River below mainstem Mineral Creek (100% benthic invertebrate diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day)								Total EDD[4]	CTE** Exposure Point Concentration		EDD (mg/kg bw-day)								Total EDD[4]
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Diet						Sediment	Water		Sediment (mg/kg, dw)	Surface Water (µg/L)	Diet						Sediment	Water	
			BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]				BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	
Arsenic	39.4	0.000	Equation	8.15	0.98	0.02	4.14E-01	8.20E-04	0.00E+00	4.15E-01	29.9	0.000	Equation	6.62	0.98	0.02	3.37E-01	6.22E-04	0.00E+00	3.37E-01
Cadmium	4.2	0.0015	Equation	1.01	0.98	0.02	5.15E-02	8.74E-05	8.40E-05	5.17E-02	3.5	0.0010	Equation	0.92	0.98	0.02	4.69E-02	7.28E-05	5.60E-05	4.71E-02
Chromium	5.0	0.0058	Equation	2.91	0.98	0.02	1.48E-01	1.04E-04	3.25E-04	1.49E-01	4.5	0.0058	Equation	2.80	0.98	0.02	1.43E-01	9.36E-05	3.25E-04	1.43E-01
Copper	292	0.0131	0.824	241	0.98	0.02	1.22E+01	6.07E-03	7.34E-04	1.22E+01	177	0.0094	0.824	146	0.98	0.02	7.42E+00	3.68E-03	5.26E-04	7.42E+00
Lead	593	0.0106	Equation	19.8	0.98	0.02	1.01E+00	1.23E-02	5.94E-04	1.02E+00	534	0.0055	Equation	18.5	0.98	0.02	9.39E-01	1.11E-02	3.08E-04	9.50E-01
Mercury	0.09	0.000	Equation	1.19	0.98	0.02	6.03E-02	1.87E-06	0.00E+00	6.03E-02	0.07	0.000	Equation	1.19	0.98	0.02	6.03E-02	1.46E-06	0.00E+00	6.03E-02
Nickel	12.1	0.0029	Equation	2.05	0.98	0.02	1.04E-01	2.52E-04	1.62E-04	1.05E-01	10.0	0.0029	Equation	1.80	0.98	0.02	9.15E-02	2.08E-04	1.62E-04	9.19E-02
Selenium	2.9	0.000	1.00	2.90	0.98	0.02	1.47E-01	6.03E-05	0.00E+00	1.48E-01	2.9	0.000	1.00	2.90	0.98	0.02	1.47E-01	6.03E-05	0.00E+00	1.48E-01
Silver	3.1	0.000	0.18	0.56	0.98	0.02	2.84E-02	6.45E-05	0.00E+00	2.84E-02	2.0	0.000	0.18	0.36	0.98	0.02	1.83E-02	4.16E-05	0.00E+00	1.84E-02
Zinc	1720	0.498	Equation	198	0.98	0.02	1.01E+01	3.58E-02	2.79E-02	1.02E+01	1114	0.265	Equation	188	0.98	0.02	9.56E+00	2.32E-02	1.48E-02	9.59E+00

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

Where $C_{invert} = (EPC_{sediment} \times Invert\ BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR$_{diet}$ (kg/kg BW-day, dw)	0.0519
IR$_{water}$ (L/kg BW-day)	0.056
[**R$_{sediment}$** (kg/kg DW-day,dw)	0.00104

Table 4.51
EDDs for mallards foraging at sampling location A75D on the Animas River below mainstem Mineral Creek (100% benthic invertebrate diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day) Diet				Sediment	Water		CTE** Exposure Point Concentration		EDD (mg/kg bw-day) Diet				Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	27.0	0.000	0.61	0.98	0.02	3.12E-02	5.62E-04	0.00E+00	3.17E-02	19.4	0.000	0.61	0.98	0.02	3.12E-02	4.04E-04	0.00E+00	3.16E-02
Cadmium	6.4	0.0014	0.78	0.98	0.02	3.98E-02	1.33E-04	7.84E-05	4.00E-02	4.8	0.0010	0.78	0.98	0.02	3.98E-02	9.98E-05	5.60E-05	4.00E-02
Chromium	4.9	0.000	3.26	0.98	0.02	1.66E-01	1.02E-04	0.00E+00	1.66E-01	4.2	0.000	3.26	0.98	0.02	1.66E-01	8.74E-05	0.00E+00	1.66E-01
Copper	212	0.0197	15.1	0.98	0.02	7.66E-01	4.41E-03	1.10E-03	7.71E-01	147	0.0138	15.1	0.98	0.02	7.66E-01	3.06E-03	7.73E-04	7.69E-01
Lead	367	0.0231	2.3	0.98	0.02	1.17E-01	7.63E-03	1.29E-03	1.26E-01	300	0.0112	2.3	0.98	0.02	1.17E-01	6.24E-03	6.27E-04	1.24E-01
Mercury	0.04	0.000	0.25	0.98	0.02	1.25E-02	8.32E-07	0.00E+00	1.25E-02	0.04	0.000	0.25	0.98	0.02	1.25E-02	8.32E-07	0.00E+00	1.25E-02
Nickel	12.4	0.000	0.61	0.98	0.02	3.12E-02	2.58E-04	0.00E+00	3.14E-02	9.4	0.000	0.61	0.98	0.02	3.12E-02	1.96E-04	0.00E+00	3.14E-02
Selenium	1.4	0.000	1.22	0.98	0.02	6.23E-02	2.91E-05	0.00E+00	6.23E-02	1.2	0.000	1.22	0.98	0.02	6.23E-02	2.50E-05	0.00E+00	6.23E-02
Silver	1.4	0.000	0.61	0.98	0.02	3.12E-02	2.91E-05	0.00E+00	3.12E-02	1.1	0.000	0.61	0.98	0.02	3.12E-02	2.29E-05	0.00E+00	3.12E-02
Zinc	2778	0.503	187	0.98	0.02	9.52E+00	5.78E-02	2.82E-02	9.60E+00	1738	0.361	187	0.98	0.02	9.52E+00	3.62E-02	2.02E-02	9.57E+00

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
$IR_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.52
Estimated daily doses for mallards foraging at sampling location A75B on the Animas R. below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	RME* Exposure Point Concentration Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	CTE** Exposure Point Concentration Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	37.2	0.000	Equation	7.80	0.98	0.02	3.97E-01	7.74E-04	0.00E+00	3.98E-01	19.9	0.000	Equation	4.87	0.98	0.02	2.48E-01	4.14E-04	0.00E+00	2.48E-01
Cadmium	10.5	0.0011	Equation	1.62	0.98	0.02	8.25E-02	2.18E-04	6.16E-05	8.27E-02	5.0	0.0009	Equation	1.11	0.98	0.02	5.64E-02	1.04E-04	5.04E-05	5.65E-02
Chromium	5.5	0.000	Equation	3.02	0.98	0.02	1.53E-01	1.14E-04	0.00E+00	1.54E-01	5.2	0.000	Equation	2.95	0.98	0.02	1.50E-01	1.08E-04	0.00E+00	1.50E-01
Copper	413	0.0215	0.824	340	0.98	0.02	1.73E+01	8.59E-03	1.20E-03	1.73E+01	188	0.0122	0.824	155	0.98	0.02	7.88E+00	3.91E-03	6.83E-04	7.88E+00
Lead	435	0.0303	Equation	16.1	0.98	0.02	8.21E-01	9.05E-03	1.70E-03	8.32E-01	296	0.0121	Equation	12.6	0.98	0.02	6.38E-01	6.16E-03	6.78E-04	6.45E-01
Mercury	0.07	0.000	Equation	1.19	0.98	0.02	6.03E-02	1.46E-06	0.00E+00	6.03E-02	0.07	0.000	Equation	1.19	0.98	0.02	6.03E-02	1.46E-06	0.00E+00	6.03E-02
Nickel	16.5	0.000	Equation	2.55	0.98	0.02	1.30E-01	3.43E-04	0.00E+00	1.30E-01	9.7	0.000	Equation	1.76	0.98	0.02	8.96E-02	2.02E-04	0.00E+00	8.98E-02
Selenium	3.3	0.000	1.00	3.30	0.98	0.02	1.68E-01	6.86E-05	0.00E+00	1.68E-01	1.9	0.000	1.00	1.90	0.98	0.02	9.66E-02	3.95E-05	0.00E+00	9.67E-02
Silver	2.2	0.000	0.18	0.40	0.98	0.02	2.01E-02	4.58E-05	0.00E+00	2.02E-02	1.4	0.000	0.18	0.25	0.98	0.02	1.28E-02	2.91E-05	0.00E+00	1.28E-02
Zinc	5320	0.429	Equation	229	0.98	0.02	1.16E+01	1.11E-01	2.40E-02	1.18E+01	2190	0.302	Equation	205	0.98	0.02	1.04E+01	4.56E-02	1.69E-02	1.05E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$
Where $C_{invert} = (EPC_{sediment} \times Invert\ BSAF)$ or the result of the BSAF regression equation
2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{invert}$ + $Dose_{plant}$ + $Dose_{sed}$ + $Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
$IR_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.53
EDDs for mallards foraging at the Baker Bridge sampling location on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

| | RME* Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | | | CTE** Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | |
| | | | Diet | | | Sediment | Water | | | | | Diet | | | Sediment | Water | |
COPECs	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF$_{Invert}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{sed}$[2]	Dose$_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (C$_{invert, dw}$)	DF$_{Invert}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{sed}$[2]	Dose$_{water}$[3]	Total EDD[4]
Arsenic	29.7	0.000	0.23	0.98	0.02	1.17E-02	6.18E-04	0.00E+00	1.24E-02	21.9	0.000	0.23	0.98	0.02	1.17E-02	4.56E-04	0.00E+00	1.22E-02
Cadmium	18.6	0.0008	1.59	0.98	0.02	8.10E-02	3.87E-04	4.48E-05	8.14E-02	10.1	0.0007	1.59	0.98	0.02	8.10E-02	2.10E-04	3.92E-05	8.12E-02
Chromium	7.0	0.000	2.05	0.98	0.02	1.04E-01	1.46E-04	0.00E+00	1.04E-01	5.4	0.000	2.05	0.98	0.02	1.04E-01	1.12E-04	0.00E+00	1.04E-01
Copper	332	0.0138	17.6	0.98	0.02	8.94E-01	6.91E-03	7.73E-04	9.02E-01	191	0.0095	17.6	0.98	0.02	8.94E-01	3.97E-03	5.32E-04	8.99E-01
Lead	376	0.0177	2.5	0.98	0.02	1.29E-01	7.82E-03	9.91E-04	1.38E-01	300	0.0078	2.5	0.98	0.02	1.29E-01	6.24E-03	4.37E-04	1.36E-01
Mercury	0.06	0.000	0.09	0.98	0.02	4.73E-03	1.25E-06	0.00E+00	4.73E-03	0.04	0.000	0.09	0.98	0.02	4.73E-03	8.32E-07	0.00E+00	4.73E-03
Nickel	31.0	0.000	1.59	0.98	0.02	8.08E-02	6.45E-04	0.00E+00	8.14E-02	18.3	0.000	1.59	0.98	0.02	8.08E-02	3.81E-04	0.00E+00	8.11E-02
Selenium	3.1	0.000	0.47	0.98	0.02	2.37E-02	6.45E-05	0.00E+00	2.37E-02	2.1	0.000	0.47	0.98	0.02	2.37E-02	4.37E-05	0.00E+00	2.37E-02
Silver	1.7	0.000	0.23	0.98	0.02	1.17E-02	3.54E-05	0.00E+00	1.18E-02	1.3	0.000	0.23	0.98	0.02	1.17E-02	2.70E-05	0.00E+00	1.18E-02
Zinc	8544	0.272	353	0.98	0.02	1.80E+01	1.78E-01	1.52E-02	1.81E+01	4620	0.216	353	0.98	0.02	1.80E+01	9.61E-02	1.21E-02	1.81E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations
1 Dose$_{invert}$ = IR$_{diet}$ X C$_{invert}$ X DF$_{invert}$ X AUF
2 Dose$_{sed}$ = Ir$_{sediment}$ X EPC$_{sediment}$ X Df$_{sed}$ X AUF
3 Dose$_{water}$ = IR$_{water}$ X C$_{water}$ X AUF
4 Total EDD = Dose$_{invert}$ + Dose$_{plant}$ + Dose$_{sed}$ + Dose$_{water}$

Area Use Factor (AUF)   1.0
Body Weight (BW) (kg)   1.162
IR$_{diet}$ (kg/kg BW-day, dw)   0.0519
IR$_{water}$ (L/kg BW-day)   0.056
IR$_{sediment}$ (kg/kg DW-day,dw)   0.00104

Table 4.54
EDDs for the mallard foraging on the Animas River above Cement Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (µg/L)	EDD (mg/kg bw-day) Diet: Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration ($C_{plant, dw}$)	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	Sediment $Dose_{sed}$[3]	Water $Dose_{water}$[4]	Total EDD[5]
Metals													
Arsenic	34.2	0.000	2.10	0.49	Equation	1.00	0.49	0.02	5.34E-02	2.54E-02	7.11E-04	0.00E+00	7.96E-02
Cadmium	12.9	0.0016	3.86	0.49	Equation	2.51	0.49	0.02	9.82E-02	6.38E-02	2.68E-04	8.96E-05	1.62E-01
Chromium	5.0	0.000	2.78	0.49	0.04	0.21	0.49	0.02	7.06E-02	5.21E-03	1.04E-04	0.00E+00	7.59E-02
Copper	399	0.0162	64.9	0.49	Equation	20.7	0.49	0.02	1.65E+00	5.26E-01	8.30E-03	9.07E-04	2.19E+00
Lead	1733	0.0219	25.2	0.49	Equation	17.4	0.49	0.02	6.41E-01	4.42E-01	3.60E-02	1.23E-03	1.12E+00
Mercury	0.10	0.000	0.09	0.49	Equation	0.11	0.49	0.02	2.24E-03	2.68E-03	2.08E-06	0.00E+00	4.92E-03
Nickel	9.2	0.000	0.52	0.49	Equation	0.57	0.49	0.02	1.31E-02	1.45E-02	1.91E-04	0.00E+00	2.78E-02
Selenium	1.0	0.000	0.88	0.49	Equation	0.51	0.49	0.02	2.24E-02	1.29E-02	2.08E-05	0.00E+00	3.53E-02
Silver	6.4	0.000	0.22	0.49	0.014	0.090	0.49	0.02	5.59E-03	2.28E-03	1.33E-04	0.00E+00	8.01E-03
Zinc	4054	0.488	799	0.49	Equation	486	0.49	0.02	2.03E+01	1.24E+01	8.43E-02	2.73E-02	3.28E+01

COPECs	CTE** Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet: Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration ($C_{plant, dw}$)	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	Sediment $Dose_{sed}$[3]	Water $Dose_{water}$[4]	Total EDD[5]
Arsenic	27.4	0.000	1.27	0.49	Equation	0.88	0.49	0.02	3.22E-02	2.24E-02	5.70E-04	0.00E+00	5.52E-02
Cadmium	11.1	0.0014	2.84	0.49	Equation	2.31	0.49	0.02	7.22E-02	5.88E-02	2.31E-04	7.84E-05	1.31E-01
Chromium	4.7	0.000	2.56	0.49	0.04	0.19	0.49	0.02	6.51E-02	4.90E-03	9.78E-05	0.00E+00	7.01E-02
Copper	339	0.0155	62.4	0.49	Equation	19.4	0.49	0.02	1.59E+00	4.93E-01	7.05E-03	8.68E-04	2.09E+00
Lead	1508	0.0116	21.3	0.49	Equation	16.1	0.49	0.02	5.43E-01	4.09E-01	3.14E-02	6.50E-04	9.84E-01
Mercury	0.07	0.000	0.09	0.49	Equation	0.09	0.49	0.02	2.16E-03	2.21E-03	1.46E-06	0.00E+00	4.37E-03
Nickel	8.2	0.000	0.52	0.49	Equation	0.52	0.49	0.02	1.31E-02	1.33E-02	1.71E-04	0.00E+00	2.66E-02
Selenium	1.5	0.000	0.88	0.49	Equation	0.79	0.49	0.02	2.24E-02	2.02E-02	3.12E-05	0.00E+00	4.27E-02
Silver	5.5	0.000	0.21	0.49	0.014	0.077	0.49	0.02	5.39E-03	1.96E-03	1.14E-04	0.00E+00	7.46E-03
Zinc	3172	0.432	579	0.49	Equation	424	0.49	0.02	1.47E+01	1.08E+01	6.60E-02	2.42E-02	2.56E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
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RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
$IR_{sediment}$ (kg/kg DW-day,dw)	0.00104

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{plant} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times plant\ BSAF)$ or the result of the BSAF regression equation

3 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

4 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

5 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Table 4.55

EDDs for mallards foraging at sampling location A72 on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day)										Total EDD[5]
			Diet								Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF$_{Invert}$	Plant BSAFs	Plant Concentration (C$_{plant, dw}$)	Df$_{plant}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{plant}$[2]	Dose$_{sed}$[3]	Dose$_{water}$[4]	
Arsenic	39.6	0.0050	0.27	0.49	Equation	1.09	0.49	0.02	6.76E-03	2.76E-02	8.24E-04	2.80E-04	3.55E-02
Cadmium	2.9	0.0019	0.68	0.49	Equation	1.11	0.49	0.02	1.73E-02	2.83E-02	6.03E-05	1.06E-04	4.57E-02
Chromium	6.1	0.000	2.16	0.49	0.04	0.25	0.49	0.02	5.50E-02	6.36E-03	1.27E-04	0.00E+00	6.14E-02
Copper	173	0.0307	38	0.49	Equation	14.9	0.49	0.02	9.74E-01	3.78E-01	3.60E-03	1.72E-03	1.36E+00
Lead	581	0.0305	7.6	0.49	Equation	9.4	0.49	0.02	1.92E-01	2.40E-01	1.21E-02	1.71E-03	4.46E-01
Mercury	0.070	0.000	0.11	0.49	Equation	0.09	0.49	0.02	2.72E-03	2.21E-03	1.46E-06	0.00E+00	4.93E-03
Nickel	5.9	0.0037	0.27	0.49	Equation	0.41	0.49	0.02	6.76E-03	1.04E-02	1.23E-04	2.07E-04	1.75E-02
Selenium	1.9	0.000	0.53	0.49	Equation	1.03	0.49	0.02	1.36E-02	2.62E-02	3.95E-05	0.00E+00	3.98E-02
Silver	2.4	0.000	0.27	0.49	0.014	0.034	0.49	0.02	6.76E-03	8.54E-04	4.99E-05	0.00E+00	7.67E-03
Zinc	819	0.711	166	0.49	Equation	200	0.49	0.02	4.23E+00	5.08E+00	1.70E-02	3.98E-02	9.37E+00

COPECs	CTE** Exposure Point Concentration		EDD (mg/kg bw-day)										Total EDD[5]
			Diet								Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF$_{Invert}$	Plant BSAFs	Plant Concentration (C$_{plant, dw}$)	Df$_{plant}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{plant}$[2]	Dose$_{sed}$[3]	Dose$_{water}$[4]	
Arsenic	33.4	0.0050	0.27	0.49	Equation	0.99	0.49	0.02	6.76E-03	2.51E-02	6.95E-04	2.80E-04	3.28E-02
Cadmium	2.1	0.0016	0.68	0.49	Equation	0.93	0.49	0.02	1.73E-02	2.37E-02	4.37E-05	8.96E-05	4.11E-02
Chromium	4.6	0.000	2.16	0.49	0.04	0.19	0.49	0.02	5.50E-02	4.80E-03	9.57E-05	0.00E+00	5.98E-02
Copper	137	0.0274	38	0.49	Equation	13.6	0.49	0.02	9.74E-01	3.45E-01	2.85E-03	1.53E-03	1.32E+00
Lead	478	0.0128	7.6	0.49	Equation	8.4	0.49	0.02	1.92E-01	2.15E-01	9.94E-03	7.17E-04	4.18E-01
Mercury	0.06	0.000	0.11	0.49	Equation	0.08	0.49	0.02	2.72E-03	2.03E-03	1.25E-06	0.00E+00	4.76E-03
Nickel	5.1	0.0050	0.27	0.49	Equation	0.37	0.49	0.02	6.76E-03	9.31E-03	1.06E-04	2.80E-04	1.65E-02
Selenium	1.5	0.000	0.53	0.49	Equation	0.79	0.49	0.02	1.36E-02	2.02E-02	3.12E-05	0.00E+00	3.38E-02
Silver	1.9	0.000	0.27	0.49	0.014	0.027	0.49	0.02	6.76E-03	6.76E-04	3.95E-05	0.00E+00	7.48E-03
Zinc	651	0.600	166	0.49	Equation	176	0.49	0.02	4.23E+00	4.48E+00	1.35E-02	3.36E-02	8.75E+00

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 Dose$_{invert}$ = IR$_{diet}$ X C$_{invert}$ X DF$_{invert}$ X AUF

2 Dose$_{plant}$ = IR$_{diet}$ X C$_{plant}$ X DF$_{plant}$ X AUF

Where C$_{plant}$ = (EPC$_{sediment}$ X plant BSAF) or the result of the BSAF regression equation

