



CHEMICAL UPDATE WORKSHEET

Chemical Name:	Diethyl ether
CAS #:	60-29-7
Revised By:	RRD Toxicology Unit
Revision Date:	August 17, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	74.12	74.12	EPI	EXP
Physical State at ambient temp	Liquid	Liquid	MDEQ	
Melting Point (°C)	157	-116.30	EPI	EXP
Boiling Point (°C)	34.5	34.60	EPI	EXP
Solubility (ug/L)	6.10E+7	6.0400E+07	EPI	EXP
Vapor Pressure (mmHg at 25°C)	539.6	5.38E+02	EPI	EXP
HLC (atm-m ³ /mol at 25°C)	8.70E-4	1.23E-03	EPI	EXP
Log Kow (log P; octanol-water)	0.83	0.89	EPI	EXP
Koc (organic carbon; L/Kg)	6.55	9.699	EPI	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm ² /s)	0.074	8.52E-02	W9	EST
Diffusivity in Water (Dw; cm ² /s)	9.3E-6	9.3639E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (°C)	-49 F	-45	CRC	EXP
Lower Explosivity Level (LEL; unit less)	0.019	0.019	CRC	EXP
Critical Temperature (K)		466.8	CRC	EXP
Enthalpy of Vaporization (cal/mol)		6.34E+03	CRC	EXP
Density (g/mL, g/cm ³)		0.7138	CRC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm ²)	2.59E-05	2.76E-05	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm ²)	5.90E-05	6.58E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm ²)	3.65E-05	4.38E-05	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm ²)	8.17E-05	1.03E-04	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
Reference Dose (RfD) (mg/kg/day)	5.0E-1	2.0E-1	IRIS, 1993	
RfD details	<p>Rat subchronic gavage study (US EPA, 1986). NOAEL = 500mg/kg/day; UF = 1000; Critical effect = depressed body weights. *Oral RfD from IRIS changed: UF from IRIS of 3,000 changed to 1,000 resulting in change in oral RfD. Source: IRIS CCD date: 11/15/1989</p>	<p>Tier 1 Source: IRIS: Basis: IRIS is a Tier 1 source. IRIS (1993) RfD = 2.0E-1 mg/kg-day IRIS accounts for subchronic study use. Critical Study: U.S. EPA. 1986. Rat oral subchronic study with ethyl ether. Prepared by American Biogenics Corporation for the Office of Solid Waste, Washington, DC. Method: Rats (30/sex/group) were exposed to 0, 500, 2000, and 3500 mg/kg/day of ethyl ether (diethyl ether synonym) by gavage for 13 weeks. Critical effect: Body weight loss End point or Point of Departure (POD): NOAEL = 500 mg/kg/day Uncertainty Factors: UF = 3,000 (3 for interspecies extrapolation and 10 each for intraspecies variability, use of a subchronic study, and database deficiencies) Source and date: IRIS, Last revision date - 7/01/1993; An IRIS screening-level review in 2001 did not identify significant new studies.</p> <p>Tier 2 Sources: PPRTV: subchronic RfD = 0.5 mg/kg/day Critical Study: American Biogenics Corporation. 1988. Ninety day gavage study in albino rats using ethyl ether. American Biogenics Corporation Study 410-2343. Decatur, IL and Research Triangle Park, NC. Study sponsored by U.S. EPA, Office of Solid Waste, Washington, DC. Unpublished report submitted to U.S. EPA. Methods: subchronic gavage in corn oil exposure to 0, 500, 2000, or 3500 mg/kg-day for 90-day in Sprague-Dawley rats, 30 rats/sex/group Critical effect: body weight decrease End point or Point of Departure (POD): NOAEL = 500 mg/kg/day Uncertainty Factors: UF = 1,000; (10 each for intraspecies variability, interspecies variability, database insufficiencies) Source and date: PPRTV 1/20/2009</p>		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
		<p>MRL: No MRL record available at this time.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, RfD = 5.0E-1 mg/kg-day. See Part 201 Value RfD details.</p>		
Oral Cancer Slope Factor (CSF) (mg/kg-day)⁻¹	--	NA	MDEQ, 2015	
CSF details	NA	<p>Weight-of-Evidence Descriptor: Studies evaluating the carcinogenic potential of oral or inhalation exposure to diethyl ether in humans or animals are not found in the available literature. Results of in vitro genotoxicity tests were mostly negative; occasional positive results were possibly related to the presence of ether peroxides that form in older samples of diethyl ether (Chen et al., 1993). Under the 2005 Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), inadequate information is available to assess the carcinogenic potential of diethyl ether. Derivation of quantitative estimates of cancer risk for diethyl ether is precluded by the lack of suitable data.</p> <p>Source and Date: PPRTV 1/20/2009</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (7/01/1993), no value at this time. IRIS has not evaluated this substance for carcinogenic potential. PPRTV: Per PPRTV (1/20/2009) no value available at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level (ITSL) (µg/m³)	1.2E+4	1.0E+3	PPRTV, 2009/MDEQ, 2015	
RfC/ITSL details	ITSL is based on	Tier 2 Source:		Complete



