CHEMICAL UPDATE WORKSHEET

Chemical Name:	**Antimony**
CAS #:	**7440-36-0**
Revised By:	RRD Toxicology Unit
Revision Date:	September 24, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	121.760	124.78	EPI	EXP
Physical State at ambient temp	Inorganic	Inorganic	MDEQ	
Melting Point (˚C)	---	630	PP	EXP
Boiling Point (˚C)	1750	1635	PP	EXP
Solubility (ug/L)	NA	NA	NA	NA
Vapor Pressure (mmHg at 25˚C)	NA	NR	NA	NA
HLC (atm-m^3/mol at 25˚C)	NR	NR	NA	NA
Log Kow (log P; octanol-water)	NR	NR	NA	NA
Koc (organic carbon; L/Kg)	NR	NR	NA	NA
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	NR	NR	NA	NA
Diffusivity in Water (Dw; cm^2/s)	NR	NR	NA	NA
Soil Water Partition Coefficient	45	4.5E+01	SSG	EST

	Part 201 Value	Updated Value	Reference Source	Comments
(Kd; inorganics)				
Flash Point (˚F)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unit less)	NA	NA	NA	NA
Critical Temperature (K)		NR	NA	NA
Enthalpy of Vaporization (cal/mol)		NR	NA	NA
Density (g/mL, g/cm^3)		NR	NA	NA
EMSOFT Flux Residential 2 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Residential 5 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	NA	NR	EMSOFT	NA
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	NA	NR	EMSOFT	NA

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	3.5E-4	4.0E-4	IRIS, 1991	
RfD details	Chronic rat drinking water study (Schroeder et al, 1970), NOAEL= 5 mg/l 0.35 mg/kg/day stated in study UF=1000; Critical effect = longevity, blood glucose & cholesterol. CCD/RRD date: 11/06/1985	**Tier 1 Source:** **IRIS:** **Basis:** IRIS is a Tier 1 source. **Critical Study**: Schroeder, H.A., M. Mitchner and A.P. Nasor. 1970. Zirconium, niobium, antimony, vanadium and lead in rats: Life term studies. J. Nutrition. 100: 59-66. **Method(s)**: Long Evans rats (50/sex) were dosed with 5 ppm (as metal) antimony (as potassium antimony tartrate) in drinking water from the time of weaning until natural death. **Critical effect**: Decreased survival of both sexes, decreased blood glucose, and altered cholesterol levels. **End point or Point of Departure (POD):** LOAEL = 0.35 mg/kg-day **Uncertainty Factors**: UF = 1,000 (10 each for intra-species variability and interspecies and LOAEL to NOAEL extrapolation) **Source and date:** IRIS, Last revision date - 2/01/1991. A September, 2002 EPA literature review identified several critical new studies. **Tier 2 Sources**: **PPRTV:** PPRTV (7/09/2008) refers to IRIS RfD. **MRL:** No MRL record available at this time. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD/RRD (11/06/1985), RfD = 3.5E-4. See Part 201 Value RfD details. Per CCD/WRD (7/16/1998), RfD = 6E-5 mg/kg-day: **Critical Study**: Per WRD; Poon, R., I. Chu, P. Lecavalier et al. 1998. Effects of antimony on rats following 90-day exposure via drinking water. Food Chem. Toxicol. 36: 21-35. **Method(s)**: Sprague-Dawley rats were exposed to 0.5 ppm antimony (administered as potassium antimony tartrate) via the drinking water for 13		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		weeks **Critical effect**: histological and biochemical changes **End point or Point of Departure (POD):** NOAEL = 0.5 pmm Sb in drinking water equivalent to 0.06 mg/kg BW-day **Uncertainty Factors**: UF = 1,000 (10 each for intraspecies variability, interspecies extrapolation and use of a subchronic study) **Source and date:** 7/16/1998		
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	--	NA	MDEQ, 2015	
CSF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate information to assess carcinogenic potential" of soluble antimony salts. A separate provisional toxicity value report for antimony trioxide indicates "suggestive evidence of the carcinogenic potential" by the inhalation route of exposure, based on human and animal studies. **IRIS WOE Basis**: Available studies have found no evidence of carcinogenic activity by soluble antimony compounds. However, the available studies were of inadequate experimental design to draw any conclusions from the results. **Source and Date**: PPRTV, 7/09/2008 **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (2/01/1991), no value at this time. This substance has not undergone evaluation for evidence of carcinogenic potential **PPRTV:** Per PPRTV (7/09/2008), no value at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD (date), no value at this time.		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level	2.0E-1	2.0E-1	MDEQ, 1998	

