Appendix G

TRVs AND BENCHMARKS

TABLE G-1
SOURCES OF AVIAN BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	EPA ECO-SSL (mg chemical/kg BW/day)	NOAEL Dose (mg chemical/kg BW/day)	LOAEL Dose (mg chemical/kg BW/day)	Species	Life Stage	Chemical Form	Exposure Time	Endpoint	Reference	Rejected Studies	Comments
Aluminum[1]	NT	--	--	--	--	--	--	--	U.S. EPA 2005a	--	U.S. EPA considers non-toxic
Antimony	NA	NA	NA	--	--	--	--	--	--	--	No Data
Arsenic	2.24	5.5	22	Mallard	Adult	Sodium arsenate	4 weeks prior to pairing and through multiple hatching cycles	Egg weight, duckling production	Stanley, et al. 1994	Camardese, et al. 1990	shorter exposure period
										Kerr et al. 1963	non-reproductive endpoints
Barium	NA	208.3	416.5	--	--	--	--	--	Johnson, et al. 1960	--	ORNL Default
Beryllium	NA	NA	NA								
Cadmium	1.47	1.9	21.1	Mallard	Adult	Cadmium chloride	90-d during reproductive phase	Body weight, food consumption, egg production, blood parameters	White and Finley 1978	White et al. 1978	Non-reproductive endpoint
										Leach et al. 1979	Similar value
										Cain, et al. 1983	Non-reproductive endpoint
Chromium III	2.66	37.7	75.4	Chicken	Immature	CrIII	15 days	Egg albumin weight	Meluzzi et al. 1996	Haseltine, et al. 1985	implausible "safe" soil concentration
										Heinz and Haseltine 1981	Behavioral endpoints
										Mertz and Roginski 1975	rejected by ECO-SSL group
										Hill and Maltrone 1970	rejected by ECO-SSL group
Chromium VI	NA										
Cobalt	7.61	7.61	38.1[2]	--	--	--	--	--	U.S. EPA 2005a	--	--
Copper	NA	33	62	Chickens	1 day old	--	10 weeks	Growth	Mehring, et al. 1960	Norvell, et al. 1975	Similar results to Mehring, et al. 1960
										Underwood 1956	Similar results to Mehring, et al. 1960
										Bakalli, et al. 1995	Similar results to Mehring, et al. 1960
										Jensen and Maurice 1978	gizzard erosion artifact
Iron[+A44]	NT	--	--	--	--	--	--	--	U.S. EPA 2005a	--	U.S. EPA consideres non-toxic
Lead	10.9	7.4	37[2]	Dove	Adult	Lead acetate	2 weeks	egg production, egg fertility, hatch weight	Kendall and Scanlon 1981	Edens, et al. 1976 Edens and Garlick 1983	back-calculated "safe" soil concentrations below common background soil concentrations
Manganese	NA	977	4,885						Sample et al. 1996		ORNL Default
Mercury	NA	0.45	0.91	Japanese quail	Adult	--	1 year	egg production, fertility, hatchability	Hill and Schaffer 1976	--	--
Methylmercury	NA	0.14	0.68	Great blue heron	Adult and Nestlings		Breeding season	population stability	Wolfe and Norman 1998	Heinz et al. 1974, 1976, 1979	Used dicyanodiamide salt
										Spalding et al. 2000a, 2000b	Additional stressors- handled daily
										Bouton et al. 1999	Behavioral endpoints
										Barr et al. 1986	Additional stressors- low pH
										Kenow et al. 2003	Additional stressors- low pH
Molybdenum	NA	7.1[2]	35.3	--	--	--	--	--	--	--	ORNL Default
Nickel	NA	80	--	Mallard	Juvenile	--	90 days	egg production, hatchability	Eastin and O'Shea 1981	Nielsen 1977	shorter exposure period
		--	107	--	--	--	--	growth	Cain and Pafford 1981	Weber and Reid 1968	shorter exposure period
Selenium	NA	0.4	0.8	--	--	--	--	--	Heinz, et al. 1989	--	ORNL Default
Thallium	NA	NA	NA	--	--	--	--	--	--	--	No data
Vanadium	NA	11.38	56.9	--	--	--	--	--	White and Dieter 1978	--	ORNL Default
Zinc	NA	14.5	131	Chickens	Adult	--	44 weeks	Hatchability as measured by fertility, egg hatchability and body mass of 3-wk old progeny	Stahl, et al. 1990	Jackson, et al. 1986	Similar NOAEL dose
										Gasaway and Bus 1972	shorter exposure period
Cyanide[3]	NA	0.52	0.68	Chicken/ Mallard	Juvenile	sodium cyanide	--	Growth	Eisler 1999	--	--

Notes:
-- - Information not provided or applicable
1) EPA considers aluminum non-toxic except below pH 5.5, and iron non-toxic, regardless of pH.
2) No LOAEL available; estimated by multiplying NOAEL by a factor of 5.
3) Class-specific TRVs, based on interspecies acute toxicity values, were derived from these chronic TRVs. See section 5 text and text table.

