CHEMICAL UPDATE WORKSHEET

Chemical Name:	**Endrin**
CAS #:	**72-20-8**
Revised By:	RRD Toxicology Unit
Revision Date:	August 24, 2015

(A) Chemical-Physical Properties

	Part 201 Value	Updated Value	Reference Source	Comments
Molecular Weight (g/mol)	380.9	380.91	PP	EXP
Physical State at ambient temp	Solid	Solid	MDEQ	
Melting Point (˚C)	473	228	PP	EXP
Boiling Point (˚C)	---	NA	NA	
Solubility (ug/L)	250	2.5E+02	PP	EXP
Vapor Pressure (mmHg at 25˚C)	0.0000005852	3.00E-06	PP	EXP
HLC (atm-m³/mol at 25˚C)	7.52E-6	6.36E-06	PP	EXP
Log Kow (log P; octanol-water)	5.06	5.20	PP	EXP
Koc (organic carbon; L/Kg)	12200	12300	SSG	EST
Ionizing Koc (L/kg)		NR	NA	NA
Diffusivity in Air (Di; cm^2/s)	0.0125	2.30E-02	W9	EST
Diffusivity in Water (Dw; cm^2/s)	4.74E-6	5.90E-06	W9	EST
Soil Water Partition Coefficient (Kd; inorganics)	NR	NR	NA	NA

	Part 201 Value	Updated Value	Reference Source	Comments
Flash Point (˚C)	NA	NA	NA	NA
Lower Explosivity Level (LEL; unit less)	NA	NA	NA	NA
Critical Temperature (K)		986.20	EPA2001	EXP
Enthalpy of Vaporization (cal/mol)		1.50E+04	EPA2001	EST
Density (g/mL, g/cm^3)		1.7	PC	EXP
EMSOFT Flux Residential 2 m (mg/day/cm^2)	NA	5.41E-07	EMSOFT	EST
EMSOFT Flux Residential 5 m (mg/day/cm^2)	NA	5.41E-07	EMSOFT	EST
EMSOFT Flux Nonresidential 2 m (mg/day/cm^2)	NA	6.82E-07	EMSOFT	EST
EMSOFT Flux Nonresidential 5 m (mg/day/cm^2)	NA	6.82E-07	EMSOFT	EST

(B) Toxicity Values/Benchmarks

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
Reference Dose (RfD) (mg/kg/day)	1.7E-4	3.0E-4	IRIS, 1991	
RfD details	(Dog chronic (2 years) dietary study (Velsicol Chemical Corp., 1969); NOAEL = 1 ppm (mg/kg x 0.017kg/kg = 0.017 kg/kg; UF = 100; RfD = 0.017/100 = 1.7E-4mg/kg-day; Critical effects = mild histopathological lesions in liver, occasional convulsions. *IRIS oral RfD changed. Dog food consumption value in IRIS was replaced by MDEQ value. Source: IRIS CCD/RRD date: 4/20/1988	**Tier 1 Source:** **IRIS:** **Basis:** IRIS is a tier 1 source. **Critical Study**: Velsicol Chemical Corporation. 1969. MRID. No. 00030198 **Method(s)**: Beagle ddogs (3-7/sex) were exposed to 0.1, 0.5, 1.0, 2.0 or 4.0 ppm endrin in diets for 2 years. **Critical effect**: occasional convulsions and mild histopathological lesions in liver. **End point or Point of Departure (POD):** NOEL = 1 ppm (0.025 mg/kg/day) **Uncertainty Factors**: UF = 100 (10 each for interspecies variability and interspecies extrapolation) **Source and date:** IRIS, Last revision date - 4/01/1991. An EPA screening-level review in 2001 did not identify critical new studies. **Tier 2 Sources:** **PPRTV:** PPRTV (5/31/2002) refers to the IRIS RfD. **MRL:** Per ATSDR1996), oral chronic MRL = 3.0E-4 mg/kg-day (An intermediate MRL = 0.002 mg/kg/day is also available). **Critical study:** Kettering Laboratory. 1969. Effects exerted upon beagle dogs during a period of two years by the introduction of 1,2,3,4,10, 10-hexachloro-6,7,- epoxy-1,4,4a,5,6,7,8,8a-octahydro -1,4-endo, endo-5,8-dimethanonaphthalene into their daily diets. Cincinnati, OH. Report to Velsicol Chemical Corporation. **Methods:** Beagle dogs were fed diets containing 0, 0.0025, 0.0125, 0.025, 0.05, or 0.1 mg/kg/day endrin for 2 years **Critical effect:** occasional convulsions and mild histological lesions in the liver **End point or Point of Departure (POD):** NOAEL = 0.025 mg/kg/day **Uncertainty Factors**: UF = 100 (10 each for interspecies variability and interspecies extrapolation)		Complete

