TERRESTRIAL TOXICITY AND AESTHETICS VALUES

Chemical Name: Ethyl *tert*-butyl ether CAS No. 637-92-3
Literature Review Date: 8/14/06
Derived By: D. Bush
Reviewed By: A Perbeck Verification Date: 3/21/07

HNV Tier Status: 1 **WV Tier Status:**
HCV Tier Status:

		Drinking Water	Non-Drinking Water
HUMAN HEALTH	**HNV**	2,500 ug/L	130,000 ug/L
	SCREENING LEVEL		
	HCV		
	POTENCY		
	HH-BAF-TL.3	1.7 L/kg	
	HH-BAF-TL.4	2.2 L/kg	
	RfD (ADE)	.0922 mg/kg/d	
WILDLIFE HEALTH	**WV**		
	WV-BAF-TL.3		
	WV-BAF-TL.4		
	RfD		
AESTHETICS	**TASTE THRESHOLD**		
	ODOR THRESHOLD		

Comments:

HUMAN NONCANCER VALUE WORKSHEET

Chemical Name: Ethyl *tert*-butyl ether CAS No. 637-92-3
Developed By: D. Bush
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Key Study:

Medinsky et al. (1999) exposed Fisher 344 rats and CD-1 mice via inhalation to 0, 500, 1,750 or 5,000 ppm ETBE for 6 hours/day, 5 days/week, for 13 weeks. At the higher two concentrations, testicular lesions occurred in male rats and bone marrow congestion occurred in female rats. The NOAEL of 500 ppm in male rats will be used for criteria development since it results in a more protective value.

Dose conversion:

$(500 \text{ ppm})(102^*/24.45) = 2085.89 \text{ mg/m}^3$

$(2085.89 \text{ mg/m}^3)(6/24)(5/7)(0.952 \text{ m}^3\text{/kg/d})^{**}(0.26)^{***} = 92.2 \text{ mg/kg/d}$

* molecular weight of ETBE.
** Inhalation rate for male Fisher 344 rats per EPA (1988).
*** Amount inhaled versus the amount exhaled in humans per Nihlen et al. (1998).

ADE = 0.0922 mg/kg/d

$$ADE = \frac{(92.2 \text{ mg/kg/d})}{1000}$$

Where UF = 10x for each interspecies, intraspecies, and subchronic-to-chronic extrapolation.

$$HNVdw = \frac{(0.0922 \text{ mg/kg/d})\ (70 \text{ kg})\ (0.8)}{(2.0 \text{ L/d}) + [(0.0036 \text{ kg/d} \times 1.7 \text{ L/kg}) + (0.0114 \text{ kg/d} \times 2.2 \text{ L/kg})]} = 2542 \text{ ug/L}$$

Human Noncancer Value for drinking water = 2,500 ug/L

$$HNVnondw = \frac{(0.0922 \text{ mg/kg/d})\ (70 \text{ kg})\ (0.8)}{(0.01 \text{ L/d}) + [(0.0036 \text{ kg/d} \times 1.7 \text{ L/kg}) + (0.0114 \text{ kg/d} \times 2.2 \text{ L/kg})]} = 125315 \text{ ug/L}$$

Human Noncancer Value for non-drinking water = 130,000 ug/L

BIOACCUMULATION FACTOR WORKSHEET

Chemical Name: Ethyl *tert*-butyl ether CAS No. 637-92-3
BAF Derived By: D. Bush Literature Review Date: 8/14/06
BAF Reviewed By: APerbeck Verification Date: 3/21/07

HH-BAF-TL.3: 1.7 L/kg **WL-BAF-TL.3:**
HH-BAF-TL.4: 2.2 L/kg **WL-BAF-TL.4:**

I. FIELD BAFs, BSAFs, or LABORATORY BCFs

Ref #	BAF, BSAF, or BCF	Value	Species	Exposure Duration days	Tissue Type	Tissue Lipid (%)	Steady State Tissue Conc.	Water or Sed. (BSAF) Conc.
.)								
.)								
.)								
.)								
.)								
.)								
.)								

Final BAF, BSAF, or BCF:
Justification:

II. LOG Kow VALUES

Ref #	Meas./Calc. Log Kow	Method	Value		Meas./Calc. Log Kow	Method	Value
1.)	calculated	C log P	1.58	.)			
2.)				.)			
.)				.)			
.)				.)			

Final Log Kow: 1.58
Justification: The final LogKow is based on an estimated value since it is the only value available.