TABLE G-2
SOURCES OF MAMMALIAN BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	EPA ECO-SSL (mg chemical/kg BW/day)	NOAEL Dose (mg chemical/kg BW/day)	LOAEL Dose (mg chemical/kg BW/day)	Species	Life Stage	Chemical Form	Exposure Time	Endpoint	Reference	Rejected Studies	Comments
Aluminum[1]	NT	--	--	--	--	--	--	--	U.S. EPA 2005a	--	U.S. EPA considers non-toxic
Antimony	0.059	13.3	66.5[3]						U.S. EPA 2005a		
Arsenic	2.47	5.7	11.6	Rat	--	--	--	Growth	Neiger and Osweiller 1989 Byron, et al. 1967	Schroeder, et al. 1968	Single no effect dose
Barium	51.8	51.8	259[3]						U.S. EPA 2005a		
Beryllium	0.532	0.532	2.7[3]						U.S. EPA 2005a		
Cadmium	1.86	5.1[2]	7.1[2]	Various	--	--	--	Reproduction	U.S. EPA 2005a	NA	NA
Chromium III	2.4	8.8	44.2	Rat	NA	Chromium III	20 weeks	Body weight, organ weight	Anderson, et al. 1997	Ivankovic and Preussmann 1975[3]	acid-insoluble chromium salt
										Elbetieha and Al-Hamood 1997	No dose-response
										Zahid et al. 1990	Biologically implausable
										Bataineh et al. 1997	Conflicting Data
										Al-Hamood et al. 1998	Conflicting Data
Chromium VI	9.35	7.4[2,3]	37	Mouse/Rat	pre-gestation	Potassium chromate (CrVI)	20-90 days	fetal weight, pre and post-implantation	Junaid, et al. 1996	MacKenzie, et al. 1958[3]	Lower no-effect dose
									Kanojia, et al. 1996	Anwar, et al. 1961	Lower no-effect dose
									Kanojia, et al. 1998	Chowdhury and Mitra 1995[3]	Lower no-effect dose
										Elbetieha and Al-Hamood 1997	No dose-response
										Zahid et al. 1990	Biologically implausable
										Bataineh et al. 1997	Conflicting Data
										Al-Hamood et al. 1998	Conflicting Data
Cobalt	7.33	7.34	36.7[3]	--	--	--	--	--	U.S.EPA 2005a	--	ORNL Default
Copper	NA	11.7	15.1	Mink	Adult	Copper sulfate	357	Reproduction	Aulerich, et al. 1982	Massie and Aiello 1984	Similar results to Aulerich, et. al 1982
										Pocino et al, 1991	Non-reproductive endpoints
										Boyden, el at. 1938	Non-reproductive endpoints
										Llewellyn, et al. 1985	Non-reproductive endpoints
										Murthy, et al. 1981	Non-reproductive endpoints
										Lecyk, et al. 1980	Shorter exposure period
Iron[1]	NT	--	--	--	--	--	--	--	U.S. EPA 2005a	--	U.S. EPA considers non-toxic
Lead	40.7	34		rat	Pregnant	Lead acetate	312 days	Birth weight, Pup survival	Kimmel et al. 1980	Draski, et al. 1989	Shorter exposure duration
										NTP 1996	Non-reproductive endpoint
										Grant, et al. 1980	Non-reproductive endpoint
										Fowler et al. 1980	Non-reproductive endpoint
			80	Rat	Adult	Lead acetate	2-years, 3-generations	Offspring weight	Azar, et al. 1973	Schroeder and Mitchener 1971	Single dose
Manganese	NA	88	284						Schroeder and Mitchener 1971	--	--
Mercury	NA	13.2		Mouse	6-month estrous cycle	Mercuric chloride	20 months	Reproduction	Revis, et al. 1989	Aulerich, et al. 1974	Single, no effect dose; shorter exposure period
			56	Rat	Adult	Mercuric chloride	2 years	Growth	Fitzhugh, et al. 1950		
Methylmercury	NA	0.08	0.12	Mink	Adult and Kits		2-generations	Reproduction and kit survival	Dansereau et al. 1999	Wobeser et al. 1976a, 1976b	Shotrer exposure duration
										Aulerich et al. 1974	Higher no-effect doses
										Wren et al. 1987	Additional Stressors- cold
										Halbrook et al. 1999	Additional Stressors- PCBs
Molybdenum	NA	2.6	13	--	--	--	--	--	Sample et al. 1996	--	ORNL default
Nickel	NA	60	80	Rat	Adult	Nickel chloride	3 generations	Lactation, fertility, gestation, offspring viability	Ambrose, et al. 1976	Smith, et al. 1993	No dose-response
										RTI 1987	Abnormal holding conditions
										Vyskocil, et a. 1994	Shorter exposure period
										Schroeder and Mitchener 1971	Single dose
Selenium	NA	0.35	1.05	Rat	Adult	Potassium selenate	3 generation	number of young, reproduction in succesive generations	Rosenfeld and Beath 1954	Schroeder and Mitchener 1971	Single dose
										NTP 1994	Non-reproductive endpoints
Silver	NA	44.4	222	Rat	Adult		37 weeks	decreased growth and lifespan	Matuk et al. 1981		
Thallium	NA	0.2	1.0[3]	Rat	Adult	Thallium sulfate	90 days	Body weight, organ weight, clinical chemistry	U.E. EPA 1986	Formigli et al. 1986	Shorter exposure period
										Downs et al. 1960	Non-reproductive endpoint
										Manzo et al. 1983	Non-reproductive endpoint
Vanadium	5.92	5.92	8.3	--	--	--	--	--	U.S. EPA 2005a	--	--
Zinc	NA	160	320	Rat	Adult	Zinc oxide	16 days	Mating, fertilization, implantation, fetal development	Schlicker and Cox 1968	Aulerich, et al. 1991	Higher NOAEL
										Ketcheson, et al. 1969	Similar NOAEL, no LOAEL
										Aughey et al. 1977	Similar NOAEL, no LOAEL
										Maita, et al. 1981	Similar NOAEL, no LOAEL
Cyanide	NA	68.7	343.5	Rat	Adult	sodium cyanide	Gestation and lactation	Reproductive performance	Tewe and Maner (1981)	Howard and Hanzal 1955	Lower no-effect dose
										Leuschner et al. 1991	Lower no-effect dose
										Singh 1981	Conflicting Data
										Frakes et al. 1986a,b	Conflicting Data
										NTP 1993	Non-reproductive endpoint

Notes:

1) EPA considers aluminum non-toxic except below pH 5.5, and iron non-toxic, regardless of pH.