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
		Source and date: ATSDR final 8/1996 (from MRL List April 2015) **Tier 3 Source:** **MDEQ:** Per DEQ-CCD/RRD (4/20/1998), RfD = 1.7E-4 mg/kg-day. See Part 201 Value RfD details. Per CCD (5/05/1994), WRD used the same primary study used by IRIS to derive an RfD value of 2.5E-4 mg/kg/d. Calculation date - with CAS date of 11/9/93.		
Oral Cancer Slope Factor (CSF) (mg/kg-day)$^{-1}$)	--	NA	MDEQ, 2015	
CSF details	NA	**Carcinogen Weight-of-Evidence (WOE) Class**: D; not classifiable as to human carcinogenicity **IRIS WOE Basis**: based on equivocal data. Oral administration of endrin to two strains of rats and three strains of mice did not produce carcinogenic effects. (NCI1979. Bioassay of endrin for possible carcinogenicity. Carcinogenesis Technical Report Series 12, NCR-CG-TR-12. Publ. No. 79-812). Several reviewed bioassays and the suggestive responses in the NCI bioassay do not strongly support a negative finding of carcinogenicity **Source and Date**: IRIS, 7/1/1993 **Tier 1 and 2 Sources:** **IRIS:** Per IRIS (7/1/1993), no value at this time. **PPRTV:** Per PPRTV (5/31/2002), no value at this time; no adequate human or animal oral cancer data demonstrating carcinogenic activity. **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		Complete
Reference Concentration (RfC) or Initial Threshold Screening Level	--	NA	MDEQ, 2015	

	Part 201 Value	Updated Value	Source/Reference/ Date	Comments/Notes /Issues
(ITSL) (µg/m³)				
RfC/ITSL details	NA	**Tier 1 and 2 Sources:** **IRIS:** Per IRIS (7/1/1993), no value at this time. **PPRTV:** Per PPRTV (5/31/2002), no value at this time **MRL:** Per ATSDR (12/2014), no inhalation chronic MRL at this time. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, no value at this time.		Complete
Inhalation Unit Risk Factor (IURF) ((µg/m^3)$^{-1}$)	--	NA	MDEQ, 2015	
IURF details	NA	**Tier 1 and 2 Sources:** **IRIS:** Per IRIS (7/1/1993), no value at this time. **PPRTV:** Per PPRTV (5/31/2002), no value at this time **MRL:** NA; MRLs are for non-cancer effects only. **Tier 3 Source:** **MDEQ:** Per DEQ-CCD, 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. http://www.epa.gov/oswer/riskassessment/sghandbook/chemicals.htm		
Developmental or Reproductive Effector? (Y/N)	No	No. The RfD is not based on a reproductive-developmental effect.	MDEQ, 2015	
Developmental or Reproductive Toxicity Details	NA	NA		
State Drinking Water Standard (SDWS) (ug/L)	--	2.0	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	
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	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 (USEPA, 2004) Default Value		
Skin absorption efficiency value (AEd)	---	0.1	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)	ID
Updated GSI value (µg/L)	ID
Rule 57 Drinking Water Value (µg/L)	ID

	Rule 57 Value (µg/L)	Verification Date
Human Non-cancer Values- Drinking water source (HNV-drink)	NLS	NA
Human Non-Cancer Values- Non-drinking water sources (HNV-Non-drink)	NLS	NA
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)	0.036	7/1997
Aquatic maximum value (AMV)	0.086	7/1997
Final Acute Value (FAV)	0.172	7/1997

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)	20	MDEQ, 2015
Target Detection Limit – Water (μg/L)	0.02	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