3 Dose$_{sed}$ = Ir$_{sediment}$ X EPC$_{sediment}$ X Df$_{sed}$ X AUF

4 Dose$_{water}$ = IR$_{water}$ X C$_{water}$ X AUF

5 Total EDD = Dose$_{invert}$ + Dose$_{plant}$ + Dose$_{sed}$ + Dose$_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR$_{diet}$ (kg/kg BW-day, dw)	0.0519
IR$_{water}$ (L/kg BW-day)	0.056
IR$_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.56
EDDs for mallards foraging at sampling location A73 on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	Dose $_{invert}$[1]	Dose $_{plant}$[2]	Dose $_{sed}$[3]	Dose$_{water}$[4]	Total EDD[5]
Arsenic	33.8	0.000	0.69	0.49	Equation	0.99	0.49	0.02	1.76E-02	2.53E-02	7.03E-04	0.00E+00	4.36E-02
Cadmium	5.4	0.0021	0.94	0.49	Equation	1.56	0.49	0.02	2.38E-02	3.97E-02	1.12E-04	1.18E-04	6.37E-02
Chromium	5.4	0.000	2.03	0.49	0.04	0.22	0.49	0.02	5.17E-02	5.63E-03	1.12E-04	0.00E+00	5.74E-02
Copper	284	0.0228	33	0.49	Equation	18.1	0.49	0.02	8.45E-01	4.60E-01	5.91E-03	1.28E-03	1.31E+00
Lead	729	0.0234	6.7	0.49	Equation	10.7	0.49	0.02	1.71E-01	2.72E-01	1.52E-02	1.31E-03	4.60E-01
Mercury	0.05	0.000	0.11	0.49	Equation	0.07	0.49	0.02	2.80E-03	1.84E-03	1.04E-06	0.00E+00	4.64E-03
Nickel	7.2	0.0038	0.58	0.49	Equation	0.47	0.49	0.02	1.46E-02	1.20E-02	1.50E-04	2.13E-04	2.71E-02
Selenium	1.4	0.000	0.55	0.49	Equation	0.74	0.49	0.02	1.40E-02	1.87E-02	2.91E-05	0.00E+00	3.27E-02
Silver	2.8	0.000	0.28	0.49	0.014	0.039	0.49	0.02	6.99E-03	9.97E-04	5.82E-05	0.00E+00	8.05E-03
Zinc	1393	0.704	197	0.49	Equation	268	0.49	0.02	5.02E+00	6.83E+00	2.90E-02	3.94E-02	1.19E+01

COPECs	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	Dose $_{invert}$[1]	Dose $_{plant}$[2]	Dose $_{sed}$[3]	Dose$_{water}$[4]	Total EDD[5]
Arsenic	27.9	0.000	0.69	0.49	Equation	0.89	0.49	0.02	1.76E-02	2.27E-02	5.80E-04	0.00E+00	4.09E-02
Cadmium	4.0	0.0015	0.94	0.49	Equation	1.32	0.49	0.02	2.38E-02	3.37E-02	8.32E-05	8.40E-05	5.76E-02
Chromium	4.0	0.000	2.03	0.49	0.04	0.16	0.49	0.02	5.17E-02	4.17E-03	8.32E-05	0.00E+00	5.59E-02
Copper	199	0.0178	33	0.49	Equation	15.7	0.49	0.02	8.45E-01	4.00E-01	4.14E-03	9.97E-04	1.25E+00
Lead	513	0.0111	6.7	0.49	Equation	8.8	0.49	0.02	1.71E-01	2.23E-01	1.07E-02	6.22E-04	4.06E-01
Mercury	0.04	0.000	0.11	0.49	Equation	0.06	0.49	0.02	2.80E-03	1.63E-03	8.32E-07	0.00E+00	4.43E-03
Nickel	6.4	0.0038	0.58	0.49	Equation	0.43	0.49	0.02	1.46E-02	1.10E-02	1.33E-04	2.13E-04	2.60E-02
Selenium	1.1	0.000	0.55	0.49	Equation	0.56	0.49	0.02	1.40E-02	1.43E-02	2.29E-05	0.00E+00	2.83E-02
Silver	1.9	0.000	0.28	0.49	0.014	0.027	0.49	0.02	6.99E-03	6.76E-04	3.95E-05	0.00E+00	7.71E-03
Zinc	1049	0.521	197	0.49	Equation	229	0.49	0.02	5.02E+00	5.83E+00	2.18E-02	2.92E-02	1.09E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{plant} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times plant\ BSAF)$ or the result of the BSAF regression equation

3 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

4 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

5 $Total\ EDD = Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR$_{diet}$ (kg/kg BW-day, dw)	0.0519
IR$_{water}$ (L/kg BW-day)	0.056
IR$_{sediment}$ (kg/kg DW-day,dw)	0.00104

Created by: EC 1/20/14
QC'd by: SJP 2/13/14
Updated by: EC 2/27/15
QC'd by: RI 3/3/15

Table 4.57
EDDs for mallards foraging at sampling location A73B on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	$Dose_{sed}$[3]	$Dose_{water}$[4]	Total EDD[5]
Arsenic	39.4	0.000	Equation	8.15	0.49	Equation	1.08	0.49	0.02	2.07E-01	2.75E-02	8.20E-04	0.00E+00	2.36E-01
Cadmium	4.2	0.0015	Equation	1.01	0.49	Equation	1.36	0.49	0.02	2.58E-02	3.46E-02	8.74E-05	8.40E-05	6.05E-02
Chromium	5.0	0.0058	Equation	2.91	0.49	0.04	0.21	0.49	0.02	7.41E-02	5.21E-03	1.04E-04	3.25E-04	7.97E-02
Copper	292	0.0131	0.824	241	0.49	Equation	18.3	0.49	0.02	6.12E+00	4.65E-01	6.07E-03	7.34E-04	6.59E+00
Lead	593	0.0106	Equation	19.8	0.49	Equation	9.5	0.49	0.02	5.03E-01	2.42E-01	1.23E-02	5.94E-04	7.58E-01
Mercury	0.09	0.000	Equation	1.19	0.49	Equation	0.10	0.49	0.02	3.02E-02	2.53E-03	1.87E-06	0.00E+00	3.27E-02
Nickel	12.1	0.0029	Equation	2.05	0.49	Equation	0.70	0.49	0.02	5.22E-02	1.78E-02	2.52E-04	1.62E-04	7.04E-02
Selenium	2.9	0.000	1.00	2.90	0.49	Equation	1.64	0.49	0.02	7.37E-02	4.18E-02	6.03E-05	0.00E+00	1.16E-01
Silver	3.1	0.000	0.18	0.56	0.49	0.014	0.043	0.49	0.02	1.42E-02	1.10E-03	6.45E-05	0.00E+00	1.54E-02
Zinc	1720	0.498	Equation	198	0.49	Equation	302	0.49	0.02	5.05E+00	7.68E+00	3.58E-02	2.79E-02	1.28E+01

COPECs	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	$Dose_{sed}$[3]	$Dose_{water}$[4]	Total EDD[5]
Arsenic	29.9	0.000	Equation	6.62	0.49	Equation	0.93	0.49	0.02	1.68E-01	2.36E-02	6.22E-04	0.00E+00	1.92E-01
Cadmium	3.5	0.0010	Equation	0.92	0.49	Equation	1.23	0.49	0.02	2.35E-02	3.13E-02	7.28E-05	5.60E-05	5.49E-02
Chromium	4.5	0.0058	Equation	2.80	0.49	0.04	0.18	0.49	0.02	7.13E-02	4.69E-03	9.36E-05	3.25E-04	7.64E-02
Copper	177	0.0094	0.824	146	0.49	Equation	15.0	0.49	0.02	3.71E+00	3.82E-01	3.68E-03	5.26E-04	4.09E+00
Lead	534	0.0055	Equation	18.5	0.49	Equation	9.0	0.49	0.02	4.69E-01	2.28E-01	1.11E-02	3.08E-04	7.09E-01
Mercury	0.07	0.000	Equation	1.19	0.49	Equation	0.09	0.49	0.02	3.02E-02	2.21E-03	1.46E-06	0.00E+00	3.24E-02
Nickel	10.0	0.0029	Equation	1.80	0.49	Equation	0.61	0.49	0.02	4.57E-02	1.54E-02	2.08E-04	1.62E-04	6.15E-02
Selenium	2.9	0.000	1.00	2.90	0.49	Equation	1.64	0.49	0.02	7.37E-02	4.18E-02	6.03E-05	0.00E+00	1.16E-01
Silver	2.0	0.000	0.18	0.36	0.49	0.014	0.028	0.49	0.02	9.16E-03	7.12E-04	4.16E-05	0.00E+00	9.91E-03
Zinc	1114	0.265	Equation	188	0.49	Equation	237	0.49	0.02	4.78E+00	6.03E+00	2.32E-02	1.48E-02	1.08E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

Where C_{invert} = ($EPC_{sediment} \times$ Invert BSAF) or the result of the BSAF regression equation

2 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{plant} \times AUF$

Where C_{plant} = ($EPC_{sediment} \times$ plant BSAF) or the result of the BSAF regression equation

3 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

4 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

5 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
$IR_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.58
EDDs for mallards foraging at sampling location A75D on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	EDD (mg/kg bw-day) Diet Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	Sediment $Dose_{sed}$[3]	Water $Dose_{water}$[4]	Total EDD[5]
Arsenic	27.0	0.000	0.61	0.49	Equation	0.88	0.49	0.02	1.56E-02	2.23E-02	5.62E-04	0.00E+00	3.84E-02
Cadmium	6.4	0.0014	0.78	0.49	Equation	1.71	0.49	0.02	1.99E-02	4.35E-02	1.33E-04	7.84E-05	6.37E-02
Chromium	4.9	0.000	3.26	0.49	0.04	0.20	0.49	0.02	8.28E-02	5.11E-03	1.02E-04	0.00E+00	8.80E-02
Copper	212	0.0197	15.1	0.49	Equation	16.1	0.49	0.02	3.83E-01	4.10E-01	4.41E-03	1.10E-03	7.98E-01
Lead	367	0.0231	2.3	0.49	Equation	7.3	0.49	0.02	5.83E-02	1.85E-01	7.63E-03	1.29E-03	2.52E-01
Mercury	0.04	0.000	0.25	0.49	Equation	0.06	0.49	0.02	6.23E-03	1.63E-03	8.32E-07	0.00E+00	7.86E-03
Nickel	12.4	0.000	0.61	0.49	Equation	0.71	0.49	0.02	1.56E-02	1.81E-02	2.58E-04	0.00E+00	3.39E-02
Selenium	1.4	0.000	1.22	0.49	Equation	0.74	0.49	0.02	3.11E-02	1.87E-02	2.91E-05	0.00E+00	4.99E-02
Silver	1.4	0.000	0.61	0.49	0.014	0.020	0.49	0.02	1.56E-02	4.98E-04	2.91E-05	0.00E+00	1.61E-02
Zinc	2778	0.503	187	0.49	Equation	394	0.49	0.02	4.76E+00	1.00E+01	5.78E-02	2.82E-02	1.49E+01

COPECs	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	EDD (mg/kg bw-day) Diet Invert Tissue Concentration (dw)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	Sediment $Dose_{sed}$[3]	Water $Dose_{water}$[4]	Total EDD[5]
Arsenic	19.4	0.000	0.61	0.49	Equation	0.73	0.49	0.02	1.56E-02	1.85E-02	4.04E-04	0.00E+00	3.45E-02
Cadmium	4.8	0.0010	0.78	0.49	Equation	1.46	0.49	0.02	1.99E-02	3.72E-02	9.98E-05	5.60E-05	5.73E-02
Chromium	4.2	0.000	3.26	0.49	0.04	0.17	0.49	0.02	8.28E-02	4.38E-03	8.74E-05	0.00E+00	8.73E-02
Copper	147	0.0138	15.1	0.49	Equation	13.9	0.49	0.02	3.83E-01	3.55E-01	3.06E-03	7.73E-04	7.41E-01
Lead	300	0.0112	2.3	0.49	Equation	6.5	0.49	0.02	5.83E-02	1.65E-01	6.24E-03	6.27E-04	2.31E-01
Mercury	0.04	0.000	0.25	0.49	Equation	0.06	0.49	0.02	6.23E-03	1.63E-03	8.32E-07	0.00E+00	7.86E-03
Nickel	9.4	0.000	0.61	0.49	Equation	0.58	0.49	0.02	1.56E-02	1.47E-02	1.96E-04	0.00E+00	3.05E-02
Selenium	1.2	0.000	1.22	0.49	Equation	0.62	0.49	0.02	3.11E-02	1.58E-02	2.50E-05	0.00E+00	4.69E-02
Silver	1.1	0.000	0.61	0.49	0.014	0.015	0.49	0.02	1.56E-02	3.92E-04	2.29E-05	0.00E+00	1.60E-02
Zinc	1738	0.361	187	0.49	Equation	304	0.49	0.02	4.76E+00	7.72E+00	3.62E-02	2.02E-02	1.25E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

2 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{plant} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times plant\ BSAF)$ or the result of the BSAF regression equation

3 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

4 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

5 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR_{diet} (kg/kg BW-day, dw)	0.0519
IR_{water} (L/kg BW-day)	0.056
$IR_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.59
EDDs for mallards foraging at sampling location A75B on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	$Dose_{sed}$[3]	$Dose_{water}$[4]	Total EDD[5]
Arsenic	37.2	0.000	Equation	7.80	0.49	Equation	1.05	0.49	0.02	1.98E-01	2.67E-02	7.74E-04	0.00E+00	2.26E-01
Cadmium	10.5	0.0011	Equation	1.62	0.49	Equation	2.24	0.49	0.02	4.12E-02	5.70E-02	2.18E-04	6.16E-05	9.86E-02
Chromium	5.5	0.000	Equation	3.02	0.49	0.04	0.23	0.49	0.02	7.67E-02	5.73E-03	1.14E-04	0.00E+00	8.25E-02
Copper	413	0.0215	0.824	340	0.49	Equation	21.0	0.49	0.02	8.65E+00	5.33E-01	8.59E-03	1.20E-03	9.20E+00
Lead	435	0.0303	Equation	16.1	0.49	Equation	8.0	0.49	0.02	4.10E-01	2.04E-01	9.05E-03	1.70E-03	6.25E-01
Mercury	0.07	0.000	Equation	1.19	0.49	Equation	0.09	0.49	0.02	3.02E-02	2.21E-03	1.46E-06	0.00E+00	3.24E-02
Nickel	16.5	0.000	Equation	2.55	0.49	Equation	0.88	0.49	0.02	6.48E-02	2.24E-02	3.43E-04	0.00E+00	8.75E-02
Selenium	3.3	0.000	1.00	3.30	0.49	Equation	1.90	0.49	0.02	8.39E-02	4.82E-02	6.86E-05	0.00E+00	1.32E-01
Silver	2.2	0.000	0.18	0.40	0.49	0.014	0.031	0.49	0.02	1.01E-02	7.83E-04	4.58E-05	0.00E+00	1.09E-02
Zinc	5320	0.429	Equation	229	0.49	Equation	565	0.49	0.02	5.82E+00	1.44E+01	1.11E-01	2.40E-02	2.03E+01

COPECs	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	BSAFs	Invert Tissue Concentration ($C_{invert, dw}$)	DF_{Invert}	Plant BSAFs	Plant Concentration (C_{plant})	Df_{plant}	$Df_{sediment}$	$Dose_{invert}$[1]	$Dose_{plant}$[2]	$Dose_{sed}$[3]	$Dose_{water}$[4]	Total EDD[5]
Arsenic	19.9	0.000	Equation	4.87	0.49	Equation	0.74	0.49	0.02	1.24E-01	1.87E-02	4.14E-04	0.00E+00	1.43E-01
Cadmium	5.0	0.0009	Equation	1.11	0.49	Equation	1.50	0.49	0.02	2.82E-02	3.80E-02	1.04E-04	5.04E-05	6.64E-02
Chromium	5.2	0.000	Equation	2.95	0.49	0.04	0.21	0.49	0.02	7.51E-02	5.42E-03	1.08E-04	0.00E+00	8.07E-02
Copper	188	0.0122	0.824	155	0.49	Equation	15.4	0.49	0.02	3.94E+00	3.91E-01	3.91E-03	6.83E-04	4.33E+00
Lead	296	0.0121	Equation	12.6	0.49	Equation	6.5	0.49	0.02	3.19E-01	1.64E-01	6.16E-03	6.78E-04	4.90E-01
Mercury	0.07	0.000	Equation	1.19	0.49	Equation	0.09	0.49	0.02	3.02E-02	2.21E-03	1.46E-06	0.00E+00	3.24E-02
Nickel	9.7	0.000	Equation	1.76	0.49	Equation	0.59	0.49	0.02	4.48E-02	1.51E-02	2.02E-04	0.00E+00	6.00E-02
Selenium	1.9	0.000	1.00	1.90	0.49	Equation	1.03	0.49	0.02	4.83E-02	2.62E-02	3.95E-05	0.00E+00	7.46E-02
Silver	1.4	0.000	0.18	0.25	0.49	0.014	0.020	0.49	0.02	6.41E-03	4.98E-04	2.91E-05	0.00E+00	6.94E-03
Zinc	2190	0.302	Equation	205	0.49	Equation	345	0.49	0.02	5.20E+00	8.78E+00	4.56E-02	1.69E-02	1.40E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{invert} = IR_{diet} \times C_{invert} \times DF_{invert} \times AUF$

Where $C_{invert} = (EPC_{sediment} \times Invert\ BSAF)$ or the result of the BSAF regression equation

2 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{plant} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times plant\ BSAF)$ or the result of the BSAF regression equation

3 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

4 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

5 Total EDD = $Dose_{invert} + Dose_{plant} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF) 1.0

Body Weight (BW) (kg) 1.162

IR_{diet} (kg/kg BW-day, dw) 0.0519

IR_{water} (L/kg BW-day) 0.056

$IR_{sediment}$ (kg/kg DW-day,dw) 0.00104

Created by: EC 1/20/14
QC'd by: SJP 2/13/14
Updated by: EC 2/27/15
QC'd by: RI 3/3/15

Table 4.60

EDDs for mallards foraging at the Bakers Bridge sampling location on the Animas R. below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF$_{Invert}$	Plant BSAFs	Plant Concentration (C$_{plant}$)	Df$_{plant}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{plant}$[2]	Sediment Dose$_{sed}$[3]	Water Dose$_{water}$[4]	Total EDD[5]
Arsenic	29.7	0	0.23	0.49	Equation	0.92	0.49	0.02	5.87E-03	2.35E-02	6.18E-04	0.00E+00	3.00E-02
Cadmium	18.6	0.0008	1.59	0.49	Equation	3.06	0.49	0.02	4.05E-02	7.79E-02	3.87E-04	4.48E-05	1.19E-01
Chromium	7.0	0	2.05	0.49	0.04	0.29	0.49	0.02	5.21E-02	7.30E-03	1.46E-04	0.00E+00	5.95E-02
Copper	332	0.0138	17.6	0.49	Equation	19.2	0.49	0.02	4.47E-01	4.89E-01	6.91E-03	7.73E-04	9.44E-01
Lead	376	0.0177	2.5	0.49	Equation	7.4	0.49	0.02	6.44E-02	1.88E-01	7.82E-03	9.91E-04	2.61E-01
Mercury	0.06	0	0.09	0.49	Equation	0.08	0.49	0.02	2.37E-03	2.03E-03	1.25E-06	0.00E+00	4.40E-03
Nickel	31.0	0	1.59	0.49	Equation	1.41	0.49	0.02	4.04E-02	3.59E-02	6.45E-04	0.00E+00	7.69E-02
Selenium	3.1	0	0.47	0.49	Equation	1.77	0.49	0.02	1.18E-02	4.50E-02	6.45E-05	0.00E+00	5.69E-02
Silver	1.7	0	0.23	0.49	0.014	0.024	0.49	0.02	5.87E-03	6.05E-04	3.54E-05	0.00E+00	6.52E-03
Zinc	8544	0.272	353	0.49	Equation	735	0.49	0.02	8.98E+00	1.87E+01	1.78E-01	1.52E-02	2.79E+01