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
(ITSL) (µg/m³)				
RfC/ITSL details	ITSL is based on the RfC for antimony trioxide (1309-64-4), which is in turn based on the chronic rat inhalation study of Newton et al., 1994. RfC was derived from a benchmark concentration; critical effect: pulmonary toxicity and chronic interstitial inflammation.	**Tier 3 Sources:** **MDEQ:** **Basis:** All Tier 3 sources (MA, MN, NJ) report an RfC from IRIS (1995). MDEQ provides the most accessible documentation. See details below. **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (2/01/1991), no value at this time. **PPRTV:** Per PPRTV (7/09/2008), no value at this time. **MRL:** No MRL record available at this time **Tier 3 Sources:** **MDEQ:** Per DEQ-CCD/AQD, ITSL = 2.0E-1 µg/m³ with 24 hour averaging time. **Basis:** ITSL is based on the IRIS RfC for antimony trioxide (1309-64-4), **Critical Study**: Newton, P.E., H.F. Bolte, I.W. Daly, et al. 1994. Subchronic and chronic inhalation toxicity of antimony trioxide in the rat. Fund. Appl. Toxicol. 22: 561-576 **Method(s)**: Chronic rat inhalation study **Critical effect**: Pulmonary toxicity and chronic interstitial inflammation **End point or Point of Departure (POD):** BMC_{10} = 0.87 mg/m^3 **Uncertainty Factors**: UF = 300 (10 for intraspecies variability and 3 each for interspecies extrapolation, database deficiencies and use of subchronic study (1 year). **Source and date:** MDEQ-AQD, 4/27/1998. **Massachusetts DEP:** RfC = 0.2 µg/m³ based on EPA 1995 (IRIS) **Minnesota:** RfC = 2E-4 mg/m^3 based on IRIS 1995 as Antimony Trioxide **New Jersey DEP:** RfC = 0.2 µg/m³ based on IRIS, 1995. **Other Tier 3:** No value is available at this time from these Tier 3		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		sources/databases: HEAST, NTP ROC, health and environmental agencies of California, New York, and Texas, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), and OECD HPV.		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: "inadequate information to assess carcinogenic potential" of soluble antimony salts. A separate provisional toxicity value report for antimony trioxide indicates "suggestive evidence of the carcinogenic potential" by the inhalation route of exposure, based on human and animal studies. **IRIS WOE Basis**: Available studies have found no evidence of carcinogenic activity by soluble antimony compounds. However, the available studies were of inadequate experimental design to draw any conclusions from the results. **Source and Date**: PPRTV, 7/09/2008 **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (2/01/1991), no value at this time. This substance has not undergone evaluation for evidence of carcinogenic potential **PPRTV:** Per PPRTV (7/09/2008), no value at this time. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD (date), no value at this time.		Complete
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2015	
MMOA Details	--	NA Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	No	No, the RfD and RfC are not based on a reproductive-developmental effect.	MDEQ, 2015	

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	6.0	6.0	SDWA, 1976	
SDWS details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399		
Secondary Maximum Contaminant Level (SMCL) (ug/L)	--	NO	SDWA, 1976 and USEPA SMCL List	
SMCL details	NA	MI Safe Drinking Water Act (SDWA) 1976 PA 399 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	--	NA	NA	
Aesthetic Value details	NA	NA		
Phytotoxicity Value? (Y/N)	NO	Not evaluated.	NA	
Phytotoxicity details	NA	NA	NA	
Others				

(C) Chemical-specific Absorption Factors

	Part 201 Value	Update	Source/Reference/ Dates	Comments/Notes /Issues
Gastrointestinal absorption efficiency value (ABSgi)	---	1.0	MDEQ, 2015/USEPA RAGS-E, 2004	
ABSgi details		MDEQ, 2015/USEPA RAGS-E, 2004		
Skin absorption efficiency value (AEd)	---	0.01	MDEQ, 2015	
AEd details				
Ingestion Absorption Efficiency (AEi)		0.5	MDEQ, 2015	
AEi Details				
Relative Source Contribution for Water (RSC_W)		0.2	MDEQ, 2015	
Relative Source Contribution for Soil (RSC_S)		1.0	MDEQ, 2015	
Relative Source Contribution for Air (RSC_A)		1.0	MDEQ, 2015	
Others				

(D) Rule 57 Water Quality Values and GSI Criteria

Current GSI value (µg/L)	130 (X)
Updated GSI value (µg/L)	130 (X)
Rule 57 Drinking Water Value (µg/L)	2 (M); 1.7

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	1.7	7/1998
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	130	7/1998
Wildlife Value (WV)	NA	NA
Human Cancer Values for Drinking Water Source (HCV-drink)	NA	NA
Human Cancer values for non-drinking water source (HCV-Non-drink)	NA	NA
Final Chronic Value (FCV)	240	6/2001
Aquatic maximum value (AMV)	1,100	6/2001
Final Acute Value (FAV)	2,300	6/2001

Sources:

1. MDEQ Surface Water Assessment Section Rule 57 website
2. MDEQ Rule 57 table

(E) Target Detection Limits (TDL)

	Value	Source
Target Detection Limit – Soil (μg/kg)	1,000	MDEQ, 2015
Target Detection Limit – Water (μg/L)	2	MDEQ, 2015
Target Detection Limit – Air (ppbv)	NA	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	NA	MDEQ, 2015

CHEMICAL UPDATE WORKSHEET ABBREVIATIONS:

CAS # - Chemical Abstract Service Number.

