CHEMICAL UPDATE WORKSHEET

Chemical Name:	**Sodium bromide**
CAS #:	**7647-15-6**
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)	102.9	102.89	EPI	EXP
Physical State at ambient temp	Inorganic	Solid	MDEQ	
Melting Point (˚C)	755	747.00	CRC	EXP
Boiling Point (˚C)	2534	1390	CRC	EXP
Solubility (ug/L)	9.1E+8	946000000	PC	EXP
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 (Kd; inorganics)	NR	NA	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (˚C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unitless)	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	NR	NA
EMSOFT Flux Residential 5 m (mg/day/cm^2)	NA	NR	NR	NA
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	NA	NR	NR	NA
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	NA	NR	NR	NA

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	--	4.0E-2	MDEQ, 2006	
RfD details	NA	**Tier 3 Source:** **MDEQ:** **Basis:** The MDEQ RfD is considered the best available Tier 3 because it is based on a study of human volunteers that is more current (1993). See details below. **Tier 1 and 2 Sources**: **IRIS:** No IRIS file is available at this time. **PPRTV:** No PPRTV record is available at this time. **MRL:** No MRL record is available at this time. **Tier 3 Sources:** **MDEQ** RfD = 4.0E-2 mg/kg-day **Critical Study**: van Gelderen, C. E.; Savelkoul, T. J.; Blom, J. L.; van Dokkum, W., and Kroes, R. (1993). The no-effect level of sodium bromide in healthy volunteers. Hum. Exp. Toxicol. 12(1):9-14. **Method(s)**: 45 healthy female volunteers were exposed to 0, 4 and 9 mg sodium bromide/kg bw/day by oral intake (in capsules) for three menstrual cycles. The volunteers were observed for 3 more menstrual cycles after bromide administration. **Critical effect**: decrease in the electroencephalogram (EEG) and visual evoked response (borderline effect) **End point or Point of Departure (POD):** NOAEL = 4 mg/kg-day **Uncertainty Factors**: UF = 100 (10 each for intraspecies variability and use of a sub chronic study) **Source and date:** MDEQ/RRD, 10/2006. A RRD toxicological assessment was conducted in October, 2006. A review of literature (2006 through 2015) conducted in June, 2015 did not identify significant new studies relating to RfD development.		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		MDEQ: Per MDEQ-CCD (11/23/2004), WRD RfD = 0.04 mg/kg-day based on the same study (vanGelderen, 1993) used by RRD for generating a similar value. **ECHA (REACH):** ECHA ( ) published a Derived No Effect Level (DNEL) of 4.75E-1 mg/kg-day: **Critical Study**: Van Logten M.J., Rauws A.G., Kroes R., Den Tonkelaar E.M. and van Esch G.J.1976. Semi chronic Toxicity Studies of Sodium Bromide in Rats on a Normal Diet and a Low Chloride Diet. Med. Fac. Landbouww. Rijksuniv. Gent. 4-1/2, 1499-1507. **Methods**: 5 groups of rats (10/sex/dose group) were exposed to 0, 8, 31, 125, 500 and 2000 ppm sodium bromide in a reduced chloride diet for 90 days (sub chronic repeated dose toxicity) **Critical effect**: histopathological changes in the adrenals and pituitaries **End point or Point of Departure (POD):** NOAEL = 95 mg/kg-day (97 ppm for the bromide ion) **Uncertainty Factors**: UF = 200 (10 for intraspecies differences, 4 for interspecies differences (allometric scaling), 2.5 for other interspecies differences, and 2 for sub chronic to chronic extrapolation). **Other Tier 3:** No value is available at this time from these Tier 3 sources/databases: HEAST, NTP ROC, health and environmental agencies of California, Massachusetts, Minnesota, New Jersey, New York, and Texas, WHO (IARC), WHO (IPCS/INCHEM), Canada, The Netherlands (RIVM), and OECD HPV.		
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	--	NA	MDEQ, 2015	
CSF details	NA	**Tier 1 and 2 Sources**: **IRIS:** No IRIS file is available at this time. **PPRTV:** No PPRTV record is available at this time **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:**		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		MDEQ: Per DEQ-CCD, no value at this time.		
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	--	1.4E+2	MDEQ, 1994	