COPECs	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (µg/L)	Invert Tissue Concentration (dw)	DF$_{Invert}$	Plant BSAFs	Plant Concentration (C$_{plant}$)	Df$_{plant}$	Df$_{sediment}$	Dose$_{invert}$[1]	Dose$_{plant}$[2]	Sediment Dose$_{sed}$[3]	Water Dose$_{water}$[4]	Total EDD[5]
Arsenic	21.9	0	0.23	0.49	Equation	0.78	0.49	0.02	5.87E-03	1.98E-02	4.56E-04	0.00E+00	2.61E-02
Cadmium	10.1	0.0007	1.59	0.49	Equation	2.20	0.49	0.02	4.05E-02	5.58E-02	2.10E-04	3.92E-05	9.66E-02
Chromium	5.4	0	2.05	0.49	0.04	0.22	0.49	0.02	5.21E-02	5.63E-03	1.12E-04	0.00E+00	5.78E-02
Copper	191	0.0095	17.6	0.49	Equation	15.5	0.49	0.02	4.47E-01	3.93E-01	3.97E-03	5.32E-04	8.45E-01
Lead	300	0.0078	2.5	0.49	Equation	6.5	0.49	0.02	6.44E-02	1.65E-01	6.24E-03	4.37E-04	2.36E-01
Mercury	0.04	0	0.09	0.49	Equation	0.06	0.49	0.02	2.37E-03	1.63E-03	8.32E-07	0.00E+00	4.00E-03
Nickel	18.3	0	1.59	0.49	Equation	0.95	0.49	0.02	4.04E-02	2.42E-02	3.81E-04	0.00E+00	6.50E-02
Selenium	2.1	0	0.47	0.49	Equation	1.15	0.49	0.02	1.18E-02	2.93E-02	4.37E-05	0.00E+00	4.12E-02
Silver	1.3	0	0.23	0.49	0.014	0.018	0.49	0.02	5.87E-03	4.63E-04	2.70E-05	0.00E+00	6.36E-03
Zinc	4620	0.216	353	0.49	Equation	522	0.49	0.02	8.98E+00	1.33E+01	9.61E-02	1.21E-02	2.24E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations
1 Dose$_{invert}$ = IR$_{diet}$ X C$_{invert}$ X DF$_{invert}$ X AUF
2 Dose$_{plant}$ = IR$_{diet}$ X C$_{plant}$ X DF$_{plant}$ X AUF
Where C$_{plant}$ = (EPC$_{sediment}$ X plant BSAF) or the result of the BSAF regression equation
3 Dose$_{sed}$ = Ir$_{sediment}$ X EPC$_{sediment}$ X Df$_{sed}$ X AUF
4 Dose$_{water}$ = IR$_{water}$ X C$_{water}$ X AUF
5 Total EDD = Dose$_{invert}$ + Dose$_{plant}$ + Dose$_{sed}$ + Dose$_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.162
IR$_{diet}$ (kg/kg BW-day, dw)	0.0519
IR$_{water}$ (L/kg BW-day)	0.056
IR$_{sediment}$ (kg/kg DW-day,dw)	0.00104

Table 4.61
EDDs for the belted kingfisher foraging on the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration — Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet — BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{fish}	DF sediment	$Dose_{fish}$[1]	Sediment $Dose_{sediment}$[2]	Water $Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration — Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet — BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{Fish}	DF sediment	$Dose_{fish}$[1]	Sediment $Dose_{sediment}$[2]	Water $Dose_{water}$[3]	Total EDD[4]
Arsenic	34.2	0.000	0.126	4.31	0.98	0.02	3.67E-01	1.19E-03	0.00E+00	3.68E-01	27.4	0.000	0.126	3.45	0.98	0.02	2.94E-01	9.52E-04	0.00E+00	2.95E-01
Cadmium	12.9	0.0016	0.164	2.12	0.98	0.02	1.80E-01	4.48E-04	1.78E-04	1.81E-01	11.1	0.0014	0.164	1.82	0.98	0.02	1.55E-01	3.86E-04	1.55E-04	1.56E-01
Chromium	5.0	0.000	0.038	0.19	0.98	0.02	1.62E-02	1.74E-04	0.00E+00	1.64E-02	4.7	0.000	0.220	1.03	0.98	0.02	8.81E-02	1.63E-04	0.00E+00	8.82E-02
Copper	399	0.0162	0.100	39.9	0.98	0.02	3.40E+00	1.39E-02	1.80E-03	3.41E+00	339	0.0155	0.100	33.9	0.98	0.02	2.89E+00	1.18E-02	1.72E-03	2.90E+00
Lead	1733	0.0219	0.070	121	0.98	0.02	1.03E+01	6.02E-02	2.43E-03	1.04E+01	1508	0.0116	0.070	106	0.98	0.02	8.99E+00	5.24E-02	1.29E-03	9.04E+00
Mercury (inorganic)	0.10	0.000	3.25	0.325	0.98	0.02	2.77E-02	3.48E-06	0.00E+00	2.77E-02	0.07	0.000	0.13	0.009	0.98	0.02	7.75E-04	2.43E-06	0.00E+00	7.77E-04
Nickel	9.2	0.000	1.00	9.2	0.98	0.02	7.83E-01	3.20E-04	0.00E+00	7.84E-01	8.2	0.000	4.58	37.6	0.98	0.02	3.20E+00	2.85E-04	0.00E+00	3.20E+00
Selenium	1.0	0.000	1.00	1.00	0.98	0.02	8.50E-02	3.47E-05	0.00E+00	8.50E-02	1.5	0.000	1.00	1.500	0.98	0.02	1.28E-01	5.21E-05	0.00E+00	1.28E-01
Silver	6.4	0.000	1.00	6.40	0.98	0.02	5.45E-01	2.22E-04	0.00E+00	5.45E-01	5.5	0.000	1.00	5.50	0.98	0.02	4.68E-01	1.91E-04	0.00E+00	4.69E-01
Zinc	4054	0.488	0.147	596	0.98	0.02	5.08E+01	1.41E-01	5.42E-02	5.09E+01	3172	0.432	0.147	466	0.98	0.02	3.97E+01	1.10E-01	4.80E-02	3.99E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$

Where $C_{fish} = EPC_{sediment} \times BSAF$

2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

Table 4.62

EDDs for the belted kingfisher foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs[a]	RME* Exposure Point Concentration		EDD (mg/kg bw-day) Diet					Sediment	Water		CTE** Exposure Point Concentration		EDD (mg/kg bw-day) Diet					Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish,dw}$)	DF_{fish}	$DF_{sediment}$	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish,dw}$)	DF_{Fish}	$DF_{sediment}$	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	39.6	0.0050	0.126	4.99	0.98	0.02	4.25E-01	1.38E-03	5.55E-04	4.27E-01	33.4	0.0050	0.126	4.21	0.98	0.02	3.58E-01	1.16E-03	5.55E-04	3.60E-01
Cadmium	2.9	0.002	0.164	0.48	0.98	0.02	4.05E-02	1.01E-04	2.11E-04	4.08E-02	2.1	0.0016	0.164	0.34	0.98	0.02	2.93E-02	7.30E-05	1.78E-04	2.96E-02
Chromium	6.1	0.000	0.038	0.23	0.98	0.02	1.97E-02	2.12E-04	0.00E+00	2.00E-02	4.6	0.000	0.038	0.17	0.98	0.02	1.49E-02	1.60E-04	0.00E+00	1.50E-02
Copper	173	0.0307	0.100	17.3	0.98	0.02	1.47E+00	6.01E-03	3.41E-03	1.48E+00	137	0.0274	0.100	13.7	0.98	0.02	1.17E+00	4.76E-03	3.04E-03	1.17E+00
Lead	581	0.0305	0.070	41	0.98	0.02	3.46E+00	2.02E-02	3.39E-03	3.49E+00	478	0.0128	0.070	33	0.98	0.02	2.85E+00	1.66E-02	1.42E-03	2.87E+00
Mercury (inorganic)	0.070	0.000	3.25	0.228	0.98	0.02	1.94E-02	2.43E-06	0.00E+00	1.94E-02	0.06	0.000	3.25	0.195	0.98	0.02	1.66E-02	2.09E-06	0.00E+00	1.66E-02
Nickel	5.9	0.0037	1.00	5.9	0.98	0.02	5.02E-01	2.05E-04	4.11E-04	5.03E-01	5.1	0.0050	1.00	5.1	0.98	0.02	4.34E-01	1.77E-04	5.55E-04	4.35E-01
Selenium	1.9	0.000	1.00	1.90	0.98	0.02	1.62E-01	6.60E-05	0.00E+00	1.62E-01	1.5	0.000	1.00	1.500	0.98	0.02	1.28E-01	5.21E-05	0.00E+00	1.28E-01
Silver	2.4	0.000	1.00	2.40	0.98	0.02	2.04E-01	8.34E-05	0.00E+00	2.04E-01	1.9	0.000	1.00	1.90	0.98	0.02	1.62E-01	6.60E-05	0.00E+00	1.62E-01
Zinc	819	0.711	0.147	120	0.98	0.02	1.03E+01	2.85E-02	7.89E-02	1.04E+01	651	0.600	0.147	96	0.98	0.02	8.15E+00	2.26E-02	6.66E-02	8.24E+00

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$
Where $C_{fish} = EPC_{sediment} \times BSAF$
2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

Table 4.63

EDDs for the belted kingfisher foraging at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration		EDD (mg/kg bw-day) Diet					Sediment	Water		CTE** Exposure Point Concentration		EDD (mg/kg bw-day) Diet					Sediment	Water	
	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish,dw}$)	DF_{fish}	DF sediment	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish,dw}$)	DF_{Fish}	DF sediment	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	33.8	0.000	0.126	4.26	0.98	0.02	3.63E-01	1.17E-03	0.00E+00	3.64E-01	27.9	0.000	0.126	3.52	0.98	0.02	2.99E-01	9.70E-04	0.00E+00	3.00E-01
Cadmium	5.4	0.0021	0.164	0.89	0.98	0.02	7.54E-02	1.88E-04	2.33E-04	7.58E-02	4.0	0.0015	0.164	0.66	0.98	0.02	5.59E-02	1.39E-04	1.67E-04	5.62E-02
Chromium	5.4	0.000	0.038	0.21	0.98	0.02	1.75E-02	1.88E-04	0.00E+00	1.77E-02	4.0	0.000	0.038	0.15	0.98	0.02	1.29E-02	1.39E-04	0.00E+00	1.31E-02
Copper	284	0.0228	0.100	28.4	0.98	0.02	2.42E+00	9.87E-03	2.53E-03	2.43E+00	199	0.0178	0.100	19.9	0.98	0.02	1.69E+00	6.92E-03	1.98E-03	1.70E+00
Lead	729	0.0234	0.070	51	0.98	0.02	4.35E+00	2.53E-02	2.60E-03	4.37E+00	513	0.0111	0.070	36	0.98	0.02	3.06E+00	1.78E-02	1.23E-03	3.08E+00
Mercury (inorganic)	0.05	0.000	3.25	0.163	0.98	0.02	1.38E-02	1.74E-06	0.00E+00	1.38E-02	0.04	0.000	3.25	0.130	0.98	0.02	1.11E-02	1.39E-06	0.00E+00	1.11E-02
Nickel	7.2	0.0038	1.00	7.2	0.98	0.02	6.13E-01	2.50E-04	4.22E-04	6.14E-01	6.4	0.0038	1.00	6.4	0.98	0.02	5.45E-01	2.22E-04	4.22E-04	5.46E-01
Selenium	1.4	0.000	1.00	1.40	0.98	0.02	1.19E-01	4.87E-05	0.00E+00	1.19E-01	1.1	0.000	1.00	1.100	0.98	0.02	9.37E-02	3.82E-05	0.00E+00	9.37E-02
Silver	2.8	0.000	1.00	2.80	0.98	0.02	2.38E-01	9.73E-05	0.00E+00	2.39E-01	1.9	0.000	1.00	1.90	0.98	0.02	1.62E-01	6.60E-05	0.00E+00	1.62E-01
Zinc	1393	0.704	0.147	205	0.98	0.02	1.74E+01	4.84E-02	7.81E-02	1.76E+01	1049	0.521	0.147	154	0.98	0.02	1.31E+01	3.65E-02	5.78E-02	1.32E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations
1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$
Where $C_{fish} = EPC_{sediment} \times BSAF$
2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

COPECs	RME* Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet: BSAFs	Fish Tissue Concentation ($C_{fish, dw}$)	DF_{fish}	$DF_{sediment}$	$Dose_{fish}$[1]	Sediment $Dose_{sediment}$[2]	Water $Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet: BSAFs	Fish Tissue Concentation ($C_{fish, dw}$)	DF_{fish}	$DF_{sediment}$	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	39.4	0.000	0.126	4.96	0.98	0.02	4.23E-01	1.37E-03	0.00E+00	4.24E-01	29.9	0.000	0.126	3.77	0.98	0.02	3.21E-01	1.04E-03	0.00E+00	3.22E-01
Cadmium	4.2	0.0015	0.164	0.69	0.98	0.02	5.87E-02	1.46E-04	1.67E-04	5.90E-02	3.5	0.0010	0.164	0.57	0.98	0.02	4.89E-02	1.22E-04	1.11E-04	4.91E-02
Chromium	5.0	0.0058	0.038	0.19	0.98	0.02	1.62E-02	1.74E-04	6.44E-04	1.70E-02	4.5	0.0058	0.038	0.17	0.98	0.02	1.46E-02	1.56E-04	6.44E-04	1.54E-02
Copper	292	0.0131	0.100	29.2	0.98	0.02	2.49E+00	1.01E-02	1.45E-03	2.50E+00	177	0.0094	0.100	17.7	0.98	0.02	1.51E+00	6.15E-03	1.04E-03	1.51E+00
Lead	593	0.0106	0.070	42	0.98	0.02	3.54E+00	2.06E-02	1.18E-03	3.56E+00	534	0.0055	0.070	37	0.98	0.02	3.18E+00	1.86E-02	6.11E-04	3.20E+00
Mercury (inorganic)	0.09	0.000	3.25	0.293	0.98	0.02	2.49E-02	3.13E-06	0.00E+00	2.49E-02	0.07	0.000	3.25	0.228	0.98	0.02	1.94E-02	2.43E-06	0.00E+00	1.94E-02
Nickel	12.1	0.0029	1.00	12.1	0.98	0.02	1.03E+00	4.21E-04	3.22E-04	1.03E+00	10.0	0.0029	1.00	10.0	0.98	0.02	8.52E-01	3.48E-04	3.22E-04	8.52E-01
Selenium	2.9	0.000	1.00	2.90	0.98	0.02	2.47E-01	1.01E-04	0.00E+00	2.47E-01	2.9	0.000	1.00	2.900	0.98	0.02	2.47E-01	1.01E-04	0.00E+00	2.47E-01
Silver	3.1	0.000	1.00	3.10	0.98	0.02	2.64E-01	1.08E-04	0.00E+00	2.64E-01	2.0	0.000	1.00	2.00	0.98	0.02	1.70E-01	6.95E-05	0.00E+00	1.70E-01
Zinc	1720	0.498	0.147	253	0.98	0.02	2.15E+01	5.98E-02	5.53E-02	2.16E+01	1114	0.265	0.147	164	0.98	0.02	1.39E+01	3.87E-02	2.94E-02	1.40E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$

Where $C_{fish} = EPC_{sediment} \times BSAF$

2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

Table 4.65

EDDs for the belted kingfisher foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet: BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{fish}	DF sediment	$Dose_{fish}$[1]	Sediment $Dose_{sediment}$[2]	Water $Dose_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration: Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet: BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{Fish}	DF sediment	$Dose_{fish}$[1]	Sediment $Dose_{sediment}$[2]	Water $Dose_{water}$[3]	Total EDD[4]
Arsenic	27.0	0.000	0.126	3.40	0.98	0.02	2.90E-01	9.39E-04	0.00E+00	2.91E-01	19.4	0.000	0.126	2.44	0.98	0.02	2.08E-01	6.74E-04	0.00E+00	2.09E-01
Cadmium	6.4	0.0014	0.164	1.05	0.98	0.02	8.94E-02	2.22E-04	1.55E-04	8.98E-02	4.8	0.0010	0.164	0.79	0.98	0.02	6.70E-02	1.67E-04	1.11E-04	6.73E-02
Chromium	4.9	0.000	0.038	0.19	0.98	0.02	1.59E-02	1.70E-04	0.00E+00	1.60E-02	4.2	0.000	0.038	0.16	0.98	0.02	1.36E-02	1.46E-04	0.00E+00	1.37E-02
Copper	212	0.0197	0.100	21.2	0.98	0.02	1.81E+00	7.37E-03	2.19E-03	1.81E+00	147	0.0138	0.100	14.7	0.98	0.02	1.25E+00	5.11E-03	1.53E-03	1.26E+00
Lead	367	0.0231	0.070	26	0.98	0.02	2.19E+00	1.28E-02	2.56E-03	2.20E+00	300	0.0112	0.070	21	0.98	0.02	1.79E+00	1.04E-02	1.24E-03	1.80E+00
Mercury (inorganic)	0.04	0.000	3.25	0.130	0.98	0.02	1.11E-02	1.39E-06	0.00E+00	1.11E-02	0.04	0.000	3.25	0.130	0.98	0.02	1.11E-02	1.39E-06	0.00E+00	1.11E-02
Nickel	12.4	0.000	1.00	12.4	0.98	0.02	1.06E+00	4.31E-04	0.00E+00	1.06E+00	9.4	0.000	1.00	9.4	0.98	0.02	8.01E-01	3.27E-04	0.00E+00	8.01E-01
Selenium	1.4	0.000	1.00	1.40	0.98	0.02	1.19E-01	4.87E-05	0.00E+00	1.19E-01	1.20	0.000	1.00	1.200	0.98	0.02	1.02E-01	4.17E-05	0.00E+00	1.02E-01
Silver	1.4	0.000	1.00	1.40	0.98	0.02	1.19E-01	4.87E-05	0.00E+00	1.19E-01	1.1	0.000	1.00	1.10	0.98	0.02	9.37E-02	3.82E-05	0.00E+00	9.37E-02
Zinc	2778	0.503	0.147	408	0.98	0.02	3.48E+01	9.66E-02	5.58E-02	3.49E+01	1738	0.361	0.147	255	0.98	0.02	2.18E+01	6.04E-02	4.01E-02	2.19E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
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RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$
Where $C_{fish} = EPC_{sediment} \times BSAF$
2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

Table 4.66

EDDs for the belted kingfisher foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{fish}	DF sediment	Dose$_{fish}$[1]	Sediment Dose$_{sediment}$[2]	Water Dose$_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{Fish}	DF sediment	Dose$_{fish}$[1]	Sediment Dose$_{sediment}$[2]	Water Dose$_{water}$[3]	Total EDD[4]
Arsenic	37.2	0.000	0.126	4.69	0.98	0.02	3.99E-01	1.29E-03	0.00E+00	4.00E-01	19.9	0.000	0.126	2.51	0.98	0.02	2.14E-01	6.92E-04	0.00E+00	2.14E-01
Cadmium	10.5	0.0011	0.164	1.72	0.98	0.02	1.47E-01	3.65E-04	1.22E-04	1.47E-01	5.0	0.0009	0.164	0.82	0.98	0.02	6.98E-02	1.74E-04	9.99E-05	7.01E-02
Chromium	5.5	0.000	0.038	0.21	0.98	0.02	1.78E-02	1.91E-04	0.00E+00	1.80E-02	5.2	0.000	0.038	0.20	0.98	0.02	1.68E-02	1.81E-04	0.00E+00	1.70E-02
Copper	413	0.0215	0.100	41.3	0.98	0.02	3.52E+00	1.44E-02	2.39E-03	3.53E+00	188	0.0122	0.100	18.8	0.98	0.02	1.60E+00	6.53E-03	1.35E-03	1.61E+00
Lead	435	0.0303	0.070	30	0.98	0.02	2.59E+00	1.51E-02	3.36E-03	2.61E+00	296	0.0121	0.070	21	0.98	0.02	1.76E+00	1.03E-02	1.34E-03	1.78E+00
Mercury (inorganic)	0.07	0.000	3.25	0.228	0.98	0.02	1.94E-02	2.43E-06	0.00E+00	1.94E-02	0.07	0.000	3.25	0.228	0.98	0.02	1.94E-02	2.43E-06	0.00E+00	1.94E-02
Nickel	16.5	0.000	1.00	16.5	0.98	0.02	1.41E+00	5.74E-04	0.00E+00	1.41E+00	9.7	0.000	1.00	9.7	0.98	0.02	8.26E-01	3.37E-04	0.00E+00	8.26E-01
Selenium	3.3	0.000	1.00	3.30	0.98	0.02	2.81E-01	1.15E-04	0.00E+00	2.81E-01	1.9	0.000	1.00	1.900	0.98	0.02	1.62E-01	6.60E-05	0.00E+00	1.62E-01
Silver	2.2	0.000	1.00	2.20	0.98	0.02	1.87E-01	7.65E-05	0.00E+00	1.87E-01	1.4	0.000	1.00	1.40	0.98	0.02	1.19E-01	4.87E-05	0.00E+00	1.19E-01
Zinc	5320	0.429	0.147	782	0.98	0.02	6.66E+01	1.85E-01	4.76E-02	6.68E+01	2190	0.302	0.147	322	0.98	0.02	2.74E+01	7.61E-02	3.35E-02	2.75E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
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RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$

Where $C_{fish} = EPC_{sediment} \times BSAF$

2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{fish}$ + $Dose_{sediment}$ + $Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IR_{sed} (kg/kg BW-day, dw)	0.001738

