CHEMICAL UPDATE WORKSHEET

Chemical Name:	**1,1,2,2-Tetrachloroethane**
CAS #:	**79-34-5**
Revised By:	RRD Toxicology Unit
Revision Date:	August 19, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	167.85	167.85	EPI	EXP
Physical State at ambient temp	Liquid	Liquid	MDEQ	
Melting Point (˚C)	228	-43.80	EPI	EXP
Boiling Point (˚C)	146.5	146.50	EPI	EXP
Solubility (ug/L)	2.97E+6	2830000	EPI	EXP
Vapor Pressure (mmHg at 25˚C)	5.168	4.62E+00	EPI	EXP
HLC (atm-m^3/mol at 25˚C)	3.45E-4	3.67E-04	EPI	EXP
Log Kow (log P; octanol-water)	2.39	2.39	EPI	EXP
Koc (organic carbon; L/Kg)	93.5	94.94	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	0.071	4.89E-02	W9	EST
Diffusivity in Water (Dw; cm^2/s)	7.9E-6	9.29E-06	W9	EST

	Part 201 Value	Updated Value	Reference Source	Comments
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA
Flash Point (˚C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unit less)	NA	NA	NA	NA
Critical Temperature (K)		6.61E+02	EPA2004	EXP
Enthalpy of Vaporization (cal/mol)		9.00E+03	EPA2004	EXP
Density (g/mL, g/cm^3)		1.5953	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm^2)	2.16E-05	2.44E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm^2)	3.61E-05	4.75E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	2.93E-05	3.75E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	4.54E-05	6.78E-05	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	--	2.0E-2	IRIS, 2010	
RfD details	NA	**Tier 1 Source:** **IRIS:** **Basis:** The IRIS RfD represents the most recent assessment. IRIS is a Tier 1 value. **Critical Study**: NTP. 2004. NTP technical report on the toxicity studies of 1,1,2,2-tetrachloroethane (CAS No. 79-34-5) administered in microcapsules in feed to F433/N rats and B6C3F1 mice. Research Triangle Park, NC: National Toxicology Program. TR-49. NIH Publication No. 04-4414. **Methods**: F344 rats (10/sex/group) were exposed to 0, 20, 40, 80, 170, or 320 mg/kg-day (both males and females) and B6C3F1 mice (10/sex/group) to 0, 100, 200, 370, 700, or 1,360 mg/kg-day (males) and 0, 80, 160, 300, 600, or 1,400 mg/kg-day (females) in the diet for 14 weeks. **Critical effect**: Increased relative liver weight in rats **End point or Point of Departure (POD):** $BMDL_{1SD}$ = 15 mg/kg-day **Uncertainty Factors:** UF = 1,000 (10 each for intraspecies variability and interspecies extrapolation, and 3 each for use of a subchronic study and database deficiency) **Source and date:** IRIS, Last revision date - 9/30/2010. An IRIS Toxicological Review is available. **Tier 2 Sources:** **PPRTV:** Per PPRTV (8/14/2008), chronic RfD = 4.0E-3 mg/kg-day. This value is derived using the NTP (2004) study. BMDL for increased relative liver weight in male rats = 10.8 mg/kg-day and UF = 3,000 (10 each for intraspecies variability, interspecies extrapolation and database deficiency, and 3 for use of a subchronic study). **MRL:** Per ATSDR List (12/2014), no chronic oral MRL value at this time. An intermediate MRL = 5.0E-1 mg/kg-day is derived as follows: **Critical Study**: NTP. 2004a. NTP technical report on the toxicity studies of		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		1,1,2,2-tetrachloroethane (CAS No. 79-34-5) administered in microcapsules in feed to F433/N rats and B6C3F1 mice. Research Triangle Park, NC: National Toxicology Program. TR-49. NIH Publication No. 04-4414. **Methods**: F344/N rats (10/sex/groups) were fed diets containing 0, 268, 589, 1,180, 2,300, or 4,600 ppm of microencapsulated 1,1,2,2-tetrachloroethane for 14 weeks. The reported average daily doses were 0, 20, 40, 80, 170, or 320 mg/kg/day; vehicle control and untreated control groups were used for both sexes. **Critical effect**: systemic toxicity based on adverse liver-related serum chemistry changes and histological manifestations of hepatocellular damage. The LOAEL for this effect (170 mg/kg-day) is lower than or equal to the LOAELs for reproductive effects in males (320 mg/kg/day) and females (170 mg/kg/day). **End point or Point of Departure (POD):** $BMDL_{10}$ = 53.88 mg/kg-day for hepatocyte necrosis **Uncertainty Factors:** UF = 100 (10 each for intraspecies variability and interspecies extrapolation). **Source and date:** ATSDR, 9/2008 **Tier 3 Source:** **MDEQ:** Per DEQ-CCD/WRD (9/5/2007), RfD = 6.7E-3 mg/kg-day. A 14-week NTP (2004) study in F344N Rats and B6C3F1 mice found a LOAEL of 20 mg/kg/d based on hepatic cytoplasmic vacuolization in male rats. Total UF = 3,000. (10 each for subchronic to chronic, inter- and interspecies and 3 for minimal LOAEL to NOAEL.)		
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	1.0E-1	2.0E-1	IRIS, 2010	
CSF details	Hepatocellular tumors occurred in female B6C3F1 mice following treatment by gavage, 5	**Tier 1 Source:** **IRIS:** **Basis:** The IRIS CSF represents the most recent assessment. IRIS is a Tier 1 value. **Critical Study**: NCI (National Cancer Institute). (1978) Bioassay of 1,1,2,2-tetrachloroethane for possible carcinogenicity. Natl Cancer Inst Carcinog Tech Rep Ser No. 27; NIH Publication No. 78-827. PB2774537GA.		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
	days/week for 78 weeks. Animals were observed for 12 weeks post-exposure. Matched controls were used in calculations (NCI, 1978). Revised species scaling factor of (BWh/BWa) to the 0.25 power used for q* calculation. CCD/RRD date: 1/18/2000.	1) **Methods**: Male and female Osborne-Mendel rats were exposed to TWA doses of 0, 62, or 108 mg/kg-day (males) or 0, 43, or 76 mg/kg-day (females) 5 days/week for 78 weeks, followed by a 32-week observation period during which the rats were not exposed (NCI, 1978). ***2)*** **Dose response data:** *Tumor Type* - hepatocellular carcinomas; *Test Species* - female B6C3F1 mice; Route - oral 3) **Extrapolation method:** Multistage model with linear extrapolation from the point of departure (LED10). **Carcinogen Weight-of-Evidence (WOE) Class**: "likely to be carcinogenic to humans" **IRIS WOE Basis**: based on data from an oral cancer bioassay in male and female Osborne-Mendel rats and B6C3F1 mice (NCI, 1978). **Source and Date**: IRIS, Last revision date - 9/30/2010. An IRIS Toxicological Review is available. Note: The slope factor for 1,1,2,2-tetrachloroethane should not be used with exposures exceeding the point of departure (0.65 mg/kg-day), because above this level the fitted dose-response model better characterizes what is known about the carcinogenicity of 1,1,2,2-tetrachloroethane. **Tier 2 Sources:** **PPRTV:** PPRTV (8/14/2008) refers to the IRIS value. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** DEQ-CCD/RRD (1/18/2000), CSF = 1.0E-1 (mg/kg-day)-1. See Part 201 Value CSF details.		
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	--	NA	MDEQ, 2015	
RfC/ITSL details	NA	**Tier 1 and 2 Sources**: **IRIS:** Per IRIS (9/30/2010), the inhalation toxicity database lacks a well-conducted		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
		study that demonstrates a dose-related toxicological effect following subchronic and/or chronic exposure to 1,1,2,2-tetrachloroethane. Therefore, an inhalation RfC was not derived. **PPRTV:** Per PPRTV (8/14/2008), no value at this time. **MRL:** Per ATSDR List (12/2014), no inhalation chronic at this time. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	5.8E-5	5.8E-5	MDEQ, 2010	
IURF details	Potency from 9/2010 IRIS oral SF of 0.2 (mg/kg)-1 increased incidence of female B6C3F1 mouse hepatocellular carcinomas from NTP 1978 gavage study. Same study and SF as the IRIS 1987 numbers.	**Tier 3 Source:** **MDEQ:** **Basis:** MDEQ value is based on the 9/2010 IRIS oral CSF of 0.2 (mg/kg)-1 for increased incidence of female B6C3F1 mouse hepatocellular carcinomas from NTP 1978 gavage study. Same study and CSF as the EPA 1987 numbers results in no change except for calculation date in this AQD entry. **Critical Study(ies)**: Refer to Updated Value CSF details. **Carcinogen Weight-of-Evidence (WOE) Class**: "likely to be carcinogenic to humans" **IRIS WOE Basis**: based on data from an oral cancer bioassay in male and female Osborne-Mendel rats and B6C3F1 mice (NCI, 1978). **Source and Date**: MDEQ-CCD/AQD, 9/30/2010 **Tier 1 and 2 Sources**: **IRIS:** Per IRIS (9/30/2010), in the absence of any data on the carcinogenicity of 1,1,2,2 tetrachloroethane via the inhalation route, an inhalation unit risk has not been derived in this evaluation. **PPRTV:** PPRTV (8/14/2008) refers to the IRIS. **MRL:** NA; MRLs are for non-cancer effects only.		Complete