Food Chain Multipliers
FCM-TL.3: 1.0000
FCM-TL.4: 1.0000

BIOACCUMULATION FACTOR WORKSHEET

Assessment/Calculations: Final log Kow 1.58

$f_{fd\ ambient} = 1 / [1 + (2.4 \times 10^{-7})(10^{1.58})]$

f_{fd} 0.9999909

Baseline BAF_{TLn} = FCM_{TLn} * Kow

Baseline BAF_{TL3} = FCM_{TL3} * Kow
Baseline BAF_{TL3} = 1.0000 * 38.01894
Baseline BAF_{TL3} = 38.01894

Baseline BAF_{TL4} = FCM_{TL4} * Kow
Baseline BAF_{TL4} = 1.0000 * 38.01894
Baseline BAF_{TL4} = 38.01894

HH BAF_{TL3} = [(Baseline BAF_{TL3})(0.0182) + 1] ($f_{fd\ ambient}$)
HH BAF_{TL3} = (38.01894 * 0.0182 + 1) * 0.9999909
HH BAF_{TL3} = 1.691929 = **1.7 L/kg**

HH BAF_{TL4} = [(Baseline BAF_{TL4})(0.0310) + 1] ($f_{fd\ ambient}$)
HH BAF_{TL4} = (38.01894 * 0.031 + 1) * 0.9999909
HH BAF_{TL4} = 2.178587 = **2.2 L/kg**

References:

1.) U.S. EPA 2006. ASTER Ecotoxicity Profile.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER BUREAU

TOXICOLOGICAL ASSESSMENT FOR Ethyl *tert*-Butyl Ether (CASRN: 637-92-3) HUMAN NONCANCER VALUE

Literature Review Date: August 14, 2006
Dennis Bush

No studies examining the toxicity of ethyl *tert*-butyl ether (ETBE) following oral exposure were found in the literature. It was considered reasonable to use an inhalation study to derive criteria protective of oral exposure because a study of a related compound, methyl *tert*-butyl ether, showed that the metabolic pathways in humans were identical after ingestion and inhalation exposure and hepatic first-pass metabolism following oral exposure was not significant (Dekant et al., 2001). It is also reasonable to use rat toxicity data to extrapolate to humans since the biotransformation of ETBE in rats has been found to be similar to humans following inhalation exposure (Dekant et al., 2001).

Male and female Fisher 344 rats and CD-1 mice were exposed to 0, 500, 1750, or 5000 ppm ETBE for 6 hours/day, 5 days/week, for 13 weeks (Medinsky et al., 1999). Exposure to ETBE had no effect on survival or growth in mice or male rats, although a significant increase in body weight was observed in female rats. At concentrations of 1750 and 5000 ppm, testicular degeneration occurred in male rats and bone marrow congestion occurred in female rats. Liver pathology occurred in male and female mice exposed to 5000 ppm. Pathological effects were also observed in the kidneys of male rats at all concentrations. However, the mechanism of this pathological effect, *alpha* 2u-globulin, does not occur in humans so these effects can not be used for criteria development. The NOAEL for male and female rats in this study is 500 ppm.

White et al. (1995) exposed Sprague-Dawley rats to 0, 500, 2000, or 4000 ppm ETBE for 6 hours/day, 5 days/week, for 4 weeks. Exposure to ETBE had no effect on body weight, survival, clinical chemistry, hematology, or sensory perception. Rats in the highest dose group exhibited ataxia temporarily during exposure and they also exhibited a significant trend in hindlimb splay. The study found a significant increase in liver weight in mid- and high-dose females and in high dose males. The NOAEL for this study is 500 ppm.

Dorman et al. (1997) assessed the potential for neurological effects to occur in male and female Fischer 344 rats exposed to 500, 1750, or 5000 ppm ETBE via inhalation for 5 days/week for 14 weeks. The only clinical finding was temporary ataxia observed in male rats immediately following exposure to 5000 ppm. No significant effects on motor activity were observed. No gross or microscopic abnormalities were observed in the central, peripheral, or autonomic nervous systems. A significant increase in body weight occurred in female rats exposed to 5000 ppm ETBE. No difference was

observed in brain weight. Based on the temporary ataxia found in male rats, the NOAEL for this study is 1750 ppm.

The NOAEL of 500 ppm found in F344 rats in the Medinsky et al. (1999) was used to derive human health values. The male NOAEL was used because it resulted in a more protective criterion. An uncertainty factor of 10x was used for each subchronic-to-chronic, intraspecies and interspecies extrapolation.

References:

Dekant, W., U. Bernauer, E. Rosner, et al. 2001. Biotransformation of MTBE, ETBE, and TAME after inhalation or ingestion in rats and humans. Health Effects Institute Research Report 102:29-109.

Dorman, D.C., M. F. Struve, B.A. Wong, et al. 1997. Neurotoxicological evaluation of ethyl *tertiary*-butyl ether following subchronic (90-day) inhalation in the Fischer 344 rat. J. Appl. Toxicol. 17(4):235-242.

Medinsky, M.A., D.C. Wolf, R.C. Cattley, et al. 1999. Effects of a thirteen-week inhalation exposure to ethyl *tertiary* butyl ether on Fischer-344 rats and CD-1 mice. Toxicol. Sci. 51:108-118.

White, R.D., W.C. Daughtrey and M.S. Wells. 1995. Health effects of inhaled *tertiary* amyl methyl ether and ethyl *tertiary* butyl ether. Toxicol. Lett. 82/83:719-724.