2) NOAEL and LOAEL based on geometric means from 34 studies (USEPA 2003)

3) No LOAEL/NOAEL available; estimated by multiplying/dividing NOAEL by a factor of 5 (Lewis, et al. 1990)

TABLE G-3
SOURCES OF SOIL INVERTEBRATE BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	EPA ECO-SSL mg/kg	Endpoint		All Data mg/kg	Selected Data mg/kg	Species	Form	Notes and Selection Criteria	Reference
Aluminum	NT[4]	18-d LC50	mortality	>5000		*E. fetida*	Al_2O_3	pH 2.41, 3.35, 4.47, 7.12	van Gestel and Hoogerwerf 2001
		18-d LC50	mortality	>4000		*E. fetida*	$Al_2(SO_4)^3$	pH 4.86 and 7.22	
		18-d LC50	mortality	457		*E. fetida*	$Al_2(SO_4)^3$	pH 3.24	
		18-d LC50	mortality	>1000		*E. fetida*	$AlCl_3$	pH 4.37	
		18-d LC50	mortality	359		*E. fetida*	$AlCl_3$	pH 3.69	
		18-d LC50	mortality	316		*E. fetida*	$AlCl_3$	pH 3.21	
		42-d NOEC	cocoon production	100	100	*E. fetida*	$Al_2(SO_4)^3$	pH 3.4, 4.3, 7.3	
benchmark					*100*			Only for use below pH 5.5	
Antimony	78[4]	NOEC	cocoon production	258	258	*E. fetida*		Lab; Freshly added but only study available	Simini et al. 2002
benchmark					*258*				
Arsenic	60[5]	28-d NOEC	mortality	2000	2000	*L. rubellus*	$NaAsO_3$	Field adapted organisms (Freshly added salt)	Langdon et al. 1999, 2001
		Population NOEC	population stability	8000	8000	*L. rubellus*	NA	Field adapted organisms; Old mine soil	
		56-d EC60	reproduction	50		*E. fetida*	$KAsO_3$	Lab; Not Selected[1]	Fischer and Koszorus 1992
benchmark					*4000*				
Barium	330[4]	NOEC	cocoon production	1348	1348	*E.fetida*		Lab; Freshly added but only study available	Simini et al. 2002
benchmark					*1348*				
Beryllium	40[4]	NOEC	cocoon production	60	60	*E.fetida*		Lab; Freshly added but only study available	Simini et al. 2002
benchmark					*60*				
Cadmium	140[4]	14-d NOEC	mortality	3000		*E. fetida*	$CdSO_4$	Lab adapted organisms; Not selected[1]	Reinecke et al. 1999
		20-w NOEC	reproduction	50		*E. fetida*	$CdCl_2$	Lab; Freshly added; Not Selected[2]	Malecki et al. 1982
		20-w NOEC	reproduction	75		*E. fetida*	$Cd(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		20-w NOEC	reproduction	10000	10000	*E. fetida*	$Cd(CO_3)_2$	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	25	25	*E. fetida*	CdO	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	75	75	*E. fetida*	$CdSO_4$	Lab; Freshly added relevant salt	
		56-d NOEC	reproduction	39.2		*E. fetida*	$Cd(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Spurgeon et al. 1994
benchmark					*266*				
Chromium III	NA[4]	21-d NOEC	reproduction	560	560	*E. fetida*	$Cr(NO_3)_3$	Lab; Freshly added non-relevant salt but ony study available	Lock and Janssen 2002
benchmark					*560*				
Copper	60[5]	20-w NOEC	reproduction	2000		*E. fetida*	$CuCl_2$	Lab; Freshly added; Not Selected[2]	Malecki et al. 1982
		20-w NOEC	reproduction	75		*E. fetida*	$Cu(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		20-w NOEC	reproduction	2000	2000	*E. fetida*	$Cu(CO_3)_2$	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	20000	20000	*E. fetida*	CuO	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	100	100	*E. fetida*	$CuSO_4$	Lab; Freshly added relevant salt	
		56-d NOEC	cocoon production	32		*E. fetida*	$Cu(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Spurgeon et al. 1994
		Population NOEC	population stability	750	750		NA	Old mine soil; genetically-selected organisms	Langdon et al. 1999, 2001
benchmark					*1316*				
Lead	1700[4]	28-d NOEC	mortality	3000		*E. fetida*	$Pb(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Davies et al. 2003a
		28-d NOEC	growth	3000		*E. fetida*	$Pb(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		28-d NOEC	mortality	3125		*E. fetida*	$Pb(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Davies et al. 2003b
		28-d NOEC	cocoon production	625		*E. fetida*	$Pb(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		28-d NOEC	mortality	>12500		*E. fetida*	$PbCO_3$	Lab; Not Selected[1]	
		28-d NOEC	cocoon production	8000	8000	*E. fetida*	$PbCO_3$	Lab; Freshly added relevant salt	
		28-d NOEC	mortality	>12500		*E. fetida*	PbS	Not Selected[1]	
		28-d NOEC	cocoon production	>12500	12500	*E. fetida*	PbS	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	10000		*E. fetida*	$PbCl_2$	Lab; Freshly added; Not Selected[2]	Malecki et al. 1982
		20-w NOEC	reproduction	2000		*E. fetida*	$Pb(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		20-w NOEC	reproduction	8000	8000	*E. fetida*	$Pb(CO_3)_2$	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	8000	8000	*E. fetida*	PbO	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	8000	8000	*E. fetida*	$PbSO_4$	Lab; Freshly added relevant salt	
		56-d NOEC	cocoon production	1810		*E. fetida*	$Pb(NO_3)_2$	Freshly added; Not Selected[2]	Spurgeon et al. 1994
benchmark					*8747*				