	Part 201 Value	Updated Value	Source/Reference/Date	Comments/Notes/Issues
	<p>the ACGIH-TLV (1991) of 1210 mg/m³ (400 ppm), per R232 (1) (c) [UF=100]; the TLV in turn appears to be based on Henderson and Haggard (1943). The critical effect is nasal irritation. The averaging time is 8 hrs. CCD/AQD date: 9/11/1996.</p>	<p>PPRTV: Basis: PPRTV is the most current evaluation of diethyl ether data available. PPRTV: Per PPRTV 2009 subchronic RfC = 3.0 mg/m³ = 3.0E+3 µg/m³. MDEQ applied an additional UF = 3 for use of a subchronic value. Final RfC = 1.0E+3 µg/m³ Critical Study: Stevens, W.C., E.I. Eger, A. White et al. 1975. Comparative toxicities of halothane, isoflurane, and diethyl ether at sub anesthetic concentrations in laboratory animals. Anesthesiology. 42:408–419. Methods: 24/sex/group ICR mice were exposed to 0, 1000 (3031 mg/m³), or 10,000 (30,310 mg/m³) ppm diethyl ether, continuously for 35 days (whole-body) Critical effect: increased liver weight in males End point or Point of Departure (POD): LOAEL_(HEC) = 3031 mg/m³ in male mice (was a continuous exposure so no duration adjustment is needed) Uncertainty Factors: UF = 1000; 10 for each intraspecies differences and database uncertainties, 3 for each interspecies extrapolation and use of LOAEL. MDEQ applied and addition UF = 3. Total UF = 3000. Source and date: PPRTV 1/20/2009</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (7/01/1993), no value at this time. MRL: No MRL record available at this time.</p> <p>Tier 3 Source: MDEQ: Per MDEQ-AQD (1996), ITSL = 1.2E+4 µg/m³: Averaging time = 8 hours. Basis: ACGIH-TLV (1991) of 1210 mg/m³ (400 ppm), Critical Study: Henderson, Y., & Haggard, H. W. (1943). Noxious gases. Reinhold Publishing Corporation. Critical effect: nasal irritation Source and date: MDEQ-CCD/AQD, 9/11/1996.</p>		
Inhalation Unit Risk Factor (IURF) ((µg/m ³) ⁻¹)	--	NA	MDEQ, 2015	



	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
IURF details	NA	<p>Weight-of-Evidence Descriptor: Studies evaluating the carcinogenic potential of oral or inhalation exposure to diethyl ether in humans or animals are not found in the available literature. Results of in vitro genotoxicity tests were mostly negative; occasional positive results were possibly related to the presence of ether peroxides that form in older samples of diethyl ether (Chen et al., 1993). Under the 2005 Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), inadequate information is available to assess the carcinogenic potential of diethyl ether. Derivation of quantitative estimates of cancer risk for diethyl ether is precluded by the lack of suitable data.</p> <p>Source and Date: PPRTV 1/20/2009</p> <p>Tier 1 and 2 Sources: IRIS: Per IRIS (7/01/1993), no value at this time. IRIS has not evaluated this substance for carcinogenic potential. PPRTV: Per PPRTV (1/20/2009) no value available at this time. MRL: NA; MRLs are for non-cancer effects only.</p> <p>Tier 3 Source: MDEQ: Per DEQ-CCD, no value at this time.</p>		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 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	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
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, 2015	
SMCL details	NA	SDWA, 1976 and USEPA SMCL List, 2015		
Is there an aesthetic value for drinking water? (Y/N)	NO	Yes	DEQ	
Aesthetic value (ug/L)	NA	1.2	November, 1998	
Aesthetic Value details	NA	The Department contracted Malcolm Pirnie to do odor testing for this chemical. Results of the odor testing became the new aesthetic drinking water criterion. See chemical paper file for report.		
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 (ABS _{gi})	---	1.0	MDEQ, 2015/ USEPA RAGS-E, 2004	
ABS _{gi} details		RAGS E (USEPA, 2004) Default Value		
Skin absorption efficiency value (AE _d)	---	0.1	MDEQ, 2015	
AE _d details				
Ingestion Absorption Efficiency (AE _i)		1.0	MDEQ, 2015	
AE _i 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)	ID
Updated GSI value (µg/L)	ID
Rule 57 Drinking Water Value (µg/L)	14,000

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	14,000	7/1997
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	1,000,000	7/1997
Wildlife Value (WV)	NA	
Human Cancer Values for Drinking Water Source (HCV-drink)	NA	
Human Cancer values for non-drinking water source (HCV-Non-drink)	NA	
Final Chronic Value (FCV)	ID	10/2013
Aquatic maximum value (AMV)	ID	10/2013
Final Acute Value (FAV)	ID	10/2013

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 ($\mu\text{g}/\text{kg}$)	200	MDEQ, 2015
Target Detection Limit – Water ($\mu\text{g}/\text{L}$)	10	MDEQ, 2015
Target Detection Limit – Air (ppbv)	3.90E+03	MDEQ, 2015
Target Detection Limit- Soil Gas (ppbv)	1.30E+05	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