	Part 201 Value	Updated Value	Source*/Reference /Date	Comments/Notes /Issues
Mutagenic Mode of Action (MMOA)? (Y/N)	--	NO	USEPA, 2014	
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/ITSL are 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	SDWA, 1976 and USEPA SMCL List		
Is there an aesthetic value for drinking water? (Y/N)	NO	Not evaluated.	NA	
Aesthetic value (ug/L)	NA	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		RAGS E (EPA, 2004) Default Value		
Skin absorption efficiency value (AEd)	---	0.1	MDEQ, 2015	
AEd details				
Ingestion Absorption Efficiency (AEi)		1.0	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)	78 (X)
Updated GSI value (µg/L)	78 (X)
Rule 57 Drinking Water Value (µg/L)	3.2

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	180	9/2007
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	4,300	9/2007
Wildlife Value (WV)	NA	NA
Human Cancer Values for Drinking Water Source (HCV-drink)	3.2	9/2007
Human Cancer values for non-drinking water source (HCV-Non-drink)	78	9/2007
Final Chronic Value (FCV)	200	7/2007
Aquatic maximum value (AMV)	910	7/2007
Final Acute Value (FAV)	1,800	7/2007

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)	50	MDEQ, 2015
Target Detection Limit – Water (μg/L)	1	MDEQ, 2015
Target Detection Limit – Air (ppbv)	6.50E-02	MDEQ, 2015
Target Detection Limit – Soil Gas (ppbv)	2.20E+00	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