TABLE G-3
SOURCES OF SOIL INVERTEBRATE BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	EPA ECO-SSL mg/kg	Endpoint		All Data mg/kg	Selected Data mg/kg	Species	Form	Notes and Selection Criteria	Reference
Manganese	NA	NOEC	cocoon production	1444	1444	*E.fetida*		Lab; Freshly added but only study available	Simini et al. 2002
benchmark					*1444*				
Mercury	0.1[5]	21-d EC50	cocoon production	9.16		*E. fetida*	$HgCl_2$	Lab; Not Selected[3]	Lock and Janssen 2001
		42-d EC50	reproduction	22		*E. aldibus*	$HgCl_2$	Lab; Not Selected[3]	
		56-d NOEC	reproduction	500		*E. fetida*	$HgCl_2$	Lab; Substrate pre-incubated 2 weeks	Fischer and Koszorus 1992
		21-d NOEC	reproduction	10	*10*	*E. fetida*	$HgCl_2$	Lab; Freshly added to OECD soil	Lock and Johnson 2001
benchmark					*0*				
Nickel	200[5]	20-w NOEC	reproduction	100		*E. fetida*	$NiCl_2$	Lab; Freshly added; Not Selected[2]	Malecki et al. 1982
		20-w NOEC	reproduction	300		*E. fetida*	$Ni(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		20-w NOEC	reproduction	1000	1000	*E. fetida*	$Ni(CO_3)_2$	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	30000	30000	*E. fetida*	NiO	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	300	300	*E. fetida*	$NiSO_4$	Lab; Freshly added relevant salt	
		4-wk EC10	cocoon production	85		*E. fetida*	$NiCl_2$	Lab; Freshly added; Not Selected[2]	Scott-Fordsmand et al. 1998
		4-w NOEC	cocoon production	100		*E. fetida*	$NiCl_2$	Lab; Freshly added; Not Selected[2]	
		4-w LOEC	cocoon production	300		*E. fetida*	$NiCl_2$	Lab; Freshly added; Not Selected[2]	
benchmark					*2080*				
Zinc	100[5]	20-w NOEC	reproduction	1000		*E. fetida*	$ZnCl_2$	Lab; Freshly added; Not Selected[2]	Malecki et al. 1982
		20-w NOEC	reproduction	1000		*E. fetida*	$Zn(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		20-w NOEC	reproduction	300	300	*E. fetida*	$Zn(CO_3)_2$	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	2000	2000	*E. fetida*	ZnO	Lab; Freshly added relevant salt	
		20-w NOEC	reproduction	300	300	*E. fetida*	$ZnSO_4$	Lab; Freshly added relevant salt	
		21-d EC50	cocoon production	3605		*E. fetida*	$Zn(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Spurgeon and Hopkin 1996
		21-d NOEC	cocoon production	1879		*E. fetida*	$Zn(NO_3)_2$	Lab; Freshly added; Not Selected[2]	
		56-d NOEC	cocoon production	199		*E. fetida*	$Zn(NO_3)_2$	Lab; Freshly added; Not Selected[2]	Spurgeon et al. 1994
		42-d NOEC	cocoon production	620	620	*E. fetida*	NA	Adapted organisms; Old mine soil	Spurgeon and Hopkin 1999b
benchmark					*578*				

1) Not selected because effects were found and reproductive endpoints were available
2) Not seleced because salt is unliklely to be present in mine soils
3) Not seleced because effects were found, reproductive endpoint data were available, and the the salt is unlikely to be found in mine soil
4) U.S. EPA ECP-SSL. Not selected because screening value based on most bioavailable salt freshly added to soi
5) Oak Ridge National Laboratory screening value. Not selected because inappropriate salt freshly added to soi

TABLE G-4
TRVs AND BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	Eastern U.S. Mean Ambient mg/kg	Site 95% UCL Ambient mg/kg	Soil Invertebrate-SSL mg/kg	Soil Invertebrate-NOEC mg/kg	Avian-SSL mg/kg	Avian-NOEC mg/kg	Mammalian-SSL mg/kg	Mammalian-NOEC mg/kg
Antimony	<1- 8.8	0.7	78	258	NA	NA	0.27-10	62-2,700
Arsenic	<0.1- 73	1.71	NA	4,000	43-1,100	114-2,645	46-170	378-969
Barium	10-1,500	74.4	330	1,348	NA	3,716-102,300	2,000-9,100	2,000-9,100
Beryllium	<1-7	1.59	40	60	NA	NA	21-90	20.7-90.5
Cadmium	NA	0.31	140	266	0.77-630	1.06-825	0.36-84	3.85-985
Chromium	1-1,000	35.9	NA	560	26-780	375-14,200	34-380	105-1,155
Cobalt	<0.3-70	9.6	NA	NA	120-1,300	124-1,334	230-2,100	214-2,350
Copper	<1-700	48.5	NA	1,326	NA	758-15,850	NA	845-2,800
Lead	<10-300	27.4	1,700	8,747	11-510	66-3,025	56-1,200	620-10,650
Manganese	<2-7,000	863	NA	1,444	NA	23,585-357,000	NA	7,500-10,650
Mercury	0.01-3.4	0.13	NA	10	NA	3.2-51	NA	433-3,750
Molybdenum	NA	NA	NA	NA	NA	52-3,450	NA	24-450
Nickel	<5-700	27.9	NA	2,080	NA	305-37,900	NA	263-16,575
Selenium	<0.1-3.9	1.59	NA	NA	NA	2-127	NA	2.1-17.5
Silver	NA	3.13	NA	NA	NA	30.5-6,750	NA	102-11,025
Thallium	2.2-23	0.34		NA	NA	NA	NA	0.95-64
Vanadium	<7-300	41.9	NA	NA	7.8-140	258-4,650	280-1,300	415-1,835
Zinc	<5-2,900	67.6	NA	578	NA	26.5-24,250	NA	725-24,900
Cyanide	NA	NA	NA	NA	NA	NA	NA	NA