Table 4.67
EDDs for the belted kingfisher foraging at the Bakers Bridge sampling location on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

| COPECs | RME* Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | | | CTE** Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | | |
| | | | Diet | | | | | | Water | | | | Diet | | | | | | Water | |
	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{fish}	$DF_{sediment}$	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Fish Tissue Concentration ($C_{fish, dw}$)	DF_{Fish}	$DF_{sediment}$	$Dose_{fish}$[1]	$Dose_{sediment}$[2]	$Dose_{water}$[3]	Total EDD[4]
Arsenic	29.7	0.000	0.126	3.74	0.98	0.02	3.19E-01	1.03E-03	0.00E+00	3.20E-01	21.9	0.000	0.126	2.76	0.98	0.02	2.35E-01	7.61E-04	0.00E+00	2.36E-01
Cadmium	18.6	0.0008	0.164	3.05	0.98	0.02	2.60E-01	6.47E-04	8.88E-05	2.61E-01	10.1	0.0007	0.164	1.66	0.98	0.02	1.41E-01	3.51E-04	7.77E-05	1.41E-01
Chromium	7.0	0.000	0.038	0.27	0.98	0.02	2.27E-02	2.43E-04	0.00E+00	2.29E-02	5.4	0.000	0.038	0.21	0.98	0.02	1.75E-02	1.88E-04	0.00E+00	1.77E-02
Copper	332	0.0138	0.100	33.2	0.98	0.02	2.83E+00	1.15E-02	1.53E-03	2.84E+00	191	0.0095	0.100	19.1	0.98	0.02	1.63E+00	6.64E-03	1.05E-03	1.63E+00
Lead	376	0.0177	0.070	26	0.98	0.02	2.24E+00	1.31E-02	1.96E-03	2.26E+00	300	0.0078	0.070	21	0.98	0.02	1.79E+00	1.04E-02	8.66E-04	1.80E+00
Mercury (inorganic)	0.06	0.000	3.25	0.195	0.98	0.02	1.66E-02	2.09E-06	0.00E+00	1.66E-02	0.04	0.000	3.25	0.130	0.98	0.02	1.11E-02	1.39E-06	0.00E+00	1.11E-02
Nickel	31.0	0.000	1.00	31.0	0.98	0.02	2.64E+00	1.08E-03	0.00E+00	2.64E+00	18.3	0.000	1.00	18.3	0.98	0.02	1.56E+00	6.36E-04	0.00E+00	1.56E+00
Selenium	3.1	0.000	1.00	3.10	0.98	0.02	2.64E-01	1.08E-04	0.00E+00	2.64E-01	2.1	0.000	1.00	2.100	0.98	0.02	1.79E-01	7.30E-05	0.00E+00	1.79E-01
Silver	1.7	0.000	1.00	1.70	0.98	0.02	1.45E-01	5.91E-05	0.00E+00	1.45E-01	1.3	0.000	1.00	1.30	0.98	0.02	1.11E-01	4.52E-05	0.00E+00	1.11E-01
Zinc	8544	0.272	0.147	1256	0.98	0.02	1.07E+02	2.97E-01	3.02E-02	1.07E+02	4620	0.216	0.147	679	0.98	0.02	5.78E+01	1.61E-01	2.40E-02	5.80E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
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DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{fish} = (IR_{diet} \times C_{fish} \times DF_{fish} \times AUF)$
Where $C_{fish} = EPC_{sediment} \times BSAF$
2 $Dose_{sediment} = (IR_{sediment} \times EPC_{sediment} \times DF_{sediment} \times AUF)$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{fish} + Dose_{sediment} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	0.147
IR_{diet} (kg/kg BW-day, dw)	0.0869
IR_{water} (L/kg BW-day)	0.111
IRsed (kg/kg BW-day, dw)	0.001738

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4
Arsenic	34.2	0.000	Equation	1.00	0.9	0.1	7.55E-02	2.87E-02	0.00E+00	1.04E-01	27.4	0.000	Equation	0.88	0.9	0.1	6.66E-02	2.30E-02	0.00E+00	8.96E-02
Cadmium	12.9	0.0016	Equation	2.51	0.9	0.1	1.90E-01	1.08E-02	1.56E-04	2.01E-01	11.1	0.0014	Equation	2.31	0.9	0.1	1.75E-01	9.31E-03	1.37E-04	1.84E-01
Chromium	5.0	0.000	0.04	0.21	0.9	0.1	1.55E-02	4.20E-03	0.00E+00	1.97E-02	4.7	0.000	0.04	0.19	0.9	0.1	1.46E-02	3.94E-03	0.00E+00	1.85E-02
Copper	399	0.0162	Equation	20.7	0.9	0.1	1.56E+00	3.35E-01	1.58E-03	1.90E+00	339	0.0155	Equation	19.4	0.9	0.1	1.46E+00	2.84E-01	1.51E-03	1.75E+00
Lead	1733	0.0219	Equation	17.4	0.9	0.1	1.31E+00	1.45E+00	2.14E-03	2.77E+00	1508	0.0116	Equation	16.1	0.9	0.1	1.21E+00	1.27E+00	1.13E-03	2.48E+00
Mercury	0.10	0.000	Equation	0.11	0.9	0.1	7.97E-03	8.39E-05	0.00E+00	8.05E-03	0.07	0.000	Equation	0.09	0.9	0.1	6.56E-03	5.87E-05	0.00E+00	6.62E-03
Nickel	9.2	0.000	Equation	0.57	0.9	0.1	4.30E-02	7.72E-03	0.00E+00	5.07E-02	8.2	0.000	Equation	0.52	0.9	0.1	3.94E-02	6.88E-03	0.00E+00	4.63E-02
Selenium	1.0	0.000	Equation	0.51	0.9	0.1	3.82E-02	8.37E-04	0.00E+00	3.91E-02	1.5	0.000	Equation	0.79	0.9	0.1	6.00E-02	1.26E-03	0.00E+00	6.12E-02
Silver	6.4	0.000	0.014	0.090	0.9	0.1	6.77E-03	5.37E-03	0.00E+00	1.21E-02	5.5	0.000	0.014	0.077	0.9	0.1	5.81E-03	4.61E-03	0.00E+00	1.04E-02
Zinc	4054	0.488	Equation	486	0.9	0.1	3.67E+01	3.40E+00	4.76E-02	4.01E+01	3172	0.432	Equation	424	0.9	0.1	3.20E+01	2.66E+00	4.21E-02	3.47E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or gegression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR_{plant} (kg/kg BW-day, dw)	0.0839
IR_{water} (L/kg BW-day)	0.0975
$IR_{sediment}$ (kg/kg BW-day, dw)	0.00839

Created by: EC 1/20/14
QC'd by: SJP 2/8/14
Updated by: EC 3/1/15
QC'd by: RI 3/3/15

Table 4.69
EDDs for the muskrat foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) BSAFs	Plant tissue Concentration (C$_{plant, dw}$)	DF$_{plant}$	Df$_{sediment}$	Dose$_{plant}$[1]	Dose$_{sed}$[2]	Dose$_{water}$[3]	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) BSAFs	Plant tissue Concentration (C$_{plant, dw}$)	DF$_{plant}$	Df$_{sediment}$	Dose$_{plant}$[1]	Dose$_{sed}$[2]	Dose$_{water}$[3]	Total EDD[4]
Arsenic	39.6	0.0050	Equation	1.09	0.9	0.1	8.20E-02	3.32E-02	4.88E-04	1.16E-01	33.4	0.0050	Equation	0.99	0.9	0.1	7.45E-02	2.80E-02	4.88E-04	1.03E-01
Cadmium	2.9	0.002	Equation	1.11	0.9	0.1	8.39E-02	2.43E-03	1.85E-04	8.65E-02	2.1	0.0016	Equation	0.93	0.9	0.1	7.03E-02	1.76E-03	1.56E-04	7.23E-02
Chromium	6.1	0.000	0.04	0.25	0.9	0.1	1.89E-02	5.12E-03	0.00E+00	2.40E-02	4.6	0.000	0.04	0.19	0.9	0.1	1.42E-02	3.86E-03	0.00E+00	1.81E-02
Copper	173	0.0307	Equation	14.9	0.9	0.1	1.12E+00	1.45E-01	2.99E-03	1.27E+00	137	0.0274	Equation	13.6	0.9	0.1	1.02E+00	1.15E-01	2.67E-03	1.14E+00
Lead	581	0.0305	Equation	9.4	0.9	0.1	7.11E-01	4.87E-01	2.97E-03	1.20E+00	478	0.0128	Equation	8.4	0.9	0.1	6.37E-01	4.01E-01	1.25E-03	1.04E+00
Mercury	0.070	0.000	Equation	0.09	0.9	0.1	6.56E-03	5.87E-05	0.00E+00	6.62E-03	0.06	0.000	Equation	0.08	0.9	0.1	6.04E-03	5.03E-05	0.00E+00	6.09E-03
Nickel	5.9	0.0037	Equation	0.41	0.9	0.1	3.08E-02	4.95E-03	3.61E-04	3.61E-02	5.1	0.0050	Equation	0.37	0.9	0.1	2.76E-02	4.28E-03	4.88E-04	3.24E-02
Selenium	1.9	0.000	Equation	1.03	0.9	0.1	7.79E-02	1.59E-03	0.00E+00	7.95E-02	1.5	0.000	Equation	0.79	0.9	0.1	6.00E-02	1.26E-03	0.00E+00	6.12E-02
Silver	2.4	0.000	0.014	0.034	0.9	0.1	2.54E-03	2.01E-03	0.00E+00	4.55E-03	1.9	0.000	0.014	0.027	0.9	0.1	2.01E-03	1.59E-03	0.00E+00	3.60E-03
Zinc	819	0.711	Equation	200	0.9	0.1	1.51E+01	6.87E-01	6.93E-02	1.59E+01	651	0.600	Equation	176	0.9	0.1	1.33E+01	5.46E-01	5.85E-02	1.39E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 Dose$_{plant}$ = IR$_{diet}$ X C$_{plant}$ X DF$_{invert}$ X AUF

Where C$_{plant}$ = (EPC$_{sediment}$ X BSAF) or the result of the BSAF regression equation

2 Dose$_{sed}$ = Ir$_{sediment}$ X EPC$_{sediment}$ X Df$_{sed}$ X AUF

3 Dose$_{water}$ = IR$_{water}$ X C$_{water}$ X AUF

4 Total EDD = Dose$_{invert}$ + Dose$_{sed}$ + Dose$_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR$_{plant}$ (kg/kg BW-day, dw)	0.0839
IR$_{water}$ (L/kg BW-day)	0.0975
IR$_{sediment}$ (kg/kg BW-day, dw)	0.00839

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	RME*			EDD (mg/kg bw-day)							CTE**			EDD (mg/kg bw-day)						
	Exposure Point Concentration			Diet				Sediment	Water		Exposure Point Concentration			Diet				Sediment	Water	
COPECs	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD[4]	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD[4]
Arsenic	33.8	0.000	Equation	0.99	0.9	0.1	7.50E-02	2.84E-02	0.00E+00	1.03E-01	27.9	0.000	Equation	0.89	0.9	0.1	6.73E-02	2.34E-02	0.00E+00	9.07E-02
Cadmium	5.4	0.0021	Equation	1.56	0.9	0.1	1.18E-01	4.53E-03	2.05E-04	1.23E-01	4.0	0.0015	Equation	1.32	0.9	0.1	1.00E-01	3.36E-03	1.46E-04	1.04E-01
Chromium	5.4	0.000	0.04	0.22	0.9	0.1	1.67E-02	4.53E-03	0.00E+00	2.12E-02	4.0	0.000	0.04	0.16	0.9	0.1	1.24E-02	3.36E-03	0.00E+00	1.57E-02
Copper	284	0.0228	Equation	18.1	0.9	0.1	1.37E+00	2.38E-01	2.22E-03	1.61E+00	199	0.0178	Equation	15.7	0.9	0.1	1.19E+00	1.67E-01	1.74E-03	1.36E+00
Lead	729	0.0234	Equation	10.7	0.9	0.1	8.08E-01	6.12E-01	2.28E-03	1.42E+00	513	0.0111	Equation	8.8	0.9	0.1	6.63E-01	4.30E-01	1.08E-03	1.09E+00
Mercury	0.05	0.000	Equation	0.07	0.9	0.1	5.47E-03	4.20E-05	0.00E+00	5.51E-03	0.04	0.000	Equation	0.06	0.9	0.1	4.84E-03	3.36E-05	0.00E+00	4.87E-03
Nickel	7.2	0.0038	Equation	0.47	0.9	0.1	3.58E-02	6.04E-03	3.71E-04	4.22E-02	6.4	0.0038	Equation	0.43	0.9	0.1	3.27E-02	5.37E-03	3.71E-04	3.85E-02
Selenium	1.4	0.000	Equation	0.74	0.9	0.1	5.56E-02	1.17E-03	0.00E+00	5.67E-02	1.1	0.000	Equation	0.56	0.9	0.1	4.26E-02	9.23E-04	0.00E+00	4.35E-02
Silver	2.8	0.000	0.014	0.039	0.9	0.1	2.96E-03	2.35E-03	0.00E+00	5.31E-03	1.9	0.000	0.014	0.027	0.9	0.1	2.01E-03	1.59E-03	0.00E+00	3.60E-03
Zinc	1393	0.704	Equation	268	0.9	0.1	2.03E+01	1.17E+00	6.86E-02	2.15E+01	1049	0.521	Equation	229	0.9	0.1	1.73E+01	8.80E-01	5.08E-02	1.83E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR_{plant} (kg/kg BW-day, dw)	0.0839
IR_{water} (L/kg BW-day)	0.0975
$IR_{sediment}$ (kg/kg BW-day, dw)	0.00839

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| | RME* Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | | | CTE** Exposure Point Concentration | | EDD (mg/kg bw-day) | | | | | | | |
| | | | Diet | | | | Sediment | Water | | | | Diet | | | | Sediment | Water | | |
COPECs	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4	Sediment (mg/kg, dw)	Surface Water (mg/L)	BSAFs	Plant tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^1$	$Dose_{sed}^2$	$Dose_{water}^3$	Total EDD^4
Arsenic	39.4	0.000	Equation	1.08	0.9	0.1	8.18E-02	3.31E-02	0.00E+00	1.15E-01	29.9	0.000	Equation	0.93	0.9	0.1	7.00E-02	2.51E-02	0.00E+00	9.51E-02
Cadmium	4.2	0.0015	Equation	1.36	0.9	0.1	1.03E-01	3.52E-03	1.46E-04	1.06E-01	3.5	0.0010	Equation	1.23	0.9	0.1	9.30E-02	2.94E-03	9.75E-05	9.60E-02
Chromium	5.0	0.0058	0.04	0.21	0.9	0.1	1.55E-02	4.20E-03	5.66E-04	2.02E-02	4.5	0.0058	0.04	0.18	0.9	0.1	1.39E-02	3.78E-03	5.66E-04	1.83E-02
Copper	292	0.0131	Equation	18.3	0.9	0.1	1.38E+00	2.45E-01	1.28E-03	1.63E+00	177	0.0094	Equation	15.0	0.9	0.1	1.13E+00	1.49E-01	9.17E-04	1.28E+00
Lead	593	0.0106	Equation	9.5	0.9	0.1	7.19E-01	4.98E-01	1.03E-03	1.22E+00	534	0.0055	Equation	9.0	0.9	0.1	6.78E-01	4.48E-01	5.36E-04	1.13E+00
Mercury	0.09	0.000	Equation	0.10	0.9	0.1	7.53E-03	7.55E-05	0.00E+00	7.60E-03	0.07	0.000	Equation	0.09	0.9	0.1	6.56E-03	5.87E-05	0.00E+00	6.62E-03
Nickel	12.1	0.0029	Equation	0.70	0.9	0.1	5.27E-02	1.02E-02	2.83E-04	6.32E-02	10.0	0.0029	Equation	0.61	0.9	0.1	4.57E-02	8.39E-03	2.83E-04	5.44E-02
Selenium	2.9	0.000	Equation	1.64	0.9	0.1	1.24E-01	2.43E-03	0.00E+00	1.27E-01	2.9	0.000	Equation	1.64	0.9	0.1	1.24E-01	2.43E-03	0.00E+00	1.27E-01
Silver	3.1	0.000	0.014	0.043	0.9	0.1	3.28E-03	2.60E-03	0.00E+00	5.88E-03	2.0	0.000	0.014	0.028	0.9	0.1	2.11E-03	1.68E-03	0.00E+00	3.79E-03
Zinc	1720	0.498	Equation	302	0.9	0.1	2.28E+01	1.44E+00	4.86E-02	2.43E+01	1114	0.265	Equation	237	0.9	0.1	1.79E+01	9.35E-01	2.58E-02	1.89E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR_{plant} (kg/kg BW-day, dw)	0.0839
IR_{water} (L/kg BW-day)	0.0975
$IR_{sediment}$ (kg/kg BW-day, dw)	0.00839

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Table 4.72
EDDs for the muskrat foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration — Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet — BSAFs	Plant tissue Concentration ($C_{plant,\,dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD^{4}	CTE** Exposure Point Concentration — Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet — BSAFs	Plant tissue Concentration ($C_{plant,\,dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD^{4}
Arsenic	27.0	0.000	Equation	0.88	0.9	0.1	6.61E-02	2.27E-02	0.00E+00	8.87E-02	19.4	0.000	Equation	0.73	0.9	0.1	5.49E-02	1.63E-02	0.00E+00	7.11E-02
Cadmium	6.4	0.0014	Equation	1.71	0.9	0.1	1.29E-01	5.37E-03	1.37E-04	1.35E-01	4.8	0.0010	Equation	1.46	0.9	0.1	1.10E-01	4.03E-03	9.75E-05	1.15E-01
Chromium	4.9	0.000	0.04	0.20	0.9	0.1	1.52E-02	4.11E-03	0.00E+00	1.93E-02	4.2	0.000	0.04	0.17	0.9	0.1	1.30E-02	3.52E-03	0.00E+00	1.65E-02
Copper	212	0.0197	Equation	16.1	0.9	0.1	1.22E+00	1.78E-01	1.92E-03	1.40E+00	147	0.0138	Equation	13.9	0.9	0.1	1.05E+00	1.23E-01	1.35E-03	1.18E+00
Lead	367	0.0231	Equation	7.3	0.9	0.1	5.50E-01	3.08E-01	2.25E-03	8.60E-01	300	0.0112	Equation	6.5	0.9	0.1	4.91E-01	2.52E-01	1.09E-03	7.44E-01
Mercury	0.04	0.000	Equation	0.06	0.9	0.1	4.84E-03	3.36E-05	0.00E+00	4.87E-03	0.04	0.000	Equation	0.06	0.9	0.1	4.84E-03	3.36E-05	0.00E+00	4.87E-03
Nickel	12.4	0.000	Equation	0.71	0.9	0.1	5.37E-02	1.04E-02	0.00E+00	6.41E-02	9.4	0.000	Equation	0.58	0.9	0.1	4.37E-02	7.89E-03	0.00E+00	5.15E-02
Selenium	1.4	0.000	Equation	0.74	0.9	0.1	5.56E-02	1.17E-03	0.00E+00	5.67E-02	1.20	0.000	Equation	0.62	0.9	0.1	4.69E-02	1.01E-03	0.00E+00	4.79E-02
Silver	1.4	0.000	0.014	0.020	0.9	0.1	1.48E-03	1.17E-03	0.00E+00	2.65E-03	1.1	0.000	0.014	0.015	0.9	0.1	1.16E-03	9.23E-04	0.00E+00	2.09E-03
Zinc	2778	0.503	Equation	394	0.9	0.1	2.97E+01	2.33E+00	4.90E-02	3.21E+01	1738	0.361	Equation	304	0.9	0.1	2.29E+01	1.46E+00	3.52E-02	2.44E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations

1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 $Total\ EDD = Dose_{invert} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR_{plant} (kg/kg BW-day, dw)	0.0839
IR_{water} (L/kg BW-day)	0.0975
$IR_{sediment}$ (kg/kg BW-day, dw)	0.00839

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COPECs	RME* Sediment (mg/kg, dw)	RME* Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]	CTE** Sediment (mg/kg, dw)	CTE** Surface Water (mg/L)	BSAFs	Plant Tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}$[1]	$Dose_{sed}$[2]	$Dose_{water}$[3]	Total EDD[4]
Metals																				
Arsenic	37.2	0.000	Equation	1.05	0.9	0.1	7.92E-02	3.12E-02	0.00E+00	1.10E-01	19.9	0.000	Equation	0.74	0.9	0.1	5.56E-02	1.67E-02	0.00E+00	7.23E-02
Cadmium	10.5	0.0011	Equation	2.24	0.9	0.1	1.69E-01	8.81E-03	1.07E-04	1.78E-01	5.0	0.0009	Equation	1.50	0.9	0.1	1.13E-01	4.20E-03	8.78E-05	1.17E-01
Chromium	5.5	0.000	0.04	0.23	0.9	0.1	1.70E-02	4.61E-03	0.00E+00	2.16E-02	5.2	0.000	0.04	0.21	0.9	0.1	1.61E-02	4.36E-03	0.00E+00	2.05E-02
Copper	413	0.0215	Equation	21.0	0.9	0.1	1.58E+00	3.47E-01	2.10E-03	1.93E+00	188	0.0122	Equation	15.4	0.9	0.1	1.16E+00	1.58E-01	1.19E-03	1.32E+00
Lead	435	0.0303	Equation	8.0	0.9	0.1	6.05E-01	3.65E-01	2.95E-03	9.72E-01	296	0.0121	Equation	6.5	0.9	0.1	4.87E-01	2.48E-01	1.18E-03	7.37E-01
Mercury	0.07	0.000	Equation	0.09	0.9	0.1	6.56E-03	5.87E-05	0.00E+00	6.62E-03	0.07	0.000	Equation	0.09	0.9	0.1	6.56E-03	5.87E-05	0.00E+00	6.62E-03
Nickel	16.5	0.000	Equation	0.88	0.9	0.1	6.65E-02	1.38E-02	0.00E+00	8.03E-02	9.7	0.000	Equation	0.59	0.9	0.1	4.47E-02	8.14E-03	0.00E+00	5.28E-02
Selenium	3.3	0.000	Equation	1.90	0.9	0.1	1.43E-01	2.77E-03	0.00E+00	1.46E-01	1.9	0.000	Equation	1.03	0.9	0.1	7.79E-02	1.59E-03	0.00E+00	7.95E-02
Silver	2.2	0.000	0.014	0.031	0.9	0.1	2.33E-03	1.85E-03	0.00E+00	4.17E-03	1.4	0.000	0.014	0.020	0.9	0.1	1.48E-03	1.17E-03	0.00E+00	2.65E-03
Zinc	5320	0.429	Equation	565	0.9	0.1	4.26E+01	4.46E+00	4.18E-02	4.72E+01	2190	0.302	Equation	345	0.9	0.1	2.61E+01	1.84E+00	2.94E-02	2.79E+01

mg/kg - milligrams per kilogram

mg/L - milligrams per liter

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

DF - Dose Fraction

BSAF - Biota-Sediment Accumulation Factor or regression equation

* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.