RfC/ITSL details	NA	**Tier 3 Source:** **MDEQ:** **Basis:** MDEQ ITSL is considered the best available Tier 3 because it is based on a study of human volunteers and more current (1993). See details below. **Tier 1 and 2 Sources**: **IRIS:** No IRIS file is available at this time. **PPRTV:** No PPRTV record is available at this time. **MRL:** No MRL record is available at this time. **Tier 3 Sources:** **MDEQ**: ITSL = 1.4E+2 µg/m³ based on oral study. **Critical Study**: van Gelderen, C. E.; Savelkoul, T. J.; Blom, J. L.; van Dokkum, W., and Kroes, R. (1993). The no-effect level of sodium bromide in healthy volunteers. Hum. Exp. Toxicol. 12(1):9-14. **Method(s)**: 45 healthy female volunteers were exposed to 0, 4 and 9 mg sodium bromide/kg bw/day by oral intake (in capsules) for three menstrual cycles. The volunteers were observed for 3 more menstrual cycles after bromide administration. **Critical effect**: decrease in the electroencephalogram (EEG) and visual evoked response (borderline effect) **End point or Point of Departure (POD):** NOAEL = 4 mg/kg-day **Uncertainty Factors**: UF = 100 (10 each for intraspecies variability and use of a sub chronic study) **Note:** Assumed 70 kg body weight and 20 m3/day air inhalation rate.		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Source and date: MDEQ/AQD, 2/3/1994. **ECHA (REACH):** This source published DNEL = 1.66 mg/m³ (1.7E+3 µg/m³) based on an oral rat study. **ECHA (REACH):** ECHA (Last modified - 5/26/2014) published a Derived No Effect Level (DNEL) of 4.75E-1 mg/kg-day: **Critical Study**: Van Logten M.J., Rauws A.G., Kroes R., Den Tonkelaar E.M. and van Esch G.J.1976. Semi chronic Toxicity Studies of Sodium Bromide in Rats on a Normal Diet and a Low Chloride Diet. Med. Fac. Landbouww. Rijksuniv. Gent. 4-1/2, 1499-1507. **Methods**: 5 groups of rats (10/sex/dose group) were exposed to 0, 8, 31, 125, 500 and 2000 ppm sodium bromide in a reduced chloride diet for 90 days (sub chronic repeated dose toxicity) **Critical effect**: histopathological changes in the adrenals and pituitaries **End point or Point of Departure (POD):** NOAEC (after route to route extrapolation = 332 mg/m³ **Uncertainty Factors**: UF = 200 (10 for intraspecies differences, 4 for interspecies differences (allometric scaling), 2.5 for other interspecies differences, and 2 for sub chronic to chronic extrapolation). **Additional Note:** Per ECHA website (6/2015), Sodium Bromide human health hazard category list reproductive toxicity or Repr. 1B (Code H360 - may damage fertility or the unborn child). **Other Tier 3:** No value is available at this time from these Tier 3 sources/databases: HEAST, NTP ROC, health and environmental agencies of California, Massachusetts, Minnesota, New Jersey, New York, and Texas, Canada, The Netherlands (RIVM), WHO (IARC), WHO (IPCS/INCHEM), and OECD HPV.		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Tier 1 and 2 Sources**: **IRIS:** No IRIS file is available at this time. **PPRTV:** No PPRTV record is available at this time		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		MRL: NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2014	
MMOA Details	--	Not listed as a carcinogen with mutagenic MOA in the USEPA OSWER List.		
Developmental or Reproductive Effector? (Y/N)	No	No, the RfD or RfC/ITSL is not based on a reproductive-developmental effect.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	--	NO	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	YES	NA	
Aesthetic value (ug/L)	--	30,000-60,000	EPA, 2003 (2012 Edition of the Drinking Water Standards and Health Advisories	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Aesthetic Value details		US EPA (2003) drinking water advisory level based on taste.		
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		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AEd)	---	NA	MDEQ, 2015	
AEd details				
Ingestion Absorption Efficiency (AEi)		NA	MDEQ, 2015	
AEi Details				
Relative Source Contribution for Water (RSC_W)		NA	MDEQ, 2015	
Relative Source Contribution for Soil (RSC_S)		NA	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)	NA
Updated GSI value (µg/L)	NA
Rule 57 Drinking Water Value (µg/L)	NA

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)		
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)		
Wildlife Value (WV)		
Human Cancer Values for Drinking Water Source (HCV-drink)		
Human Cancer values for non-drinking water source (HCV-Non-drink)		
Final Chronic Value (FCV)		
Aquatic maximum value (AMV)		
Final Acute Value (FAV)		

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)	NA	MDEQ, 2015
Target Detection Limit – Water (μg/L)	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