TABLE G-5
SOURCES OF AMPHIBIAN BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	NRWQC ug/L	Endpoint		All Data ug/L	Selected NOEC[1,2] ug/L	Species	pH	Hardness	Reference
Aluminum	87	embryo-larval LC50		2280	1416	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1978
		embryo-larval LC50		20	12	*Bufo americanus*	5.75	7.8	Clark and LaZerte 1985
		embryo-larval LC50		100	62	*Bufo americanus*	4.75	7.8	Clark and LaZerte 1985
		embryo-larval LC50	>	997	619	*Bufo americanus*	4.8	6.1	Freda and McDonald 1990
		embryo-larval LC50	>	1029	639	*Bufo americanus*	4.6	6.1	Freda and McDonald 1990
		embryo-larval LC50	>	1038	645	*Bufo americanus*	4.4	6.1	Freda and McDonald 1990
		embryo-larval LC50		805	500	*Bufo americanus*	4.2	6.1	Freda and McDonald 1990
		96-h LC50 (tadpole)		627	389	*Bufo americanus*	4.5	6.1	Freda et al. 1990
		embryo-larval LC50		403	250	*Rana pipiens*	4.8	6.1	Freda and McDonald 1990
		embryo-larval LC50		811	504	*Rana pipiens*	4.6	6.1	Freda and McDonald 1990
		embryo-larval LC50		471	293	*Rana pipiens*	4.8	6.1	Freda et al. 1990
		embryo-larval LC50		746	463	*Rana sylvatica*	4.8	6.1	Freda and McDonald 1993
		embryo-larval LC50	>	1118	694	*Rana sylvatica*	4.6	6.1	Freda and McDonald 1993
		embryo-larval LC50	>	1150	714	*Rana sylvatica*	4.4	6.1	Freda and McDonald 1993
		embryo-larval LC50		1148	713	*Rana sylvatica*	4.2	6.1	Freda and McDonald 1993
benchmark					*370*				
Antimony	NA	embryo-larval LC50		300	186	*Gastrophryne carolinensis*	7.4	195	Birge 1978
benchmark					*186*				
Arsenic	150	embryo-larval LC50		4450	2764	*Ambystoma. opacum*	7.2-7.8	93-105	Birge et al. 1979
					2764				
Beryllium	NA	96-h LC50 (larva)		3,150	1957	*Ambystoma maculatum*		20-25	Slonim and Ray 1975
		96-h LC50 (larva)		31,500	19565	*Ambystoma maculatum*		400	Slonim and Ray 1975
benchmark					*6187*				
Cadmium[3]	0.094-0.48	10-d NOEC (larva)		12.8	12.8	*Ambystoma gracile*	6.8	45	Nebeker et al. 1994
		24-d NOEC (larva)		48.9	48.9	*Ambystoma gracile*	6.8	45	Nebeker et al. 1994
		10-d NOEC (larva)		193.1	193.1	*Ambystoma gracile*	6.8	45	Nebeker et al. 1994
		24-d NOEC (larva)		48.9	48.9	*Ambystoma gracile*	6.8	45	Nebeker et al. 1994
		embryo-larval LC50		150	93	*Ambystoma opacum*	7.2-7.8	93-105	Nebeker et al. 1994
				4000	2484	*Notophthalmus viridescens*	NA	NA	Manson and O'Flaherty 1978
		embryo-larval LC50		100	62	*Rana pipiens*	NA	NA	Birge and Just 1975
		embryo-larval LC50		500	311	*Rana pipiens*	NA	NA	Birge and Just 1975
		embryo-larval LC50		77	48	*Rana pipiens*	7.9-8.2	102	Francis et al. 1984
				10000	6211	*Rana pipiens*	NA	NA	Birge and Just 1973
benchmark					*331*				
Chromium	24-160	embryo-larval LC50		2130	1323	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1978
benchmark					*1323*				
Copper[3]	2.7-20	embryo-larval LC50		770	478	*Ambystomoa opacum*	7.2-7.8	93-105	Birge et al. 1978
		embryo-larval LC50		26960	16745	*Bufo flowerli*	7.2-7.8	93-105	Birge and Black 1979
		embryo-larval LC50		40	25	*Hyla chrysocelis*	7.2-7.8	100	Birge and Black 1979
		embryo-larval LC50		50	31	*Rana pipiens*	7.2-7.8	100	Birge and Black 1979
benchmark					*280*				
Iron	NA	39-d NOEC (tadple)			20000	*Bufo boreas*	5-6	NA	Porter and Hakanson 1976
benchmark					*20000*				
Lead[3]	0.54-7.0	embryo-larval LC50		1460	907	*Ambystoma jeffersonium*	7.2-7.8	93-105	Birge et al. 1978
benchmark					*907*				
Manganese	NA	96-h LC50 (tadpole)		14,840	9217	*Hyla ornata*	6.9	142-145	Rao and Madhyastha 1987
benchmark					*9217*				
Mercury	0.77	embryo-larval LC50		10.4	6	*Acris crepitans blanchardi*	7.0-7.8	90-105	Birge et al. 1979
		embryo-larval LC50		107.5	67	*Ambystoma mexicanum*	7.0-7.8	90-105	Birge et al. 1979
		embryo-larval LC50		110	68	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1979
		embryo-larval LC50		40	25	*Bufo debilis debilis*	7.0-7.8	90-105	Birge et al. 1979
		embryo-larval LC50		65.9	41	*Bufo fowleri*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		36.8	23	*Bufo punctatus*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		2.4	1	*Hyla chrysocelis*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		2.8	2	*Hyla crusifer*	7.0-7.8	90-105	Birge et al. 1979
		embryo-larval LC50		2.5	2	*Hyla gratiosa*	NA	NA	Birge et al. 1979
		embryo-larval LC50		2.4	1	*Hyla squirella*	NA	NA	Birge et al. 1979
		embryo-larval LC50		2.6	2	*Hyla diversacolor*	NA	NA	Birge et al. 1979
		embryo-larval LC50		67.2	42	*Rana gyrlio*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		59.9	37	*Rana heckscheri*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		7.3	5	*Rana pipiens*	7.0-7.8	90-105	Birge et al. 1979; 1983
		embryo-larval LC50		75	47	*Rana heckscheri*	7.9	200	Birge and Black 1977
		embryo-larval LC50		10	6	*Rana pipiens*	7.9	200	Birge and Black 1977
benchmark					*10.2*				