** The CTE values represents the mean concentration.

Equations

1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$

Where $C_{plant} = (EPC_{sediment} \times BSAF)$ or the result of the BSAF regression equation

2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$

3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$

4 Total EDD = $Dose_{invert} + Dose_{sed} + Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR_{plant} (kg/kg BW-day, dw)	0.0839
IR_{water} (L/kg BW-day)	0.0975
$IR_{sediment}$ (kg/kg BW-day, dw)	0.00839

Created by:EC 1/20/14
QC'd by: SJP 2/8/14
Updated by: EC 3/1/15
QC'd by: RI 3/3/15

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Table 4.74
EDDs for the muskrat foraging at the Bakers Bridge sampling location on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME* Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Plant tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD[4]	CTE** Exposure Point Concentration Sediment (mg/kg, dw)	Surface Water (mg/L)	EDD (mg/kg bw-day) Diet BSAFs	Plant tissue Concentration ($C_{plant, dw}$)	DF_{plant}	$Df_{sediment}$	$Dose_{plant}^{1}$	Sediment $Dose_{sed}^{2}$	Water $Dose_{water}^{3}$	Total EDD[4]
Arsenic	29.7	0	Equation	0.92	0.9	0.1	6.97E-02	2.49E-02	0.00E+00	9.47E-02	21.9	0	Equation	0.78	0.9	0.1	5.87E-02	1.84E-02	0.00E+00	7.71E-02
Cadmium	18.6	0.0008	Equation	3.06	0.9	0.1	2.31E-01	1.56E-02	7.80E-05	2.47E-01	10.1	0.0007	Equation	2.20	0.9	0.1	1.66E-01	8.47E-03	6.83E-05	1.74E-01
Chromium	7.0	0	0.04	0.29	0.9	0.1	2.17E-02	5.87E-03	0.00E+00	2.75E-02	5.4	0	0.04	0.22	0.9	0.1	1.67E-02	4.53E-03	0.00E+00	2.12E-02
Copper	332	0.0138	Equation	19.2	0.9	0.1	1.45E+00	2.79E-01	1.35E-03	1.73E+00	191	0.0095	Equation	15.5	0.9	0.1	1.17E+00	1.60E-01	9.26E-04	1.33E+00
Lead	376	0.0177	Equation	7.4	0.9	0.1	5.57E-01	3.15E-01	1.73E-03	8.74E-01	300	0.0078	Equation	6.5	0.9	0.1	4.91E-01	2.52E-01	7.61E-04	7.43E-01
Mercury	0.06	0	Equation	0.08	0.9	0.1	6.04E-03	5.03E-05	0.00E+00	6.09E-03	0.04	0	Equation	0.06	0.9	0.1	4.84E-03	3.36E-05	0.00E+00	4.87E-03
Nickel	31.0	0	Equation	1.41	0.9	0.1	1.07E-01	2.60E-02	0.00E+00	1.33E-01	18.3	0	Equation	0.95	0.9	0.1	7.19E-02	1.54E-02	0.00E+00	8.72E-02
Selenium	3.1	0	Equation	1.77	0.9	0.1	1.34E-01	2.60E-03	0.00E+00	1.36E-01	2.1	0	Equation	1.15	0.9	0.1	8.70E-02	1.76E-03	0.00E+00	8.87E-02
Silver	1.7	0	0.014	0.024	0.9	0.1	1.80E-03	1.43E-03	0.00E+00	3.22E-03	1.3	0	0.014	0.018	0.9	0.1	1.37E-03	1.09E-03	0.00E+00	2.46E-03
Zinc	8544	0.272	Equation	735	0.9	0.1	5.55E+01	7.17E+00	2.65E-02	6.27E+01	4620	0.216	Equation	522	0.9	0.1	3.94E+01	3.88E+00	2.11E-02	4.33E+01

mg/kg - milligrams per kilogram
mg/L - milligrams per liter
mg/kg bw-day - milligrams per kilogram of body weight per day
COPECs - Chemicals of Potential Ecological Concern
EDD - Estimated Daily Dose
RME - Reasonable Maximum Exposure
CTE - Central Tendency Exposure
DF - Dose Fraction
BSAF - Biota-Sediment Accumulation Factor or regression equation
* The RME value represents the 95% UCL or the maximum detected concentration if a 95% UCL could not be calculated.
** The CTE values represents the mean concentration.

Equations
1 $Dose_{plant} = IR_{diet} \times C_{plant} \times DF_{invert} \times AUF$
Where C_{plant} = (EPC$_{sediment}$ $\times$ BSAF) or the result of the BSAF regression equation
2 $Dose_{sed} = Ir_{sediment} \times EPC_{sediment} \times Df_{sed} \times AUF$
3 $Dose_{water} = IR_{water} \times C_{water} \times AUF$
4 Total EDD = $Dose_{invert}$ + $Dose_{sed}$ + $Dose_{water}$

Area Use Factor (AUF)	1.0
Body Weight (BW) (kg)	1.17
IR$_{plant}$ (kg/kg BW-day, dw)	0.0839
IR$_{water}$ (L/kg BW-day)	0.0975
IR$_{sediment}$ (kg/kg BW-day, dw)	0.00839

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Table 5.1
Summary of the risk estimation approaches by receptor group, exposure unit, and measurement endpoint
Baseline Ecological Risk Assessments
Upper Animas Mining District

receptor group	exposure units[a]	measurement endpoint		risk estimation approach
		exposure	effect	
benthic invertebrate community	CC, MC, AR above CC, AR below MC	total metals in bulk sediment	no effect & effect sediment benchmarks	HQ method
	MC, AR above CC, AR below MC,	dissolved metals in pore water	chronic surface water benchmarks	HQ method
	CC, MC, AR above CC, and AR below MR	10-day sediment toxicity test using juvenile amphipods (*Hyalella azteca*)		statistical method
	CC, MC, AR above CC, and AR below MR	macroinvertebrate benthic community survey		graphical analysis
fish community	CC, MC, AR above CC, AR between CC & MR, AR below MC	total or dissolved metals in surface water	chronic surface water benchmarks	HQ method
	CC, MC, AR above CC, AR below MC	96-hour acute surface water toxicity tests using juvenile rainbow trout		statistical method
insectivorous birds	AR aboce CC; AR below MC	exposure modeling to calculate RME and CTE EDDs	bird no-effect and effect TRVs	HQ method
omnivorous birds	AR aboce CC; AR below MC	exposure modeling to calculate RME and CTE EDDs	bird no-effect and effect TRVs	HQ method
piscivorous birds	AR aboce CC; AR below MC	exposure modeling to calculate RME and CTE EDDs	bird no-effect and effect TRVs	HQ method
herbivorous mammals	AR aboce CC; AR below MC	exposure modeling to calculate RME and CTE EDDs	mammal no-effect and effect TRVs	HQ method

[a] CC = Cement Creek; MC = Mineral Creek; AR = Animas River

CTE = central tendency exposure

EDD = estimated daily dose

HQ = hazard quotient

RME = reasonable maximum exposure

TRV = toxicity reference value

created by: SJP (1/9/14)

reviewed by: EC (3/16/15)

Table 5.2
Sediment HQs for mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Arsenic	32.7	26.9	9.8	33	**3.3**	**2.7**	<1	<1
Copper	127	90.4	31.6	149	**4.0**	**2.9**	<1	<1
Lead	237	183	35.8	128	**6.6**	**5.1**	**1.9**	**1.4**
Manganese	1430	1295	630	1,200	**2.3**	**2.1**	**1.2**	**1.1**
Selenium	1.7	1.7	0.9	4.7	**1.9**	**1.9**	<1	<1
Zinc	666	468	121	459	**5.5**	**3.9**	**1.5**	**1.02**

mg/kg = milligram per kilogram

COPEC = chemical of potential ecological concern

CTE = central tendency exposure

EPC = exposure point concentration

HQ = hazard quotient

RME = reasonable maximum exposure

Table 5.3
Sediment HQs for mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Arsenic	40.6	40.6	9.8	33	**4.1**	**4.1**	**1.2**	**1.2**
Copper	55.6	55.6	31.6	149	**1.8**	**1.8**	<1	<1
Lead	282	282	35.8	128	**7.9**	**7.9**	**2.2**	**2.2**
Silver	2.0	2.0	1.0	3.7	**2.0**	**2.0**	<1	<1
Zinc	195	195	121	459	**1.6**	**1.6**	<1	<1

mg/kg = milligram per kilogram

COPEC = chemical of potential ecological concern

CTE = central tendency exposure

EPC = exposure point concentration

HQ = hazard quotient

RME = reasonable maximum exposure

prepared by: SJP (1/31/14)

reviewed by: RI (2/10/14)

updated by: EC (3/8/15)

reviewed by: ES (3/9/15)

Table 5.4
Sediment HQs for the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Arsenic	34.2	27.4	9.8	33	**3.5**	**2.8**	**1.04**	<1
Cadmium	12.9	11.1	0.99	4.98	**13.0**	**11.2**	**2.6**	**2.2**
Copper	399	339	31.6	149	**12.6**	**10.7**	**2.7**	**2.3**
Lead	1733	1508	35.8	128	**48.4**	**42.1**	**13.5**	**11.8**
Manganese	12566	10617	630	1,200	**19.9**	**16.9**	**10.5**	**8.8**
Mercury	0.09	0.07	0.18	1.06	<1	<1	<1	<1
Selenium	0.998	1.54	0.9	4.7	**1.1**	**1.7**	<1	<1
Silver	6.4	5.5	1.0	3.7	**6.4**	**5.5**	**1.7**	**1.5**
Zinc	4054	3172	121	459	**33.5**	**26.2**	**8.8**	**6.9**

mg/kg = milligram per kilogram

COPEC = chemical of potential ecological concern

CTE = central tendency exposure

EPC = exposure point concentration

HQ = hazard quotient

RME = reasonable maximum exposure

Table 5.5
Sediment HQs for sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	19,659	14,872	26,000	60,000	<1	<1	<1	<1
Arsenic	39.6	33.4	9.8	33	**4.0**	**3.4**	**1.2**	**1.01**
Cadmium	2.9	2.1	1.0	4.98	**2.9**	**2.1**	<1	<1
Copper	173	137	31.6	149	**5.5**	**4.3**	**1.2**	**<1**
Lead	581	478	35.8	128	**16.2**	**13.4**	**4.5**	**3.7**
Manganese	2,979	2,100	630	1,200	**4.7**	**3.3**	**2.5**	**1.8**
Nickel	5.9	5.1	22.7	48.6	<1	<1	<1	<1
Selenium	1.9	1.5	0.9	4.7	**2.1**	**1.7**	<1	<1
Silver	2.4	1.9	1.0	3.7	**2.4**	**1.9**	<1	<1
Zinc	819	651	121	459	**6.8**	**5.4**	**1.8**	**1.4**

mg/kg = milligram per kilogram
COPEC = chemical of potential ecological concern
CTE = central tendency exposure
EPC = exposure point concentration
HQ = hazard quotient
RME = reasonable maximum exposure

Table 5.6
Sediment HQs for sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	35,775	17,123	26,000	60,000	**1.4**	<1	<1	<1
Arsenic	33.8	27.9	9.8	33	**3.4**	**2.9**	**1.02**	<1
Cadmium	5.4	4.0	1.0	4.98	**5.5**	**4.1**	**1.1**	<1
Copper	284	199	31.6	149	**9.0**	**6.3**	**1.9**	**1.3**
Lead	729	513	35.8	128	**20.4**	**14.3**	**5.7**	**4.0**
Manganese	6,618	4,340	630	1,200	**10.5**	**6.9**	**5.5**	**3.6**
Nickel	7.2	6.4	22.7	48.6	<1	<1	<1	<1
Selenium	1.4	1.1	0.9	4.7	**1.6**	**1.2**	<1	<1
Silver	2.8	1.9	1.0	3.7	**2.8**	**1.9**	<1	<1
Zinc	1,393	1,049	121	459	**11.5**	**8.7**	**3.0**	**2.3**

mg/kg = milligram per kilogram
COPEC = chemical of potential ecological concern
CTE = central tendency exposure
EPC = exposure point concentration
HQ = hazard quotient
RME = reasonable maximum exposure

Table 5.7
Sediment HQs for sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	31,900	16,373	26,000	60,000	**1.2**	<1	<1	<1
Arsenic	39.4	29.9	9.8	33	**4.0**	**3.1**	**1.2**	<1
Cadmium	4.2	3.5	1.0	4.98	**4.3**	**3.5**	<1	<1
Copper	292	177	31.6	149	**9.2**	**5.6**	**2.0**	**1.2**
Lead	593	534	35.8	128	**16.6**	**14.9**	**4.6**	**4.2**
Manganese	4,340	3,143	630	1,200	**6.9**	**5.0**	**3.6**	**2.6**
Nickel	12.1	10.0	22.7	48.6	<1	<1	<1	<1
Selenium	2.9	2.9	0.9	4.7	**3.2**	**3.2**	<1	<1
Silver	3.1	2.0	1.0	3.7	**3.1**	**2.0**	<1	<1
Zinc	1,720	1,114	121	459	**14.2**	**9.2**	**3.7**	**2.4**

mg/kg = milligram per kilogram
COPEC = chemical of potential ecological concern
CTE = central tendency exposure
EPC = exposure point concentration
HQ = hazard quotient
RME = reasonable maximum exposure

Table 5.8
Sediment HQs for sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	27,525	15,428	26,000	60,000	1.1	<1	<1	<1
Arsenic	27.0	19.4	9.8	33	2.8	2.0	<1	<1
Cadmium	6.4	4.8	1.0	4.98	6.5	4.9	1.3	<1
Copper	212	147	31.6	149	6.7	4.6	1.4	<1
Lead	367	300	35.8	128	10.3	8.4	2.9	2.3
Manganese	6,390	4,348	630	1,200	10.1	6.9	5.3	3.6
Nickel	12.4	9.4	22.7	48.6	<1	<1	<1	<1
Selenium	1.4	1.2	0.9	4.7	1.6	1.4	<1	<1
Silver	1.4	1.1	1.0	3.7	1.4	1.1	<1	<1
Zinc	2,778	1,738	121	459	23.0	14.4	6.1	3.8

mg/kg = milligram per kilogram

COPEC = chemical of potential ecological concern

CTE = central tendency exposure

EPC = exposure point concentration

HQ = hazard quotient

RME = reasonable maximum exposure

Table 5.9
Sediment HQs for sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	48,600	20,820	26,000	60,000	**1.9**	<1	<1	<1
Arsenic	37.2	19.9	9.8	33	**3.8**	**2.0**	**1.1**	<1
Cadmium	10.5	5.0	1.0	4.98	**10.6**	**5.1**	**2.1**	**1.01**
Copper	413	188	31.6	149	**13.1**	**5.9**	**2.8**	**1.3**
Lead	435	296	35.8	128	**12.2**	**8.3**	**3.4**	**2.3**
Manganese	3,820	2,743	630	1,200	**6.1**	**4.4**	**3.2**	**2.3**
Nickel	16.5	9.7	22.7	48.6	<1	<1	<1	<1
Selenium	3.3	1.9	0.9	4.7	**3.7**	**2.1**	<1	<1
Silver	2.2	1.4	1.0	3.7	**2.2**	**1.4**	<1	<1
Zinc	5,320	2,190	121	459	**44.0**	**18.1**	**11.6**	**4.8**

mg/kg = milligram per kilogram

COPEC = chemical of potential ecological concern

CTE = central tendency exposure

EPC = exposure point concentration

HQ = hazard quotient

RME = reasonable maximum exposure

Table 5.10
Sediment HQs for sampling location Bakers Bridge on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	EPCs (mg/kg)		Sed benchmarks (mg/kg)		No Effect HQs		Effect HQs	
	RME	CTE	no effect	effect	RME	CTE	RME	CTE
Aluminum	37,400	20,025	26,000	60,000	**1.4**	<1	<1	<1
Arsenic	29.7	21.9	9.8	33	**3.0**	**2.2**	<1	<1
Cadmium	18.6	10.1	1.0	4.98	**18.8**	**10.2**	**3.7**	**2.0**
Copper	332	191	31.6	149	**10.5**	**6.0**	**2.2**	**1.3**
Lead	376	300	35.8	128	**10.5**	**8.4**	**2.9**	**2.3**
Manganese	13,100	7,425	630	1,200	**20.8**	**11.8**	**10.9**	**6.2**
Nickel	31.0	18.3	22.7	48.6	**1.4**	<1	<1	<1
Selenium	3.1	2.1	0.9	4.7	**3.4**	**2.4**	<1	<1
Silver	1.7	1.3	1.0	3.7	**1.7**	**1.3**	<1	<1
Zinc	8,544	4,620	121	459	**70.6**	**38.2**	**18.6**	**10.1**

mg/kg = milligram per kilogram
COPEC = chemical of potential ecological concern
CTE = central tendency exposure
EPC = exposure point concentration
HQ = hazard quotient
RME = reasonable maximum exposure

Table 5.11

Average and lower hardnesses for deriving hardness-sensitive surface water benchmarks to calculate chronic HQs for pore water
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Exposure Unit	Pore water hardness (mg/L)					
	n	95% UCL	average[a]	difference[b]	ave - diff[c]	minimum[d]
Mineral Creek	1	--	139	--	--	139
Cement Creek	0	--	--	--	--	--
Animas R. above Cement Cr.	11	594.2	296	298	-2	118
Animas R. between CC & MC	0	--	--	--	--	--
A71B (Animas R. below MC)	0	--	--	--	--	--
A72 (Animas R. below MC)	2	--	208	--	--	160
A73 (Animas R. below MC)	2	--	168	--	--	151
A73B (Animas R. below MC)	1	--	49	--	--	49
A75D (Animas R. below MC)	2	--	115.5			96
A75B (Animas R. below MC)	0	--	--	--	--	--
BBridge(Animas R. below MC)	2	--	198	--	--	125

Highlighted concentrations were retained to adjust the hardness-sensitive benchmarks used in calculating the surface water HQs

note: the higher of the "ave - diff" value or "minimum" value was used to represent the estimated lower bound for pore water hardness for a given period

[a] average = arithmetic mean pore water hardness concentration

[b] difference = 95% UCL - average concentration

[c] ave - diff = concentration obtained by subtracting "difference" from "average"

[d] minimum = lowest pore water hardness measured in the samples collected from an exposure unit during the period

Table 5.12
Pore water HQs for benthic community-level receptors in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Beryllium	1.0	1.0	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Silver	0.25	0.25	--	**--**	**--**	139	139	0.13	0.13	**1.9**	**1.9**	**1.9**	**1.9**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.13
Pore water HQs for benthic community-level receptors in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	4,514	1,259	87	**52**	**14**	--	--	--	--	--	--	--	--
Beryllium	10	2.2	0.66	**15**	**3.4**	--	--	--	--	--	--	--	--
Cadmium	93	24	--	**--**	**--**	118	296	0.48	0.95	**195**	**49**	**98**	**25**
Copper	2,242	224	--	**--**	**--**	118	296	10.3	22.6	**217**	**22**	**99**	**9.9**
Lead	19	14	--	**--**	**--**	118	296	3.0	8.0	**6.4**	**4.5**	**2.4**	**1.7**
Manganese	78,300	17,912	--	**--**	**--**	118	296	1,743	2,368	**45**	**10**	**33**	**7.6**
Selenium	5.0	1.6	4.6	**1.1**	**<1**	--	--	--	--	**--**	**--**	**--**	**--**
Silver	2.5	0.8	--	**--**	**--**	118	296	0.10	0.49	**25**	**7.9**	**5.1**	**1.6**
Zinc	19,367	5,735	--	**--**	**--**	118	296	141	325	**137**	**41**	**60**	**18**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.14
Pore water HQs for benthic community-level receptors at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	517	282	87	**5.9**	**3.2**	--	--	--	--	--	--	--	--
Beryllium	1	1	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Cadmium	3.0	2.2	--	**--**	**--**	160	208	0.60	0.73	**5.0**	**3.6**	**4.1**	**3.0**
Iron	338	338	1,000	<1	<1	--	--	--	--	--	--	--	**--**
Manganese	995	722	--	**--**	**--**	160	208	1,929	2,105	<1	<1	<1	<1
Silver	0.25	0.25	4.6	**--**	**--**	160	208	0.17	0.26	**1.5**	**1.5**	<1	<1
Zinc	1,630	1,019	--	**--**	**--**	160	208	186	236	**8.8**	**5.5**	**6.9**	**4.3**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.15
Pore water HQs for benthic community-level receptors at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	29	26	87	<1	<1	--	--	--	--	--	--	--	--
Beryllium	1.0	1.0	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Cadmium	2.0	1.2	--	**--**	**--**	151	168	0.58	0.62	**3.5**	**2.1**	**3.3**	**1.9**
Iron	341	341	1,000	<1	<1	--	--	--	--	**--**	**--**	**--**	**--**
Manganese	1,870	936	--	**--**	**--**	151	168	1,892	1,961	<1	<1	<1	<1
Silver	0.25	0.25	--	**--**	**--**	151	168	0.15	0.18	**1.6**	**1.6**	**1.4**	**1.4**
Zinc	709	536	--	**--**	**--**	151	168	176	194	**4.0**	**3.0**	**3.6**	**2.8**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.16
Pore water HQs for benthic community-level receptors at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	10	10	87	<1	<1	--	--	--	--	--	--	--	--
Beryllium	1.0	1.0	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Cadmium	0.1	0.1	--	**--**	**--**	49	49	0.25	0.25	<1	<1	<1	<1
Iron	50	50	1,000	<1	<1	--	--	--	--	**--**	**--**	**--**	**--**
Manganese	3.4	3.4	--	**--**	**--**	49	49	1,301	1,301	<1	<1	<1	<1
Silver	0.25	0.25	--	**--**	**--**	49	49	0.02	0.02	**11**	**11**	**11**	**11**
Zinc	33	33	--	**--**	**--**	49	49	63	63	<1	<1	<1	<1