Section (A) Chemical-Physical Properties

Reference Source(s):

CRC	Chemical Rubber Company Handbook of Chemistry and Physics, 95th edition, 2014-2015
EMSOFT	USEPA Exposure Model for Soil-Organic Fate and Transport (EMSOFT) (EPA, 2002)
EPA2001	USEPA (2001) Fact Sheet, Correcting the Henry's Law Constant for Soil Temperature. Office of Solid Waste and Emergency Response, Washington, D.C.
EPA4	USEPA (2004) User's Guide for Evaluating Subsurface Vapor Intrusion into Buildings. February 22, 2004.
EPI	USEPA's Estimation Programs Interface SUITE 4.1, Copyright 2000-2012
HSDB	Hazardous Substances Data Bank
MDEQ	Michigan Department of Environmental Quality
NPG	National Institute for Occupational Safety and Health Pocket Guide to Chemical Hazards
PC	National Center for Biotechnology Information's PubChem database
PP	Syracuse Research Corporation's PhysProp database
SCDM	USEPA's Superfund Chemical Data Matrix
SSG	USEPA's Soil Screening Guidance: Technical Background Document, Second Edition, 1996
USEPA/EPA	United States environmental protection agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.
W9	USEPA's User Guide for Water9 Software, Version 2.0.0, 2001

Basis/Comments:

EST	estimated
EXP	experimental
EXT	extrapolated
NA	not available or not applicable
NR	not relevant

Section (B) Toxicity Values/Benchmarks

Sources/References:

ATSDR	Agency for Toxic Substances and Disease Registry
CALEPA	California Environmental Protection Agency
CAL DTSC	California Department of Toxic Substances Control
CAL OEHHA	CAEPA Office of Environmental Health Hazard Assessment
CCD	MDEQ Chemical Criteria Database
ECHA	European Chemicals Agency (REACH)
OECD HPV	Organization for Economic Cooperation and Development HPV Database
HEAST	USEPA's Health Effects Assessment Summary Tables
IRIS	USEPA's Integrated Risk Information System
MADEP	Massachusetts Department of Environmental Protection
MDEQ/DEQ	Michigan Department of Environmental Quality
DEQ-CCD/AQD	MDEQ Air Quality Division
DEQ-CCD/RRD	MDEQ Remediation and Redevelopment Division
DEQ-CCD/WRD	MDEQ Water Resources Division
MNDOH	Minnesota Department of Health

NJDEP	New Jersey Department of Environmental Protection
NYDEC	New York State Department of Environmental Conservation
OPP/OPPT	USEPA's Office of Pesticide Programs
PPRTV	USEPA's Provisional Peer Reviewed Toxicity Values
RIVM	The Netherlands National Institute of Public Health and the Environment
TCEQ	Texas Commission on Environmental Quality
USEPA	United States Environmental Protection Agency
USEPA OSWER	USEPA Office of Solid Waste and Emergency Response
USEPA MCL	USEPA Maximum Contaminant Level
WHO	World Health Organization
WHO IPCS	International Programme on Chemical Safety (IPCS/INCHEM)
WHO IARC	International Agency for Research on Cancers
NA	Not Available.
NR	Not Relevant.

Toxicity terms:

BMC	Benchmark concentration
BMCL	Lower bound confidence limit on the BMC
BMD	benchmark dose
BMDL	Lower bound confidence limit on the BMD
CSF	Cancer slope Factor
CNS	Central nervous system
IURF or IUR	Inhalation unit risk factor
LOAEL	Lowest observed adverse effect level
LOEL	Lowest observed effect level
MRL	Minimal risk level (ATSDR)
NOAEL	No observed adverse effect level
NOEL	No observed effect level
RfC	Reference concentration
RfD	Reference dose
p-RfD	Provisional RfD
aRfD	Acute RfD
UF	Uncertainty factor
WOE	Weight of evidence

Section (C) Chemical-specific Absorption Factors

MDEQ	Michigan Department of Environmental Quality
USEPA RAGS-E	United States Environmental Protection Agency's Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment). July, 2004.

Section (D) Rule 57 Water Quality Values and GSI Criteria

GSI	Groundwater-surface water interface
NA	A value is not available or not applicable.
ID	Insufficient data to derive value
NLS	No literature search has been conducted