TABLE G-5
SOURCES OF AMPHIBIAN BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	NRWQC ug/L	Endpoint		All Data ug/L	Selected NOEC[1,2] ug/L	Species	pH	Hardness	Reference
Methlymercury	0.77	5-d embryo LC50		12-16	*7.5*	*Rana pipiens*	NA	NA	Dial 1976
benchmark					*7.5*				
Nickel[3]	16-120	embryo-larval LC50		420	261	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1978
		embryo-larval LC50		11,030	6851	*Bufo fowleri*	7.2-7.7	95-103	Birge and Black 1980
		96-h LC50 (tadpole)		25,320	15727	*Bufo melanosticus*	7.4	185	Khangarot and Ray 1987
benchmark					*1337*				
Selenium	NA	embryo-larval LC50		90	56	*Gastrophryne carolinensis*	7.4	195	Birge 1978; Birge et al. 1979
benchmark					*56*				
Silver	3.2 (acute)	embryo-larval LC50		240	149	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1978
benchmark					*149*				
Thallium,	NA	embryo-larval LC50		110	68	*Gastrophryne carolinensis*	7.4	195	Birge 1978; Birge et al.1979
benchmark					*68*				
Zinc[3]	36-270	embryo-larval LC50		2380	1478	*Ambystoma opacum*	7.2-7.8	93-105	Birge et al. 1978
benchmark					*1478*				
pH	6 to 9	embryo-larval NOEC			*4.8*	*Rana pipiens*	1.2 mg Ca/L		Freda and McDonald 1990
					4.6		0.7 mg Mg/L		Freda and McDonald 1990
					4.4				Freda and McDonald 1990
					4.2				Freda and McDonald 1990
		embryo-larval NOEC			*5.8*	*Ambystoma opacum*			Freda and Dunson 1986
					4.75				Freda and Dunson 1986
					4.5				Freda and Dunson 1986
					4.25				Freda and Dunson 1986
		embryo-larval NOEC			*5.8*	*Rana sylvatica*			Freda and Dunson 1986
					4.5				Freda and Dunson 1986
					4.25				Freda and Dunson 1986
					4				Freda and Dunson 1986
Cyanide	5.2	NA			5.2				
benchmark					*5.2*				

1) NOEC= LC50/1.61 (Sloof et al. 1983)
2) Geometric mean of NOECs
3) Hardness-dependent WQCs at 12.2 and 262 mg $CaCO_3$/L, respectively

TABLE G-6
SOURCES OF FISH BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	NRWQC ug/L	Endpoint	All Data ug/L	LC50:NOEC Conversion	Selected Value ug/L	Species	Notes Test Type	Hardness mg/L	pH	Reference
Aluminum	87	32-d LC301	30		*30*	Rainbow trout	flow-through	90	5.2	Wilson et al. 1996
Antimony	NA	ChV	1,600		*1600*	Fathead minnow	NA	NA	NA	Suter and Tsao 1996
Arsenic III	150	96-h LC50	4,600			Fathead minnow	flow-through	147	7.8	Cardwell et al. 1976
		96-h LC50	15,200	5.2	*2939*	Bluegill	static	50	7.3-8.0	Ingles and Davis 1972
		96-h LC50	41,600			Bluegill	flow-through	147	7.8	Cardwell et al. 1976
		96-h LC50	18,000			Channel catfish	flow-through	140	8	
		96-h LC50	40,500			Striped bass	flow-through	40	8	Palawski et al. 1985
		96-h LC50	30,500			Striped bass	flow-through	285	7.9	
		96-h LC50	13,300			Rainbow trout	static	44	7.4	Mayer and Ellersieck 1986
		90-d NOEC	>2,900		*2962*	Rainbow trout	static	44	7.4	Mayer et al. 1986
		96-h LC50	15,000			Rainbow trout	flow-through	152	7.8	Cardwell et al. 1976
		144-d LC50	20,700			Rainbow trout	flow-through	NA	NA	McGeachy and Dixon 1989
Arsenic V	150	96-h LC50	32,790			Fathead minnow	NA	NA	NA	Sutter and Tsao 1996
		ChV	892		*892*	Fathead minnow	NA	NA	NA	Sutter and Tsao 1996
		96-h LC50	46,860	28.7	*1633*	Rainbow trout	NA	NA	NA	Sutter and Tsao 1996
Beryllium	NA	96-h LC50	1,300			Bluegill	static	20	NA	Tarzwell & Henderson 1960
		96-h LC50	12,000			Bluegill	static	400	NA	
		96-h LC50	5,000			Brook trout	static	140	NA	Cardwell et al. 1976
		96-h LC50	5,000			Channel catfish	static	140	NA	
		96-h LC50	3,250			Fathead minnow	flow-through	140	NA	
		96-h LC50	150-200			Fathead minnow	static	20	NA	Tarzwell & Henderson 1960
		96-h LC50	11000-20000			Fathead minnow	static	400	NA	
		96-h LC50	3500-4400			Flagfish	flow-through	40	NA	Cardwell et al. 1976
		96-h LC50	4800			Goldfish	flow-through	147	NA	
		96-h LC50	160			Guppy	static	22	NA	Slonim & Slonim 1973
		96-h LC50	6100			Guppy	static	150	NA	
		96-h LC50	13700			Guppy	static	275	NA	
		96-h LC50	20000			Guppy	static	400	NA	
		96-h LC50	19000-32000			Guppy	static	450	NA	
		ChV	57		*57*	All Fish	NA	NA	NA	Sutter and Tsao 1996
Cadmium	0.25	11-month NOEC	31		*31*	Bluegill	flow-through	120	7.7	Eaton 1974
		35-40-d NOEC	4.2			White sucker	flow-through	45	7.6	Eaton et al. 1978
		35-40-d NOEC	4.2			Northern pike	flow-through	45	7.6	
		33-d NOEC	4.3			Smallmouth bass	flow-through	45	7.6	
		126-d NOEC	1.1			Brook trout	flow-through	45	7.6	
		61-d NOEC	1.1			Brown trout (late eyed embryo	flow-through	45	7.6	
		178-d NOEC	3.6			Rainbow trout	flow-through	45	7.6	Majewski and Giles 1981
		3-generation MATC	1-7-3.4		*1.7-3.4*	Brook trout	flow-through	44	7.8	Benoit et al. 1976
		30-d NOEC	0.2			Atlantic salmon fry	flow-through	13	6.5-6.8	Peterson et al. 1983
Chromium III	74	ChV	68.63		*68.63*	Steelhead	NA	NA	NA	Sutter and Tsao 1996
Chromium VI	11	22-month MATC	200-350		*200 - 350*	Rainbow trout	flow-through	45.4	7.5	Benoit 1976
Cobalt	NA	ChV	286.2		*286.2*	Fathead minnow	NA	NA	NA	Sutter and Tsao 1996
Copper	9	96-h LC50	884			Bluegill	static	44	7.1	Mayer and Elersiek 1986
		96-h LC50	7,340			Bluegill	static	272	7.4	
		96-h LC50	1,204			Bluegill	flow-through	45.4	7.5	Benoit 1975
		22-month MATC	40-77		*40*	Bluegill	flow-through	45.4	7.5	
		96-h LC50	3,510			Green sunfish	static	44	7.1	Mayer and Elersiek 1986
		96-h LC50	3,400			Green sunfish	static	272	7.4	
		96-h LC50	2,700			Pumpkinseed	static	55	8.0	Rehwoldt et al. 1972
		96-h LC50	6,400			White perch	static	55	8.0	
		96-h LC50	4,000			Stripped bass	static	55	8.0	
		96-h LC50	8,460			Golden shiner	static	72.5	7.5	Hartwell et al. 1989
		96-h LC50	540			Brown bullhead	flow-through	154	8.0	Geckler et al. 1976
		30-d LC50	186			Brown bullhead	flow-through	202	7.6	Brungs et al. 1973
		96-h LC50	790			Striped shiner	flow-through	154	8.0	Geckler et al. 1976
		96-h LC50	110			Brook trout	flow-through	ND	ND	McKim and Benoit 1976
		22-month MATC	9.5-17.4		*9.5 -17.4*	Brook trout	flow-through	45.4	7.5	McKim and Benoit 1976
Lead	2.5	96-h LC50	5,600			Fathead minnow	static	20	7.5	Pickering and Henderson 1966
		96-h LC50	482,000			Fathead minnow	static	360	8.2	
		96-h LC50	23,800	40	*595*	Bluegill	static	20	7.5	
		96-h LC50	442,000			Bluegill	static	360	8.2	
		96-h LC50	3,362			Brook trout	flow-through	44.3	6.8-7.6	Holcombe et al. 1976
		3-generation MATC	39-84		*39 - 84*	Brook trout	flow-through	44.3	6.8-7.6	
		24-d LC50	2,500			Rainbow trout	flow-through	135	7.4	Lam et al. 1976
		96-h LC50	1.32			fingerling	static	353	7.6	Davies et al. 1976
		96-h LC50	1.47			fingerling	static	28	6.6	
		96-h LC50	1.17			fingerling	flow-through	28	6.6	
		14-d MATC	18.2			fingerling	flow-through	28	6.6	
		14-d MATC	31.7			fingerling	flow-through	353	7.6	
		MATC	4.1			eyed egg	flow-through	28	6.6	
		MATC	7.6			eyed egg	flow-through	353	7.6	
		19-m MATC	7.2			post-hatch	flow-through	28	6.6	
		19-m MATC	14.6			post-hatch	flow-through	353	7.6	