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.17
Pore water HQs for benthic community-level receptors at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	40	34	87	<1	<1	--	--	--	--	--	--	--	--
Beryllium	1.0	1.0	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Cadmium	0.79	0.59	--	**--**	**--**	96	116	0.41	0.47	**1.9**	**1.4**	**1.7**	**1.2**
Iron	107	107	1,000	<1	<1	--	--	--	--	--	--	--	**--**
Manganese	290	238	--	**--**	**--**	96	116	1,627	1,731	<1	<1	<1	<1
Silver	0.25	0.25	--	**--**	**--**	96	116	0.07	0.10	**3.6**	**3.6**	**2.6**	**2.6**
Zinc	190	182	--	**--**	**--**	96	116	117	138	**1.6**	**1.6**	**1.4**	**1.3**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.18
Pore water HQs for benthic community-level receptors at sampling location Bakers Bridge on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs (dissolved)	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
Aluminum	47	41	87	<1	<1	--	--	--	--	--	--	--	--
Beryllium	1.0	1.0	0.66	**1.5**	**1.5**	--	--	--	--	--	--	--	--
Cadmium	0.3	0.3	--	**--**	**--**	125	198	0.50	0.71	<1	<1	<1	<1
Iron	1,260	1,260	1,000	**1.3**	**1.3**	--	--	--	--	--	--	--	**--**
Manganese	5,870	3,098	--	**--**	**--**	125	198	1,777	2,071	**3.3**	**1.7**	**2.8**	**1.5**
Silver	0.25	0.25	--	**--**	**--**	125	198	0.11	0.24	**2.3**	**2.3**	**1.03**	**1.03**
Zinc	115	64	--	**--**	**--**	125	198	148	226	<1	<1	<1	<1

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.19
Average and lower hardnesses used for deriving hardness-sensitive surface water benchmarks needed to calculate chronic HQs
Baseline Ecological Risk Assessment
Upper Animas River Mining District

Exposure Unit	Pre-Runoff Period Hardness (mg/L)						Runoff Period Hardness (mg/L)						Post-Runoff Period Hardness (mg/L)					
	n	95% UCL[a]	average[b]	difference[c]	ave - diff[d]	minimum[e]	n	95% UCL	average	difference	ave - diff	minimum	n	95% UCL	average	difference	ave - diff	minimum
Mineral Creek	4	342	253	89	164	150	7	80	68	12	56	49	13	188	161	27	135	65
Cement Creek	4	619	477	143	334	301	7	157	124	33	91	76	14	475	409	66	343	67
Animas R. above Cement Cr.	5	192	170	22	148	148	17	74	69	5.1	64	49	18	136	124	12	112	66
Animas R. between CC & MC	0	--	--	--	--	--	0	--	--	--	--	--	2	--	296	--	--	295
A71B (Animas R. below MC)	0	--	--	--	--	--	0	--	--	--	--	--	1	--	263	--	--	263
A72 (Animas R. below MC)	4	378	285	93	192	177	7	87	72	15	56	45	13	221	189	32	158	75
A73 (Animas R. below MC)	the 1 pre-runoff datapoint was combined with the 2 runoff datapoints						5	216	147	70	77	71	the 2 post-runoff datapoints were combined with the 2 runoff datapoints					
A73B (Animas R. below MC)	0	--	--	--	--	--	4	194	98	96	1.6	37	the 2 post-runoff datapoints were combined with the 2 runoff datapoints					
A75D (Animas R. below MC)	the 1 pre-runoff datapoint was combined with the 2 runoff datapoints						5	161	110	50	60	60	the 2 post-runoff datapoints were combined with the 2 runoff datapoints					
A75B (Animas R. below MC)	0	--	--	--	--	--	4	174	102	72	30	61	the 2 post-runoff datapoints were combined with the 2 runoff datapoints					
BBridge(Animas R. below MC)	the 1 pre-runoff datapoint was combined with the 2 runoff datapoints						5	155	108	47	61	58	the 2 post-runoff datapoints were combined with the 2 runoff datapoints					

Highlighted concentrations were retained to adjust the hardness-sensitive benchmarks used in calculating the surface water HQs

note: the higher of the "ave - diff" value or "minimum" value was used to represent the estimated lower bound for surface water hardness for a given period

[a] UCL = upper confidence limit for surface water hardness concentration (see Appendix X)

[b] average = arithmetic mean surface water hardness concentration

[c] difference = 95% UCL - average concentration

[d] ave - diff = concentration obtained by subtracting "difference" from "average"

[e] minimum = lowest surface water hardness concentration measured in the samples collected from an exposure unit during the period

Table 5.20
Surface water HQs for aquatic community-level receptors in mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD													
Aluminum (total)	5,950	4,575	87	**68**	**53**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.9	1.3	--	**--**	**--**	164	253	0.61	0.85	**3.0**	**2.1**	**2.2**	**1.5**
Iron (total)	6,830	5,868	1,000	**6.8**	**5.9**	--	--	--	--	--	--	--	--
Silver (dissolved)	0.6	0.4	--	**--**	**--**	164	253	0.18	0.37	**3.4**	**2.3**	**1.6**	**1.1**
Zinc (dissolved)	470	358	--	**--**	**--**	164	253	190	282	**2.5**	**1.9**	**1.7**	**1.3**
RUNOFF PERIOD													
Aluminum (total)	1,910	1,353	87	**22**	**16**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	0.4	0.3	--	**--**	**--**	56	68	0.27	0.32	**1.5**	**1.01**	**1.3**	<1
Iron (total)	4,119	2,664	1,000	**4.1**	**2.7**	--	--	--	--	--	--	--	--
Silver (dissolved)	1.3	0.4	--	**--**	**--**	56	68	0.03	0.04	**46.9**	**14.4**	**33.6**	**10.3**
Zinc (dissolved)	104	83.9	--	**--**	**--**	56	68	72	85	**1.5**	**1.2**	**1.2**	<1
POST-RUNOFF PERIOD													
Aluminum (total)	2,826	2,267	87	**32**	**26**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	0.7	0.6	--	**--**	**--**	135	161	0.53	0.60	**1.4**	**1.1**	**1.2**	**1.0**
Iron (total)	4,316	3,339	1,000	**4.3**	**3.3**	--	--	--	--	--	--	--	--
Silver (dissolved)	1.3	0.3	--	**--**	**--**	135	161	0.13	0.17	**10.3**	**2.4**	**7.6**	**1.8**
Zinc (dissolved)	194	160	--	**--**	**--**	135	161	159	187	**1.2**	**1.002**	**1.04**	<1

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.21
Surface water HQs for aquatic community-level receptors in mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD													
Aluminum (total)	8,610	7,318	87	**99**	**84**	--	--	--	--	--	--	--	--
Beryllium (dissolved	1.3	1.2	0.7	**2.0**	**1.8**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	5.5	5.3	--	**--**	**--**	334	477	1.05	1.37	**5.3**	**5.1**	**4.0**	**3.9**
Copper (dissolved)	119	107	--	**--**	**--**	334	477	25.1	34.0	**4.7**	**4.3**	**3.5**	**3.1**
Iron (total)	21,700	17,150	1,000	**22**	**17**	--	--	--	--	--	--	--	--
Lead (dissolved)	15.1	14.2	--	**--**	**--**	334	477	9.1	13.1	**1.7**	**1.6**	**1.2**	**1.1**
Manganese (dissolved)	5,290	4,618	--	**--**	**--**	334	477	2465	2776	**2.1**	**1.9**	**1.9**	**1.7**
Zinc (dissolved)	2,670	2,303	--	**--**	**--**	334	477	363	502	**7.4**	**6.3**	**5.3**	**4.6**
RUNOFF PERIOD													
Aluminum (total)	2,876	2,389	87	**33**	**27**	--	--	--	--	--	--	--	--
Beryllium (dissolved)	1.0	0.7	0.7	**1.5**	**1.1**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	3.3	2.8	--	**--**	**--**	91	124	0.39	0.50	**8.4**	**7.1**	**6.7**	**5.6**
Copper (dissolved)	78.1	68.6	--	**--**	**--**	91	124	8.3	10.8	**9.5**	**8.3**	**7.3**	**6.4**
Iron (total)	12,554	8,067	1,000	**13**	**8.1**	--	--	--	--	--	--	--	--
Lead (dissolved)	10.4	8.4	--	**--**	**--**	91	124	2.3	3.2	**4.6**	**3.7**	**3.3**	**2.6**
Manganese (dissolved)	1,620	1,268	--	**--**	**--**	91	124	1599	1772	**1.01**	**<1**	**<1**	**<1**
Zinc (dissolved)	1,144	929	--	**--**	**--**	91	124	111	147	**10**	**8.4**	**7.8**	**6.3**
POST-RUNOFF PERIOD													
Aluminum (total)	7,110	6,360	87	**82**	**73**	--	--	--	--	--	--	--	--
Beryllium (dissolved)	1.0	1.1	0.7	**1.5**	**1.7**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	6.1	5.6	--	**--**	**--**	343	409	1.07	1.22	**5.7**	**5.3**	**5.0**	**4.6**
Copper (dissolved)	152	130	--	**--**	**--**	343	409	25.7	29.8	**5.9**	**5.1**	**5.1**	**4.4**
Iron (total)	12,725	10,801	1,000	**13**	**11**	--	--	--	--	--	--	--	--
Lead (dissolved)	17.1	15.5	--	**--**	**--**	343	409	9.3	11.2	**1.8**	**1.7**	**1.5**	**1.4**
Manganese (dissolved)	5,300	4,112	--	**--**	**--**	343	409	2487	2637	**2.1**	**1.7**	**2.0**	**1.6**
Zinc (dissolved)	2,890	2,190	--	**--**	**--**	343	409	372	436	**7.8**	**5.9**	**6.6**	**5.0**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.22
Surface water HQs for aquatic community-level receptors in the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD													
Aluminum (total)	401	305	87	**4.6**	**3.5**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	3.6	2.6	--	**--**	**--**	148	170	0.57	0.63	**6.3**	**4.7**	**5.7**	**4.2**
Copper (dissolved)	8.3	7.2	--	**--**	**--**	148	170	12.5	14.1	<1	<1	<1	<1
Iron (total)	309	259	1,000	<1	<1	--	--	--	--	--	--	--	--
Lead (dissolved)	0.5	0.4	--	**--**	**--**	148	170	3.8	4.5	<1	<1	<1	<1
Manganese (dissolved)	3,676	3,300	--	**--**	**--**	148	170	1880	1969	**2.0**	**1.8**	**1.9**	**1.7**
Zinc (dissolved)	1,012	840	--	**--**	**--**	148	170	173	196	**5.8**	**4.9**	**5.2**	**4.3**
RUNOFF PERIOD													
Aluminum (total)	566	480	87	**6.5**	**5.5**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.1	1.0	--	**--**	**--**	64	69	0.30	0.32	**3.8**	**3.5**	**3.6**	**3.3**
Copper (dissolved)	11.3	10.0	--	**--**	**--**	64	69	6.1	6.5	**1.8**	**1.6**	**1.7**	**1.5**
Iron (total)	556	469	1,000	<1	<1	--	--	--	--	--	--	--	--
Lead (dissolved)	1.1	1.0	--	**--**	**--**	64	69	1.5	1.7	<1	<1	<1	<1
Manganese (dissolved)	633	514	--	**--**	**--**	64	69	1422	1458	<1	<1	<1	<1
Zinc (dissolved)	381	344	--	**--**	**--**	64	69	81	86	**4.7**	**4.3**	**4.4**	**4.0**
POST-RUNOFF PERIOD													
Aluminum (total)	154	153	87	**1.8**	**1.8**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.2	1.1	--	**--**	**--**	112	124	0.46	0.50	**2.6**	**2.4**	**2.4**	**2.2**
Copper (dissolved)	3.2	3.2	--	**--**	**--**	112	124	9.9	10.8	<1	<1	<1	<1
Iron (total)	149	154	1,000	<1	<1	--	--	--	--	--	--	--	--
Lead (dissolved)	0.3	0.3	--	**--**	**--**	112	124	2.8	3.2	<1	<1	<1	<1
Manganese (dissolved)	1,247	1,031	--	**--**	**--**	112	124	1713	1772	<1	<1	<1	<1
Zinc (dissolved)	362	327	--	**--**	**--**	112	124	134	147	**2.7**	**2.4**	**2.5**	**2.2**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.23

Surface water HQs for aquatic community-level receptors in the Animas River between the mainstems of Cement Creek and Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
POST-RUNOFF PERIOD													
Aluminum (total)	2,520	2,490	87	**29**	**29**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	2.7	2.7	--	**--**	**--**	295	296	0.95	0.95	**2.8**	**2.8**	**2.8**	**2.8**
Copper (dissolved)	24.8	20.6	--	**--**	**--**	295	296	22.6	22.6	**1.1**	<1	**1.1**	<1
Iron (total)	5,100	4,995	1,000	**5.1**	**5.0**	--	--	--	--	--	--	--	--
Manganese (dissolved)	2,590	2,565	--	**--**	**--**	295	296	2365	2368	**1.1**	**1.1**	**1.1**	**1.1**
Zinc (dissolved)	1,160	1,160	--	**--**	**--**	295	296	324	325	**3.6**	**3.6**	**3.6**	**3.6**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

RME = reasonable maximum exposure

Table 5.24
Surface water HQs for aquatic community-level receptors at sampling location A71B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
POST-RUNOFF PERIOD													
Aluminum (total)	2,780	2,780	87	**32**	**32**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.9	1.9	--	**--**	**--**	263	263	0.87	0.87	**2.2**	**2.2**	**2.2**	**2.2**
Copper (dissolved)	8.7	8.7	--	**--**	**--**	263	263	20.5	20.5	<1	<1	<1	<1
Iron (total)	4,640	4,640	1,000	**4.6**	**4.6**	--	--	--	--	--	--	--	--
Manganese (dissolved)	1,660	1,660	--	**--**	**--**	263	263	2276	2276	<1	<1	<1	<1
Zinc (dissolved)	743	743	--	**--**	**--**	263	263	292	292	**2.5**	**2.5**	**2.5**	**2.5**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

RME = reasonable maximum exposure

Table 5.25
Surface water HQs for aquatic community-level receptors at sampling location A72 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD													
Aluminum (total)	4,440	3,455	87	**51**	**40**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	2.9	2.7	--	**--**	**--**	192	285	0.69	0.93	**4.2**	**3.9**	**3.1**	**2.9**
Copper (dissolved)	35.9	28.9	--	**--**	**--**	192	285	15.6	21.9	**2.3**	**1.8**	**1.6**	**1.3**
Iron (total)	7,710	6,018	1,000	**7.7**	**6.0**	--	--	--	--	--	--	--	--
Manganese (dissolved)	2,920	2,435	--	**--**	**--**	192	285	2050	2338	**1.4**	**1.2**	**1.2**	**1.04**
Zinc (dissolved)	1,230	1,044	--	**--**	**--**	192	285	219	314	**5.6**	**4.8**	**3.9**	**3.3**
RUNOFF PERIOD													
Aluminum (total)	2,065	1,359	87	**24**	**16**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.0	0.9	--	**--**	**--**	56	72	0.27	0.33	**3.7**	**3.2**	**3.0**	**2.7**
Copper (dissolved)	6.7	5.2	--	**--**	**--**	56	72	5.5	6.8	**1.2**	<1	<1	<1
Iron (total)	4,687	2,905	1,000	**4.7**	**2.9**	--	--	--	--	--	--	--	--
Manganese (dissolved)	578	427	--	**--**	**--**	56	72	1360	1479	<1	<1	<1	<1
Zinc (dissolved)	352	273	--	**--**	**--**	56	72	72	90	**4.9**	**3.8**	**3.9**	**3.0**
POST-RUNOFF PERIOD													
Aluminum (total)	2,129	1,777	87	**24**	**20**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.9	1.6	--	**--**	**--**	158	189	0.60	0.68	**3.1**	**2.7**	**2.7**	**2.3**
Copper (dissolved)	17	14	--	**--**	**--**	158	189	13.2	15.4	**1.3**	**1.1**	**1.1**	<1
Iron (total)	3,409	2,701	1,000	**3.4**	**2.7**	--	--	--	--	--	--	--	--
Manganese (dissolved)	1,514	1,242	--	**--**	**--**	158	189	1921	2039	<1	<1	<1	<1
Zinc (dissolved)	696	579	--	**--**	**--**	158	189	184	216	**3.8**	**3.2**	**3.2**	**2.7**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.26
Surface water HQs for aquatic community-level receptors at sampling location A73 in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark (µg/L)	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE		RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF (n=1) RUNOFF PERIOD (n = 2) and POST-RUNOFF PERIOD (n = 2) COMBINED													
Aluminum (total)	2,030	1,461	87	**23**	**17**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.7	1.3	--	**--**	**--**	77	147	0.35	0.56	**4.9**	**3.6**	**3.0**	**2.2**
Copper (dissolved)	5.0	3.7	--	**--**	**--**	77	147	7.2	12.4	<1	<1	<1	<1
Iron (total)	4,163	2,986	1,000	**4**	**3**	--	--	--	--	--	--	--	--
Manganese (dissolved)	1,592	1,009	--	**--**	**--**	77	147	1512	1875	**1.05**	<1	<1	<1
Zinc (dissolved)	666	463	--	**--**	**--**	77	147	96	172	**7.0**	**4.8**	**3.9**	**2.7**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.27
Surface water HQs for aquatic community-level receptors at sampling location A73B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
RUNOFF PERIOD (n = 2) and POST-RUNOFF PERIOD (n = 2) COMBINED													
Aluminum (total)	1,764	975	87	**20**	**11**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.3	0.7	--	--	--	37	98	0.20	0.42	**6.4**	**3.6**	**3.1**	**1.7**
Copper (dissolved)	3.8	2.6	--	--	--	37	98	3.8	8.8	**1.0**	<1	<1	<1
Iron (total)	2,649	1,570	1,000	**2.6**	**1.6**	--	--	--	--	--	--	--	--
Manganese (dissolved)	1,079	508	--	--	--	37	98	1185	1639	<1	<1	<1	<1
Zinc (dissolved)	500	250	--	--	--	37	98	49	119	**10**	**5.1**	**4.2**	**2.1**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.28
Surface water HQs for aquatic community-level receptors at sampling location A75D in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD (n=1) RUNOFF PERIOD (n = 2) and POST-RUNOFF PERIOD (n = 2) COMBINED													
Aluminum (total)	1,728	1,255	87	**20**	**14**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.0	0.8	--	**--**	**--**	60	110	0.29	0.45	**3.6**	**2.7**	**2.3**	**1.7**
Copper (dissolved)	3.9	2.5	--	**--**	**--**	60	110	5.8	9.7	<1	<1	<1	<1
Iron (total)	3,922	2,556	1,000	**3.9**	**2.6**	--	--	--	--	--	--	--	--
Manganese (dissolved)	935	590	--	**--**	**--**	60	110	1391	1703	<1	<1	<1	<1
Zinc (dissolved)	384	261	--	**--**	**--**	60	110	76	132	**5.0**	**3.4**	**2.9**	**2.0**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.29
Surface water HQs for aquatic community-level receptors at sampling location A75B in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
RUNOFF PERIOD (n = 2) and POST-RUNOFF PERIOD (n = 2) COMBINED													
Aluminum (total)	1,565	1,021	87	**18**	**12**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	1.0	0.7	--	**--**	**--**	61	102	0.29	0.43	**3.5**	**2.4**	**2.4**	**1.6**
Copper (dissolved)	4.1	2.6	--	**--**	**--**	61	102	5.9	9.1	<1	<1	<1	<1
Iron (total)	4,454	2,224	1,000	**4.5**	**2.2**	61	--	--	--	--	--	--	--
Manganese (dissolved)	782	462	--	**--**	**--**	61	102	1399	1661	<1	<1	<1	<1
Zinc (dissolved)	402	235	--	**--**	**--**	61	102	77	123	**5.2**	**3.0**	**3.3**	**1.9**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.30
Surface water HQs for aquatic community-level receptors at Bakers Bridge sampling location in the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas River Mining District