TABLE G-6
SOURCES OF FISH BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	NRWQC ug/L	Endpoint	All Data ug/L	LC50:NOEC Conversion	Selected Value ug/L	Species	Notes Test Type	Hardness mg/L	pH	Reference
Manganese	NA	96-h LC50	7960			Fathead minnow	flow-through	50		Stubblefield et al. 1997
		ChV	1775		*1775*	Fathead minnow	flow-through	NA	NA	Sutter and Tsao 1996
		96-h LC50	3680			Rainbow trout	flow-through	50	7-7.9	Stubblefield et al. 1997
		96-h LC50	3760			Brook trout	flow-through	50	7-7.9	
		96-h LC50	9960			Brown trout	flow-through	50	7-7.9	
		29-d NOEC	3940			Brown trout	flow-through	30	7-7.9	
		29-d NOEC	2780			Brown trout	flow-through	150	7-7.9	
		29-d NOEC	4550			Brown trout	flow-through	450	7-7.9	
		29-d IC25	4670		*4670*	Brown trout	flow-through	30	7-7.9	
		29-d IC25	5590			Brown trout	flow-through	150	7-7.9	
		29-d IC25	8680			Brown trout	flow-through	450	7-7.9	
Mercury	0.77	96-h LC50	90			Striped bass	static	55	8	Rehwoldt et al. 1972
		96-h LC50	300			Pumpkinseed	static	55	8	
		96-h LC50	220			White perch	static	55	8	
		96-h LC50	280			Rainbow trout	static	90	7.7-7.8	MacLeod and Pessah 1973
		96-h LC50	33			Rainbow trout	flow-through	82-132	6.4-8.3	Hale 1977
		ChV	<0.23		*0.23*		NA	NA	NA	Sutter and Tsao 1996
Methylmercury	0.77	96-h LC50	74			Brook trout	flow-through	45-46	6.9-7.6	McKim et al. 1976
		3-generation MATC	0.29-0.93		*0.29-0.93*	Brook trout	flow-through	45	7.5	
Molybdenum	NA	AWQC	2200		*2200*	15 species	NA	NA	NA	Canton et al. 2004
Nickel	52	96-h LC50	19700	42.7	*461*	Bluegill	both	NA	NA	U.S. EPA 1996a
		96-h LC50	15646			Rainbow trout	flow-through	140	7.9-8.0	Pane et al. 2004
		99-d NOEC	384		*384*	Rainbow trout	flow-through	140	7.9-8.0	
		96-h LC50	466			Rainbow trout	flow-through	91	8	Brix et al. 2004
		85-d NOEC	20800			Rainbow trout	flow-through	89	7.9	
Selenium	5	ChV	88.3		*88.3*	Rainbow trout	NA	NA	NA	Suter and Tsao 1996
Silver	3.2 (acute)	96-h LC50	32			Bluegill	static	NA	NA	U.S. EPA 1996a
		6-m NOEC	70		*70*	Bluegill	flow-through	193 mg Cl/L		Coleman and Clearey 1974
		28-d NOEC	0.7-1.7			rainbow trout	flow-through	25 mg Cl/L		Galvez et al. 1998
		96-h LC50	6.5			Rainbow trout	flow-through	NA	NA	Davies et al. 1978
		18-m MATC	0.09-0.17		*0.09-1.7*	Rainbow trout	flow-through	NA	NA	
		30-d NOEC	>11,000			Fathead minnow	flow-through	Silver sulfide		LeBlanc et al. 1984
		30-d NOEC	>16,000			Fathead minnow	flow-through	Silver thiosulfide		
Thallium	NA	96-h LC50	125900			Bluegill	NA	NA	NA	Sutter and Tsao 1996
		96-h LC50	1795			Fathead minnow	NA	NA	NA	
		ChV	56.92		*56.9*	Fathead minnow	NA	NA	NA	
Vanadium	NA	96-h LC50	1850			Fathead minnow	NA	NA	NA	Sutter and Tsao 1996
		ChV	169.7		*169.7*	Fathead minnow	NA	NA	NA	
		96-h LC50	10250	10.9	*940*	Brook trout	NA	NA	NA	
Zinc	120	96-h LC50	770			Fathead minnow	static	20	7.5	Pickering and Henderson 1966
		96-h LC50	880			Fathead minnow	static	360	8.2	
		96-h LC50	4,850	3.7	*1,295*	Bluegill	static	20	7.5	
		96-h LC50	40,900			Bluegill	static	360	8.2	
		96-h LC50	20,100			Pumpkinseed	static	55	8	Rehwoldt et al. 1972
		96-h LC50	6,800			Striped bass	static	55	8	
		96-h LC50	14,400			White perch	static	55	8	
		96-h LC50	2,000			Brook trout	flow-through	45.4	7.0-7.6	Holcombe et al. 1979
		3-generation MATC	852		*852*	Brook trout	flow-through	45.4	7.0-7.6	
		3-generation NOEC	534			Brook trout	flow-through	45.4	7.0-7.6	
pH	6.0 - 9.0									
Cyanide	5.2	ChV	7.8		*7.8*	Brook trout	NA	NA	NA	U.S. EPA 1984
		ChV	13.6		*13.6*	Bluegill	NA	NA	NA	U.S. EPA 1984
		ChV	16.4			Fathead minnow	NA	NA	NA	U.S. EPA 1984

1) Considered as NOEC because authors reported feeding cessation caused mortality. This is unlikely to occur under field conditions.
MATC = Geometric mean of NOEC and LOEC = ChV

TABLE G-7
SOURCES OF EPIFAUNAL BENTHOS BENCHMARKS
ELIZABETH MINE SITE
SOUTH STRAFFORD, VERMONT

Analyte	NRWQC ug/L	96-h LC50 pH 6-6.5 ug/L	96-h LC50 pH 7-7.5 ug/L	Ratio pH 7:pH 6 ug/L	MATC pH 7 ug/L	Predicted MATC pH 6 ug/L	Species	Reference
Antimony	NA	NA	NA	NA	*5,400*	NA	*D. magna*	Suter and Tsao 1996
Arsenic	150	NA	NA	NA	*450*		*D. magna*	Suter and Tsao 1996
Barium	NA	NA	NA	NA	*5,800*	NA	*D. magna*	Suter and Tsao 1996
Beryllium	NA	NA	NA	NA	*5.3*	NA	*D. magna*	Suter and Tsao 1996
Cadmium	0.25	230	<25	0.1			*H. azteca*	Schubauer-Berigan et al. 1993
					0.39	*3.9*	*H. azteca*	Borgmann et al. 1998
Chromium	11 to 74	NA	2,000	NA			*H. betteni*	Warnick and Bell 1969
					74	NA		USEPA 2002c
Cobalt	NA	NA	NA	NA	*5.1*	NA	*D. magna*	Suter and Tsao 1996
Copper	9	17	24	1.4			*H. azteca*	Schubauer-Berigan et al. 1993
					21	*15*	*H. azteca*	Borgmann et al. 1998
Lead	2.5	<90	>5,400	60			*H. azteca*	Schubauer-Berigan et al. 1993
					8.7	*0.1*	*H. azteca*	Borgmann et al. 1998
Manganese	NA	Moderately Hard	Soft	ACR	Moderately Hard	Soft		
		8,100	3,000	17.9	*453*	*168*	*H. azteca*	Lasier et al. 2000
Mercury	0.77	NA	NA	NA	*1.7*	NA	*H. azteca*	Borgmann et al. 1998
Methylmercury	0.77	NA	NA	NA	0.87	NA		Suter and Tsao 1996
Molybdenum	NA	NA	NA	NA	879	NA	*D. magna*	Suter and Tsao 1996
Nickel	52	2,000	1,900	0.95			*H. azteca*	Schubauer-Berigan et al. 1993
					17.3	*18.2*	*H. azteca*	Borgmann et al. 2001
Selenium	NA	NA	NA	NA	*700*	NA	*H. azteca*	Brasher and Ogle 1993
Silver[1]	3.2 (acute	NA	20	NA	*20*	NA	*H. azteca*	Hirsch 1998
Thallium	NA				*9.8*	NA	*H. azteca*	Borgmann et al. 1998
Vanadium	NA	NA	NA	NA	*1,900*	NA	*D. magna*	Suter and Tsao 1996
Zinc	120	1,200	1,500	1.25			*H. azteca*	Schubauer-Berigan et al. 1993
					111	*89*	*H. azteca*	Borgmann et al. 1998
pH	6 to 9	4.3- 4.9					*H. azteca*	Mackie 1989
Cyanide	5.2	NA	NA	NA	*5.2*	NA		USEPA 2002c

Notes:
1) Silver sulfide NOEC