COPECs	Surface Water EPCs (µg/L)		Benchmark	HQ		Hardness (mg/L)		Hardn. Adj. Benchm.		Low Hardness		High Hardness	
	RME	CTE	(µg/L)	RME	CTE	low	average	low	average	HQ RME	HQ CTE	HQ RME	HQ CTE
PRE-RUNOFF PERIOD (n=1) RUNOFF PERIOD (n = 2) and POST-RUNOFF PERIOD (n = 2) COMBINED													
Aluminum (total)	1,103	704	87	**13**	**8.1**	--	--	--	--	--	--	--	--
Cadmium (dissolved)	0.6	0.5	--	**--**	**--**	61	108	0.29	0.45	**2.1**	**1.6**	**1.4**	**1.03**
Copper (dissolved)	3.7	2.9	--	**--**	**--**	61	108	5.9	9.6	<1	<1	<1	<1
Iron (total)	2,742	1,717	1,000	**2.7**	**1.7**	--	--	--	--	--	--	--	--
Manganese (dissolved)	543	356	--	**--**	**--**	61	108	1399	1692	<1	<1	<1	<1
Zinc (dissolved)	204	136	--	**--**	**--**	61	108	77	130	**2.6**	**1.8**	**1.6**	**1.05**

µg/L = microgram per liter

mg/L = milligram per liter

CTE = central tendency exposure

COPEC = contaminant of potential ecological concern

EPC = exposure point concentration

HQ = hazard quotient (concentration/benchmark)

RME = reasonable maximum exposure

Table 5.31
HQs for the American dipper foraging on the Animas River above mainstem Cement Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.85E-01	2.24	4.51	<1	<1	3.07E-01	2.24	4.51	<1	<1
Cadmium	7.84E-01	1.47	6.35	<1	<1	5.80E-01	1.47	6.35	<1	<1
Chromium	5.54E-01	2.66	15.6	<1	<1	5.11E-01	2.66	15.6	<1	<1
Copper	1.36E+01	4.05	34.9	**3.4**	<1	1.30E+01	4.05	34.9	**3.2**	<1
Lead	8.70E+00	1.63	44.6	**5.3**	<1	7.45E+00	1.63	44.6	**4.6**	<1
Mercury	1.74E-02	0.45	0.9	<1	<1	1.68E-02	0.45	0.9	<1	<1
Nickel	1.21E-01	6.71	18.6	<1	<1	1.19E-01	6.71	18.6	<1	<1
Selenium	1.75E-01	0.29	0.82	<1	<1	1.76E-01	0.29	0.82	<1	<1
Silver	5.69E-02	2.02	60.5	<1	<1	5.34E-02	2.02	60.5	<1	<1
Zinc	1.65E+02	66.1	171	**2.5**	<1	1.20E+02	66.1	171	**1.8**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.32
HQs for the American dipper foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.39E-01	2.24	4.51	<1	<1	1.25E-01	2.24	4.51	<1	<1
Cadmium	1.39E-01	1.47	6.35	<1	<1	1.38E-01	1.47	6.35	<1	<1
Chromium	4.36E-01	2.66	15.6	<1	<1	4.33E-01	2.66	15.6	<1	<1
Copper	7.87E+00	4.05	34.9	**1.9**	<1	7.79E+00	4.05	34.9	**1.9**	<1
Lead	2.75E+00	1.63	44.6	**1.7**	<1	2.52E+00	1.63	44.6	**1.5**	<1
Mercury	2.11E-02	0.45	0.9	<1	<1	2.11E-02	0.45	0.9	<1	<1
Nickel	6.54E-02	6.71	18.6	<1	<1	6.39E-02	6.71	18.6	<1	<1
Selenium	1.09E-01	0.29	0.82	<1	<1	1.08E-01	0.29	0.82	<1	<1
Silver	5.72E-02	2.02	60.5	<1	<1	5.62E-02	2.02	60.5	<1	<1
Zinc	3.44E+01	66.1	171	<1	<1	3.40E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.33
HQs for the American dipper foraging at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	2.09E-01	2.24	4.51	<1	<1	1.96E-01	2.24	4.51	<1	<1
Cadmium	1.95E-01	1.47	6.35	<1	<1	1.92E-01	1.47	6.35	<1	<1
Chromium	4.09E-01	2.66	15.6	<1	<1	4.06E-01	2.66	15.6	<1	<1
Copper	7.12E+00	4.05	34.9	**1.8**	<1	6.93E+00	4.05	34.9	**1.7**	<1
Lead	2.90E+00	1.63	44.6	**1.8**	<1	2.43E+00	1.63	44.6	**1.5**	<1
Mercury	2.16E-02	0.45	0.9	<1	<1	2.16E-02	0.45	0.9	<1	<1
Nickel	1.29E-01	6.71	18.6	<1	<1	1.27E-01	6.71	18.6	<1	<1
Selenium	1.10E-01	0.29	0.82	<1	<1	1.10E-01	0.29	0.82	<1	<1
Silver	5.99E-02	2.02	60.5	<1	<1	5.79E-02	2.02	60.5	<1	<1
Zinc	4.18E+01	66.1	171	<1	<1	4.10E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.34

HQs for the American dipper foraging at sampling location A73B on the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.68E+00	2.24	4.51	<1	<1	1.36E+00	2.24	4.51	<1	<1
Cadmium	2.08E-01	1.47	6.35	<1	<1	1.88E-01	1.47	6.35	<1	<1
Chromium	5.81E-01	2.66	15.6	<1	<1	5.59E-01	2.66	15.6	<1	<1
Copper	4.77E+01	4.05	34.9	**12**	**1.4**	2.89E+01	4.05	34.9	**7.1**	<1
Lead	5.15E+00	1.63	44.6	**3.2**	<1	4.77E+00	1.63	44.6	**2.9**	<1
Mercury	2.11E-02	0.45	0.9	<1	<1	1.64E-02	0.45	0.9	<1	<1
Nickel	4.28E-01	6.71	18.6	<1	<1	3.74E-01	6.71	18.6	<1	<1
Selenium	5.73E-01	0.29	0.82	**2.0**	<1	5.73E-01	0.29	0.82	**2.0**	<1
Silver	1.16E-01	2.02	60.5	<1	<1	7.48E-02	2.02	60.5	<1	<1
Zinc	4.26E+01	66.1	171	<1	<1	3.92E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.35
HQs for the American dipper foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.79E-01	2.24	4.51	<1	<1	1.62E-01	2.24	4.51	<1	<1
Cadmium	1.67E-01	1.47	6.35	<1	<1	1.64E-01	1.47	6.35	<1	<1
Chromium	6.48E-01	2.66	15.6	<1	<1	6.46E-01	2.66	15.6	<1	<1
Copper	3.41E+00	4.05	34.9	<1	<1	3.27E+00	4.05	34.9	<1	<1
Lead	1.25E+00	1.63	44.6	<1	<1	1.10E+00	1.63	44.6	<1	<1
Mercury	4.80E-02	0.45	0.9	<1	<1	4.80E-02	0.45	0.9	<1	<1
Nickel	1.47E-01	6.71	18.6	<1	<1	1.40E-01	6.71	18.6	<1	<1
Selenium	2.42E-01	0.29	0.82	<1	<1	2.42E-01	0.29	0.82	<1	<1
Silver	1.23E-01	2.02	60.5	<1	<1	1.22E-01	2.02	60.5	<1	<1
Zinc	4.27E+01	66.1	171	<1	<1	4.04E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.36
HQs for the American dipper foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.61E+00	2.24	4.51	<1	<1	9.95E-01	2.24	4.51	<1	<1
Cadmium	3.40E-01	1.47	6.35	<1	<1	2.28E-01	1.47	6.35	<1	<1
Chromium	6.02E-01	2.66	15.6	<1	<1	5.89E-01	2.66	15.6	<1	<1
Copper	6.75E+01	4.05	34.9	**17**	**1.9**	3.07E+01	4.05	34.9	**7.6**	<1
Lead	4.11E+00	1.63	44.6	**2.5**	<1	3.10E+00	1.63	44.6	**1.9**	<1
Mercury	1.64E-02	0.45	0.9	<1	<1	1.64E-02	0.45	0.9	<1	<1
Nickel	5.34E-01	6.71	18.6	<1	<1	3.66E-01	6.71	18.6	<1	<1
Selenium	6.53E-01	0.29	0.82	**2.3**	<1	3.76E-01	0.29	0.82	**1.3**	<1
Silver	8.22E-02	2.02	60.5	<1	<1	5.23E-02	2.02	60.5	<1	<1
Zinc	5.64E+01	66.1	171	<1	<1	4.48E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.37

HQs for the American dipper foraging at the Bakers Bridge sampling location on the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.10E-01	2.24	4.51	<1	<1	9.28E-02	2.24	4.51	<1	<1
Cadmium	3.52E-01	1.47	6.35	<1	<1	3.33E-01	1.47	6.35	<1	<1
Chromium	4.16E-01	2.66	15.6	<1	<1	4.12E-01	2.66	15.6	<1	<1
Copper	4.16E+00	4.05	34.9	**1.03**	<1	3.85E+00	4.05	34.9	<1	<1
Lead	1.32E+00	1.63	44.6	<1	<1	1.15E+00	1.63	44.6	<1	<1
Mercury	1.83E-02	0.45	0.9	<1	<1	1.83E-02	0.45	0.9	<1	<1
Nickel	3.78E-01	6.71	18.6	<1	<1	3.50E-01	6.71	18.6	<1	<1
Selenium	9.77E-02	0.29	0.82	<1	<1	9.55E-02	0.29	0.82	<1	<1
Silver	4.89E-02	2.02	60.5	<1	<1	4.80E-02	2.02	60.5	<1	<1
Zinc	8.76E+01	66.1	171	**1.3**	<1	7.91E+01	66.1	171	**1.2**	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.38

HQs for the mallard foraging on the Animas River above mainstem Cement Creek (100% benthic invert diet)

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.08E-01	2.24	4.51	<1	<1	6.50E-02	2.24	4.51	<1	<1
Cadmium	1.97E-01	1.47	6.35	<1	<1	1.45E-01	1.47	6.35	<1	<1
Chromium	1.41E-01	2.66	15.6	<1	<1	1.30E-01	2.66	15.6	<1	<1
Copper	3.31E+00	4.05	34.9	<1	<1	3.18E+00	4.05	34.9	<1	<1
Lead	1.32E+00	1.63	44.6	<1	<1	1.12E+00	1.63	44.6	<1	<1
Mercury	4.48E-03	0.45	0.9	<1	<1	4.32E-03	0.45	0.9	<1	<1
Nickel	2.64E-02	6.71	18.6	<1	<1	2.64E-02	6.71	18.6	<1	<1
Selenium	4.49E-02	0.29	0.82	<1	<1	4.49E-02	0.29	0.82	<1	<1
Silver	1.13E-02	2.02	60.5	<1	<1	1.09E-02	2.02	60.5	<1	<1
Zinc	4.08E+01	66.1	171	<1	<1	2.96E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.39

HQs for mallards foraging at sampling location A72 on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.46E-02	2.24	4.51	<1	<1	1.43E-02	2.24	4.51	<1	<1
Cadmium	3.47E-02	1.47	6.35	<1	<1	3.47E-02	1.47	6.35	<1	<1
Chromium	1.10E-01	2.66	15.6	<1	<1	1.10E-01	2.66	15.6	<1	<1
Copper	1.95E+00	4.05	34.9	<1	<1	1.95E+00	4.05	34.9	<1	<1
Lead	3.98E-01	1.63	44.6	<1	<1	3.95E-01	1.63	44.6	<1	<1
Mercury	5.44E-03	0.45	0.9	<1	<1	5.44E-03	0.45	0.9	<1	<1
Nickel	1.39E-02	6.71	18.6	<1	<1	1.39E-02	6.71	18.6	<1	<1
Selenium	2.72E-02	0.29	0.82	<1	<1	2.72E-02	0.29	0.82	<1	<1
Silver	1.36E-02	2.02	60.5	<1	<1	1.36E-02	2.02	60.5	<1	<1
Zinc	8.51E+00	66.1	171	<1	<1	8.50E+00	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.40

HQs for mallards foraging at sampling location A73 on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.60E-02	2.24	4.51	<1	<1	3.58E-02	2.24	4.51	<1	<1
Cadmium	4.78E-02	1.47	6.35	<1	<1	4.78E-02	1.47	6.35	<1	<1
Chromium	1.03E-01	2.66	15.6	<1	<1	1.03E-01	2.66	15.6	<1	<1
Copper	1.70E+00	4.05	34.9	<1	<1	1.70E+00	4.05	34.9	<1	<1
Lead	3.59E-01	1.63	44.6	<1	<1	3.53E-01	1.63	44.6	<1	<1
Mercury	5.60E-03	0.45	0.9	<1	<1	5.60E-03	0.45	0.9	<1	<1
Nickel	2.97E-02	6.71	18.6	<1	<1	2.96E-02	6.71	18.6	<1	<1
Selenium	2.80E-02	0.29	0.82	<1	<1	2.79E-02	0.29	0.82	<1	<1
Silver	1.40E-02	2.02	60.5	<1	<1	1.40E-02	2.02	60.5	<1	<1
Zinc	1.01E+01	66.1	171	<1	<1	1.01E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.41

HQs for mallards foraging at sampling location A73B on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.15E-01	2.24	4.51	<1	<1	3.37E-01	2.24	4.51	<1	<1
Cadmium	5.17E-02	1.47	6.35	<1	<1	4.71E-02	1.47	6.35	<1	<1
Chromium	1.49E-01	2.66	15.6	<1	<1	1.43E-01	2.66	15.6	<1	<1
Copper	1.22E+01	4.05	34.9	**3.0**	<1	7.42E+00	4.05	34.9	**1.8**	<1
Lead	1.02E+00	1.63	44.6	<1	<1	9.50E-01	1.63	44.6	<1	<1
Mercury	6.03E-02	0.45	0.9	<1	<1	6.03E-02	0.45	0.9	<1	<1
Nickel	1.05E-01	6.71	18.6	<1	<1	9.19E-02	6.71	18.6	<1	<1
Selenium	1.48E-01	0.29	0.82	<1	<1	1.48E-01	0.29	0.82	<1	<1
Silver	2.84E-02	2.02	60.5	<1	<1	1.84E-02	2.02	60.5	<1	<1
Zinc	1.02E+01	66.1	171	<1	<1	9.59E+00	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.42
HQs for mallards foraging at sampling location A75D on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.17E-02	2.24	4.51	<1	<1	3.16E-02	2.24	4.51	<1	<1
Cadmium	4.00E-02	1.47	6.35	<1	<1	4.00E-02	1.47	6.35	<1	<1
Chromium	1.66E-01	2.66	15.6	<1	<1	1.66E-01	2.66	15.6	<1	<1
Copper	7.71E-01	4.05	34.9	<1	<1	7.69E-01	4.05	34.9	<1	<1
Lead	1.26E-01	1.63	44.6	<1	<1	1.24E-01	1.63	44.6	<1	<1
Mercury	1.25E-02	0.45	0.9	<1	<1	1.25E-02	0.45	0.9	<1	<1
Nickel	3.14E-02	6.71	18.6	<1	<1	3.14E-02	6.71	18.6	<1	<1
Selenium	6.23E-02	0.29	0.82	<1	<1	6.23E-02	0.29	0.82	<1	<1
Silver	3.12E-02	2.02	60.5	<1	<1	3.12E-02	2.02	60.5	<1	<1
Zinc	9.60E+00	66.1	171	<1	<1	9.57E+00	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.43

HQs for mallards foraging at sampling location A75B on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD[1] (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD[1] (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.98E-01	2.24	4.51	<1	<1	2.48E-01	2.24	4.51	<1	<1
Cadmium	8.27E-02	1.47	6.35	<1	<1	5.65E-02	1.47	6.35	<1	<1
Chromium	1.54E-01	2.66	15.6	<1	<1	1.50E-01	2.66	15.6	<1	<1
Copper	1.73E+01	4.05	34.9	**4.28**	<1	7.88E+00	4.05	34.9	**1.95**	<1
Lead	8.32E-01	1.63	44.6	<1	<1	6.45E-01	1.63	44.6	<1	<1
Mercury	6.03E-02	0.45	0.9	<1	<1	6.03E-02	0.45	0.9	<1	<1
Nickel	1.30E-01	6.71	18.6	<1	<1	8.98E-02	6.71	18.6	<1	<1
Selenium	1.68E-01	0.29	0.82	<1	<1	9.67E-02	0.29	0.82	<1	<1
Silver	2.02E-02	2.02	60.5	<1	<1	1.28E-02	2.02	60.5	<1	<1
Zinc	1.18E+01	66.1	171	<1	<1	1.05E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.44

HQs for mallards foraging at the Baker Bridge sampling location on the Animas River below mainstem Mineral Creek (100% benthic invert diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.24E-02	2.24	4.51	<1	<1	1.22E-02	2.24	4.51	<1	<1
Cadmium	8.14E-02	1.47	6.35	<1	<1	8.12E-02	1.47	6.35	<1	<1
Chromium	1.04E-01	2.66	15.6	<1	<1	1.04E-01	2.66	15.6	<1	<1
Copper	9.02E-01	4.05	34.9	<1	<1	8.99E-01	4.05	34.9	<1	<1
Lead	1.38E-01	1.63	44.6	<1	<1	1.36E-01	1.63	44.6	<1	<1
Mercury	4.73E-03	0.45	0.9	<1	<1	4.73E-03	0.45	0.9	<1	<1
Nickel	8.14E-02	6.71	18.6	<1	<1	8.11E-02	6.71	18.6	<1	<1
Selenium	2.37E-02	0.29	0.82	<1	<1	2.37E-02	0.29	0.82	<1	<1
Silver	1.18E-02	2.02	60.5	<1	<1	1.18E-02	2.02	60.5	<1	<1
Zinc	1.81E+01	66.1	171	<1	<1	1.81E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.45
HQs for Mallard foraging on the Animas River above mainstem Cement Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

	RME Scenario					CTE Scenario				
COPECs	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	7.96E-02	2.24	4.51	<1	<1	5.52E-02	2.24	4.51	<1	<1
Cadmium	1.62E-01	1.47	6.35	<1	<1	1.31E-01	1.47	6.35	<1	<1
Chromium	7.59E-02	2.66	15.6	<1	<1	7.01E-02	2.66	15.6	<1	<1
Copper	2.19E+00	4.05	34.9	<1	<1	2.09E+00	4.05	34.9	<1	<1
Lead	1.12E+00	1.63	44.6	<1	<1	9.84E-01	1.63	44.6	<1	<1
Mercury	4.92E-03	0.45	0.9	<1	<1	4.37E-03	0.45	0.9	<1	<1
Nickel	2.78E-02	6.71	18.6	<1	<1	2.66E-02	6.71	18.6	<1	<1
Selenium	3.53E-02	0.29	0.82	<1	<1	4.27E-02	0.29	0.82	<1	<1
Silver	8.01E-03	2.02	60.5	<1	<1	7.46E-03	2.02	60.5	<1	<1
Zinc	3.28E+01	66.1	171	<1	<1	2.56E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.46
HQs for mallards foraging at sampling location A72 on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.55E-02	2.24	4.51	<1	<1	3.26E-02	2.24	4.51	<1	<1
Cadmium	4.57E-02	1.47	6.35	<1	<1	4.11E-02	1.47	6.35	<1	<1
Chromium	6.14E-02	2.66	15.6	<1	<1	5.98E-02	2.66	15.6	<1	<1
Copper	1.36E+00	4.05	34.9	<1	<1	1.32E+00	4.05	34.9	<1	<1
Lead	4.46E-01	1.63	44.6	<1	<1	4.18E-01	1.63	44.6	<1	<1
Mercury	4.93E-03	0.45	0.9	<1	<1	4.76E-03	0.45	0.9	<1	<1
Nickel	1.75E-02	6.71	18.6	<1	<1	1.65E-02	6.71	18.6	<1	<1
Selenium	3.98E-02	0.29	0.82	<1	<1	3.38E-02	0.29	0.82	<1	<1
Silver	7.67E-03	2.02	60.5	<1	<1	7.48E-03	2.02	60.5	<1	<1
Zinc	9.37E+00	66.1	171	<1	<1	8.75E+00	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.47

HQs for mallards foraging at sampling location A73 on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.36E-02	2.24	4.51	<1	<1	4.09E-02	2.24	4.51	<1	<1
Cadmium	6.37E-02	1.47	6.35	<1	<1	5.76E-02	1.47	6.35	<1	<1
Chromium	5.74E-02	2.66	15.6	<1	<1	5.59E-02	2.66	15.6	<1	<1
Copper	1.31E+00	4.05	34.9	<1	<1	1.25E+00	4.05	34.9	<1	<1
Lead	4.60E-01	1.63	44.6	<1	<1	4.06E-01	1.63	44.6	<1	<1
Mercury	4.64E-03	0.45	0.9	<1	<1	4.43E-03	0.45	0.9	<1	<1
Nickel	2.71E-02	6.71	18.6	<1	<1	2.60E-02	6.71	18.6	<1	<1
Selenium	3.27E-02	0.29	0.82	<1	<1	2.83E-02	0.29	0.82	<1	<1
Silver	8.05E-03	2.02	60.5	<1	<1	7.71E-03	2.02	60.5	<1	<1
Zinc	1.19E+01	66.1	171	<1	<1	1.09E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Created by: EC 1/20/14
QC'd by: SJP 2/13/14
Updated by: EC 2/27/15
QC'd by: RI 3/3/15

Table 5.48

HQs for mallards foraging at sampling location A73B on the Animas River below mainstem Mineral Creek (50%-50% diet)

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	2.36E-01	2.24	4.51	<1	<1	1.92E-01	2.24	4.51	<1	<1
Cadmium	6.05E-02	1.47	6.35	<1	<1	5.49E-02	1.47	6.35	<1	<1
Chromium	7.97E-02	2.66	15.6	<1	<1	7.64E-02	2.66	15.6	<1	<1
Copper	6.59E+00	4.05	34.9	**1.6**	<1	4.09E+00	4.05	34.9	**1.01**	<1
Lead	7.58E-01	1.63	44.6	<1	<1	7.09E-01	1.63	44.6	<1	<1
Mercury	3.27E-02	0.45	0.9	<1	<1	3.24E-02	0.45	0.9	<1	<1
Nickel	7.04E-02	6.71	18.6	<1	<1	6.15E-02	6.71	18.6	<1	<1
Selenium	1.16E-01	0.29	0.82	<1	<1	1.16E-01	0.29	0.82	<1	<1
Silver	1.54E-02	2.02	60.5	<1	<1	9.91E-03	2.02	60.5	<1	<1
Zinc	1.28E+01	66.1	171	<1	<1	1.08E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.49
HQs for mallards foraging at sampling location A75D on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.84E-02	2.24	4.51	<1	<1	3.45E-02	2.24	4.51	<1	<1
Cadmium	6.37E-02	1.47	6.35	<1	<1	5.73E-02	1.47	6.35	<1	<1
Chromium	8.80E-02	2.66	15.6	<1	<1	8.73E-02	2.66	15.6	<1	<1
Copper	7.98E-01	4.05	34.9	<1	<1	7.41E-01	4.05	34.9	<1	<1
Lead	2.52E-01	1.63	44.6	<1	<1	2.31E-01	1.63	44.6	<1	<1
Mercury	7.86E-03	0.45	0.9	<1	<1	7.86E-03	0.45	0.9	<1	<1
Nickel	3.39E-02	6.71	18.6	<1	<1	3.05E-02	6.71	18.6	<1	<1
Selenium	4.99E-02	0.29	0.82	<1	<1	4.69E-02	0.29	0.82	<1	<1
Silver	1.61E-02	2.02	60.5	<1	<1	1.60E-02	2.02	60.5	<1	<1
Zinc	1.49E+01	66.1	171	<1	<1	1.25E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.50

HQs for mallards foraging at sampling location A75B on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD[1] (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD[1] (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	2.26E-01	2.24	4.51	<1	<1	1.43E-01	2.24	4.51	<1	<1
Cadmium	9.86E-02	1.47	6.35	<1	<1	6.64E-02	1.47	6.35	<1	<1
Chromium	8.25E-02	2.66	15.6	<1	<1	8.07E-02	2.66	15.6	<1	<1
Copper	9.20E+00	4.05	34.9	**2.3**	<1	4.33E+00	4.05	34.9	**1.1**	<1
Lead	6.25E-01	1.63	44.6	<1	<1	4.90E-01	1.63	44.6	<1	<1
Mercury	3.24E-02	0.45	0.9	<1	<1	3.24E-02	0.45	0.9	<1	<1
Nickel	8.75E-02	6.71	18.6	<1	<1	6.00E-02	6.71	18.6	<1	<1
Selenium	1.32E-01	0.29	0.82	<1	<1	7.46E-02	0.29	0.82	<1	<1
Silver	1.09E-02	2.02	60.5	<1	<1	6.94E-03	2.02	60.5	<1	<1
Zinc	2.03E+01	66.1	171	<1	<1	1.40E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.51

HQs for mallards foraging at the Bakers Bridge sampling location on the Animas River below mainstem Mineral Creek (50%-50% diet)
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.00E-02	2.24	4.51	<1	<1	2.61E-02	2.24	4.51	<1	<1
Cadmium	1.19E-01	1.47	6.35	<1	<1	9.66E-02	1.47	6.35	<1	<1
Chromium	5.95E-02	2.66	15.6	<1	<1	5.78E-02	2.66	15.6	<1	<1
Copper	9.44E-01	4.05	34.9	<1	<1	8.45E-01	4.05	34.9	<1	<1
Lead	2.61E-01	1.63	44.6	<1	<1	2.36E-01	1.63	44.6	<1	<1
Mercury	4.40E-03	0.45	0.9	<1	<1	4.00E-03	0.45	0.9	<1	<1
Nickel	7.69E-02	6.71	18.6	<1	<1	6.50E-02	6.71	18.6	<1	<1
Selenium	5.69E-02	0.29	0.82	<1	<1	4.12E-02	0.29	0.82	<1	<1
Silver	6.52E-03	2.02	60.5	<1	<1	6.36E-03	2.02	60.5	<1	<1
Zinc	2.79E+01	66.1	171	<1	<1	2.24E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.52

HQs for the belted kingfisher foraging on the Animas River above mainstem Cement Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.68E-01	2.24	4.51	<1	<1	2.95E-01	2.24	4.51	<1	<1
Cadmium	1.81E-01	1.47	6.35	<1	<1	1.56E-01	1.47	6.35	<1	<1
Chromium	1.64E-02	2.66	15.6	<1	<1	8.82E-02	2.66	15.6	<1	<1
Copper	3.41E+00	4.05	34.9	<1	<1	2.90E+00	4.05	34.9	<1	<1
Lead	1.04E+01	1.63	44.6	**6.4**	<1	9.04E+00	1.63	44.6	**5.5**	<1
Mercury	2.77E-02	0.45	0.9	<1	<1	7.77E-04	0.45	0.9	<1	<1
Nickel	7.84E-01	6.71	18.6	<1	<1	3.20E+00	6.71	18.6	<1	<1
Selenium	8.50E-02	0.29	0.82	<1	<1	1.28E-01	0.29	0.82	<1	<1
Silver	5.45E-01	2.02	60.5	<1	<1	4.69E-01	2.02	60.5	<1	<1
Zinc	5.09E+01	66.1	171	<1	<1	3.99E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.53
HQs for the belted kingfisher foraging at sampling location A72 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.27E-01	2.24	4.51	<1	<1	3.60E-01	2.24	4.51	<1	<1
Cadmium	4.08E-02	1.47	6.35	<1	<1	2.96E-02	1.47	6.35	<1	<1
Chromium	2.00E-02	2.66	15.6	<1	<1	1.50E-02	2.66	15.6	<1	<1
Copper	1.48E+00	4.05	34.9	<1	<1	1.17E+00	4.05	34.9	<1	<1
Lead	3.49E+00	1.63	44.6	**2.1**	<1	2.87E+00	1.63	44.6	**1.8**	<1
Mercury	1.94E-02	0.45	0.9	<1	<1	1.66E-02	0.45	0.9	<1	<1
Nickel	5.03E-01	6.71	18.6	<1	<1	4.35E-01	6.71	18.6	<1	<1
Selenium	1.62E-01	0.29	0.82	<1	<1	1.28E-01	0.29	0.82	<1	<1
Silver	2.04E-01	2.02	60.5	<1	<1	1.62E-01	2.02	60.5	<1	<1
Zinc	1.04E+01	66.1	171	<1	<1	8.24E+00	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.54
HQs for the belted kingfisher foraging at sampling location A73 on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.64E-01	2.24	4.51	<1	<1	3.00E-01	2.24	4.51	<1	<1
Cadmium	7.58E-02	1.47	6.35	<1	<1	5.62E-02	1.47	6.35	<1	<1
Chromium	1.77E-02	2.66	15.6	<1	<1	1.31E-02	2.66	15.6	<1	<1
Copper	2.43E+00	4.05	34.9	<1	<1	1.70E+00	4.05	34.9	<1	<1
Lead	4.37E+00	1.63	44.6	**2.7**	<1	3.08E+00	1.63	44.6	**1.9**	<1
Mercury	1.38E-02	0.45	0.9	<1	<1	1.11E-02	0.45	0.9	<1	<1
Nickel	6.14E-01	6.71	18.6	<1	<1	5.46E-01	6.71	18.6	<1	<1
Selenium	1.19E-01	0.29	0.82	<1	<1	9.37E-02	0.29	0.82	<1	<1
Silver	2.39E-01	2.02	60.5	<1	<1	1.62E-01	2.02	60.5	<1	<1
Zinc	1.76E+01	66.1	171	<1	<1	1.32E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.55

HQs for the belted kingfisher foraging at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.24E-01	2.24	4.51	<1	<1	3.22E-01	2.24	4.51	<1	<1
Cadmium	5.90E-02	1.47	6.35	<1	<1	4.91E-02	1.47	6.35	<1	<1
Chromium	1.70E-02	2.66	15.6	<1	<1	1.54E-02	2.66	15.6	<1	<1
Copper	2.50E+00	4.05	34.9	<1	<1	1.51E+00	4.05	34.9	<1	<1
Lead	3.56E+00	1.63	44.6	**2.2**	<1	3.20E+00	1.63	44.6	**2.0**	<1
Mercury	2.49E-02	0.45	0.9	<1	<1	1.94E-02	0.45	0.9	<1	<1
Nickel	1.03E+00	6.71	18.6	<1	<1	8.52E-01	6.71	18.6	<1	<1
Selenium	2.47E-01	0.29	0.82	<1	<1	2.47E-01	0.29	0.82	<1	<1
Silver	2.64E-01	2.02	60.5	<1	<1	1.70E-01	2.02	60.5	<1	<1
Zinc	2.16E+01	66.1	171	<1	<1	1.40E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.56

HQs for the belted kingfisher foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	2.91E-01	2.24	4.51	<1	<1	2.09E-01	2.24	4.51	<1	<1
Cadmium	8.98E-02	1.47	6.35	<1	<1	6.73E-02	1.47	6.35	<1	<1
Chromium	1.60E-02	2.66	15.6	<1	<1	1.37E-02	2.66	15.6	<1	<1
Copper	1.81E+00	4.05	34.9	<1	<1	1.26E+00	4.05	34.9	<1	<1
Lead	2.20E+00	1.63	44.6	**1.4**	<1	1.80E+00	1.63	44.6	**1.1**	<1
Mercury	1.11E-02	0.45	0.9	<1	<1	1.11E-02	0.45	0.9	<1	<1
Nickel	1.06E+00	6.71	18.6	<1	<1	8.01E-01	6.71	18.6	<1	<1
Selenium	1.19E-01	0.29	0.82	<1	<1	1.02E-01	0.29	0.82	<1	<1
Silver	1.19E-01	2.02	60.5	<1	<1	9.37E-02	2.02	60.5	<1	<1
Zinc	3.49E+01	66.1	171	<1	<1	2.19E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.57
HQsfor the belted kingfisher foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	4.00E-01	2.24	4.51	<1	<1	2.14E-01	2.24	4.51	<1	<1
Cadmium	1.47E-01	1.47	6.35	<1	<1	7.01E-02	1.47	6.35	<1	<1
Chromium	1.80E-02	2.66	15.6	<1	<1	1.70E-02	2.66	15.6	<1	<1
Copper	3.53E+00	4.05	34.9	<1	<1	1.61E+00	4.05	34.9	<1	<1
Lead	2.61E+00	1.63	44.6	**1.6**	<1	1.78E+00	1.63	44.6	**1.1**	<1
Mercury	1.94E-02	0.45	0.9	<1	<1	1.94E-02	0.45	0.9	<1	<1
Nickel	1.41E+00	6.71	18.6	<1	<1	8.26E-01	6.71	18.6	<1	<1
Selenium	2.81E-01	0.29	0.82	<1	<1	1.62E-01	0.29	0.82	<1	<1
Silver	1.87E-01	2.02	60.5	<1	<1	1.19E-01	2.02	60.5	<1	<1
Zinc	6.68E+01	66.1	171	**1.01**	<1	2.75E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.58

HQs for the belted kingfisher foraging at the Baker Bridge sampling location on the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	3.20E-01	2.24	4.51	<1	<1	2.36E-01	2.24	4.51	<1	<1
Cadmium	2.61E-01	1.47	6.35	<1	<1	1.41E-01	1.47	6.35	<1	<1
Chromium	2.29E-02	2.66	15.6	<1	<1	1.77E-02	2.66	15.6	<1	<1
Copper	2.84E+00	4.05	34.9	<1	<1	1.63E+00	4.05	34.9	<1	<1
Lead	2.26E+00	1.63	44.6	**1.4**	<1	1.80E+00	1.63	44.6	**1.1**	<1
Mercury	1.66E-02	0.45	0.9	<1	<1	1.11E-02	0.45	0.9	<1	<1
Nickel	2.64E+00	6.71	18.6	<1	<1	1.56E+00	6.71	18.6	<1	<1
Selenium	2.64E-01	0.29	0.82	<1	<1	1.79E-01	0.29	0.82	<1	<1
Silver	1.45E-01	2.02	60.5	<1	<1	1.11E-01	2.02	60.5	<1	<1
Zinc	1.07E+02	66.1	171	**1.6**	<1	5.80E+01	66.1	171	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.59

HQs for the muskrat foraging on the Animas River above mainstem Cement Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.04E-01	1.04	4.6	<1	<1	8.96E-02	1.04	4.6	<1	<1
Cadmium	2.01E-01	0.77	6.9	<1	<1	1.84E-01	0.77	6.9	<1	<1
Chromium	1.97E-02	2.4	58.2	<1	<1	1.85E-02	2.4	58.2	<1	<1
Copper	1.90E+00	5.6	82.7	<1	<1	1.75E+00	5.6	82.7	<1	<1
Lead	2.77E+00	4.7	186.4	<1	<1	2.48E+00	4.7	186.4	<1	<1
Mercury	8.05E-03	1	3	<1	<1	6.62E-03	1	3	<1	<1
Nickel	5.07E-02	1.7	14.8	<1	<1	4.63E-02	1.7	14.8	<1	<1
Selenium	3.91E-02	0.14	0.66	<1	<1	6.12E-02	0.14	0.66	<1	<1
Silver	1.21E-02	6.02	119	<1	<1	1.04E-02	6.02	119	<1	<1
Zinc	4.01E+01	75.4	298	<1	<1	3.47E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.60

HQs for the muskrat foraging at sampling location A72 on the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.16E-01	1.04	4.6	<1	<1	1.03E-01	1.04	4.6	<1	<1
Cadmium	8.65E-02	0.77	6.9	<1	<1	7.23E-02	0.77	6.9	<1	<1
Chromium	2.40E-02	2.4	58.2	<1	<1	1.81E-02	2.4	58.2	<1	<1
Copper	1.27E+00	5.6	82.7	<1	<1	1.14E+00	5.6	82.7	<1	<1
Lead	1.20E+00	4.7	186.4	<1	<1	1.04E+00	4.7	186.4	<1	<1
Mercury	6.62E-03	1	3	<1	<1	6.09E-03	1	3	<1	<1
Nickel	3.61E-02	1.7	14.8	<1	<1	3.24E-02	1.7	14.8	<1	<1
Selenium	7.95E-02	0.14	0.66	<1	<1	6.12E-02	0.14	0.66	<1	<1
Silver	4.55E-03	6.02	119	<1	<1	3.60E-03	6.02	119	<1	<1
Zinc	1.59E+01	75.4	298	<1	<1	1.39E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.61

HQs for the muskrat foraging at sampling location A73 on the Animas River below mainstem Mineral Creek

Baseline Ecological Risk Assessment

Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.03E-01	1.04	4.6	<1	<1	9.07E-02	1.04	4.6	<1	<1
Cadmium	1.23E-01	0.77	6.9	<1	<1	1.04E-01	0.77	6.9	<1	<1
Chromium	2.12E-02	2.4	58.2	<1	<1	1.57E-02	2.4	58.2	<1	<1
Copper	1.61E+00	5.6	82.7	<1	<1	1.36E+00	5.6	82.7	<1	<1
Lead	1.42E+00	4.7	186.4	<1	<1	1.09E+00	4.7	186.4	<1	<1
Mercury	5.51E-03	1	3	<1	<1	4.87E-03	1	3	<1	<1
Nickel	4.22E-02	1.7	14.8	<1	<1	3.85E-02	1.7	14.8	<1	<1
Selenium	5.67E-02	0.14	0.66	<1	<1	4.35E-02	0.14	0.66	<1	<1
Silver	5.31E-03	6.02	119	<1	<1	3.60E-03	6.02	119	<1	<1
Zinc	2.15E+01	75.4	298	<1	<1	1.83E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.62

HQs for the muskrat foraging at sampling location A73B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.15E-01	1.04	4.6	<1	<1	9.51E-02	1.04	4.6	<1	<1
Cadmium	1.06E-01	0.77	6.9	<1	<1	9.60E-02	0.77	6.9	<1	<1
Chromium	2.02E-02	2.4	58.2	<1	<1	1.83E-02	2.4	58.2	<1	<1
Copper	1.63E+00	5.6	82.7	<1	<1	1.28E+00	5.6	82.7	<1	<1
Lead	1.22E+00	4.7	186.4	<1	<1	1.13E+00	4.7	186.4	<1	<1
Mercury	7.60E-03	1	3	<1	<1	6.62E-03	1	3	<1	<1
Nickel	6.32E-02	1.7	14.8	<1	<1	5.44E-02	1.7	14.8	<1	<1
Selenium	1.27E-01	0.14	0.66	<1	<1	1.27E-01	0.14	0.66	<1	<1
Silver	5.88E-03	6.02	119	<1	<1	3.79E-03	6.02	119	<1	<1
Zinc	2.43E+01	75.4	298	<1	<1	1.89E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.63

HQs for the muskrat foraging at sampling location A75D on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	8.87E-02	1.04	4.6	<1	<1	7.11E-02	1.04	4.6	<1	<1
Cadmium	1.35E-01	0.77	6.9	<1	<1	1.15E-01	0.77	6.9	<1	<1
Chromium	1.93E-02	2.4	58.2	<1	<1	1.65E-02	2.4	58.2	<1	<1
Copper	1.40E+00	5.6	82.7	<1	<1	1.18E+00	5.6	82.7	<1	<1
Lead	8.60E-01	4.7	186.4	<1	<1	7.44E-01	4.7	186.4	<1	<1
Mercury	4.87E-03	1	3	<1	<1	4.87E-03	1	3	<1	<1
Nickel	6.41E-02	1.7	14.8	<1	<1	5.15E-02	1.7	14.8	<1	<1
Selenium	5.67E-02	0.14	0.66	<1	<1	4.79E-02	0.14	0.66	<1	<1
Silver	2.65E-03	6.02	119	<1	<1	2.09E-03	6.02	119	<1	<1
Zinc	3.21E+01	75.4	298	<1	<1	2.44E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.64

HQs for the muskrat foraging at sampling location A75B on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	1.10E-01	1.04	4.6	<1	<1	7.23E-02	1.04	4.6	<1	<1
Cadmium	1.78E-01	0.77	6.9	<1	<1	1.17E-01	0.77	6.9	<1	<1
Chromium	2.16E-02	2.4	58.2	<1	<1	2.05E-02	2.4	58.2	<1	<1
Copper	1.93E+00	5.6	82.7	<1	<1	1.32E+00	5.6	82.7	<1	<1
Lead	9.72E-01	4.7	186.4	<1	<1	7.37E-01	4.7	186.4	<1	<1
Mercury	6.62E-03	1	3	<1	<1	6.62E-03	1	3	<1	<1
Nickel	8.03E-02	1.7	14.8	<1	<1	5.28E-02	1.7	14.8	<1	<1
Selenium	1.46E-01	0.14	0.66	**1.04**	<1	7.95E-02	0.14	0.66	<1	<1
Silver	4.17E-03	6.02	119	<1	<1	2.65E-03	6.02	119	<1	<1
Zinc	4.72E+01	75.4	298	<1	<1	2.79E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient

Table 5.65

HQs for the muskrat foraging at the Baker Bridge sampling location on the Animas River below mainstem Mineral Creek
Baseline Ecological Risk Assessment
Upper Animas Mining District

COPECs	RME Scenario					CTE Scenario				
	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ	Total EDD (mg/kg bw-day)	TRV NOAEL	TRV LOAEL	No Effect HQ	Effect HQ
Arsenic	9.47E-02	1.04	4.6	<1	<1	7.71E-02	1.04	4.6	<1	<1
Cadmium	2.47E-01	0.77	6.9	<1	<1	1.74E-01	0.77	6.9	<1	<1
Chromium	2.75E-02	2.4	58.2	<1	<1	2.12E-02	2.4	58.2	<1	<1
Copper	1.73E+00	5.6	82.7	<1	<1	1.33E+00	5.6	82.7	<1	<1
Lead	8.74E-01	4.7	186.4	<1	<1	7.43E-01	4.7	186.4	<1	<1
Mercury	6.09E-03	1	3	<1	<1	4.87E-03	1	3	<1	<1
Nickel	1.33E-01	1.7	14.8	<1	<1	8.72E-02	1.7	14.8	<1	<1
Selenium	1.36E-01	0.14	0.66	<1	<1	8.87E-02	0.14	0.66	<1	<1
Silver	3.22E-03	6.02	119	<1	<1	2.46E-03	6.02	119	<1	<1
Zinc	6.27E+01	75.4	298	<1	<1	4.33E+01	75.4	298	<1	<1

mg/kg bw-day - milligrams per kilogram of body weight per day

COPECs - Chemicals of Potential Ecological Concern

EDD - Estimated Daily Dose

NOAEL - No Observable Adverse Effect Level

LOAEL - Lowest Observable Adverse Effect Level

TRV - Toxicity Reference Value

RME - Reasonable Maximum Exposure

CTE - Central Tendency Exposure

HQ - Hazard Quotient