

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



SIBUR TOGLIATTI LLC

SAFETY DATA SHEET

According to Regulations (EC) 1907/2006 (REACH), (EC) 1272/2008 (CLP) & (EU) 2015/830

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SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

1.1. Product identifier

Product form:	Substance
Substance name:	Tert-butyl methyl ether
Chemical name:	Tert-butyl methyl ether
EC index No.:	603-181-00-X
EC No.:	216-653-1
CAS-No.:	1634-04-4
REACH registration No:	01-2119452786-27-0022
Formula:	C ₅ H ₁₂ O
Synonyms:	MTBE; methyl tertiary butyl ether; methyl t-butyl ether; 2-methoxy-2-methylpropane; propane, 2-methoxy-2-methyl-
Trade names:	MTBE

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture:	Formulation Use as intermediate Use as process solvent and extraction agent Industrial distribution of MTBE and gasoline containing MTBE Fuel use For the detailed identified uses of the product see Annex.
Most common technical function of substance:	Fuels and fuel additives. MTBE acts as an octane enhancer.

1.2.2. Uses advised against

Restrictions on use:	Uses other than those given in section 1.2.1 are not recommended unless an assessment is completed, prior to commencement of that use, which demonstrates that the use will be controlled
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1.3. Details of the supplier of the safety data sheet

Only representative

Company name:	Gazprom Marketing and Trading France
Address:	68 avenue des Champs-Élysées, 75008, Paris, France
Contact Telephone:	+33 1 42 99 73 50
Fax:	+33 1 42 99 73 99
Email Address:	didier.lebout@gazprom-mt.com

Manufacturer

Company name:	SIBUR Togliatti LLC
Address:	Novozavodskaya str. 8, 445007, Togliatti, Samara Region, Russian Federation

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Contact phone: +7 8482 29 91 51; 23 11 04; 29 32 69
Fax: +7 8482 22 14 41; 70 15 18
Email Address: office@tltk.sibur.ru
Emergency Telephone: +7 8482 29-91-51 (round the clock)
Importer: List of importers is available with the Only Representative

1.4. Emergency telephone number

Emergency phone in the country of delivery **112** (Please note that emergency numbers may vary depending upon the country of delivery though 112 remains valid as universal number)

SECTION 2. HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Flam. Liq. 2 H225

Skin Irrit. 2 H315

Full text of hazard classes and H-statements : see section 16

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms
(CLP):



GHS02



GHS07

Signal word (CLP): Danger
Hazard statements (CLP): H225: Highly flammable liquid.
H315: Causes skin irritation.
Precautionary statements (CLP): P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243: Take actions to prevent static discharges.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P403+P235: Store in a well-ventilated place. Keep cool.
P302+P352: IF ON SKIN: Wash with plenty of water/...
EUH-statements: Not applicable

2.3. Other hazards

Other hazards not contributing to the classification: May cause lung damage if swallowed (Aspiration).

Assessment PBT / vPvB: According to Annex XIII of Regulation (EC) No.1907/2006 (REACH):
- not fulfilling PBT (persistent/bioaccumulative/toxic) criteria;
- not fulfilling vPvB (very persistent/very bioaccumulative) criteria.

Remark: Refer to Section 15 for classification and labelling according to UN-GHS.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Name	Product identifier	%	Classification [CLP]
Methyl tert-butyl ether	(CAS-No.) 1634-04-4 (EC No.) 216-653-1 (EC index No.) 603-181-00-X (REACH-no) 01-2119452786-27-0022	98.0- 99.7	H225; H315
Methanol (impurity)	(CAS-No.) 67-56-1 (EC No.) 200-659-6 (EC index No.) 603-001-00-X	0.1- 1.0	H225;H301; H311; H331; H370 Specific Concentration limits: STOT SE 1; H370: $C \geq 10\%$ STOT SE 2; H371: $3\% \leq C < 10\%$

The product does not contain impurities or additives that could affect product's labelling and classification according to Regulation (EC) No 67/548/EEC and Regulation (EC) No 1272/2008 (CLP).

3.2. Mixtures

Not applicable

SECTION 4. FIRST-AID MEASURES

4.1. Description of first aid measures

Product-specific hazards and other issues

Low acute toxicity.

May be moderately irritating to skin and slightly irritating to eyes and respiratory system.

Harmful: may cause lung damage if swallowed (Aspiration).

At high doses, effects on the CNS are possible.

First-aid measures general

Always observe self protection methods.

Move out of dangerous area.

Remove contaminated shoes and clothing.

Consult a physician.

Show this material safety data sheet to the doctor in attendance.

First-aid measures after inhalation

Remove to fresh air and keep at rest in a position comfortable for breathing.

Do not leave the victim unattended.

Keep patient warm and at rest.

Immediately seek medical attention.

If breathing is difficult, give oxygen.

If unconscious place in recovery position and seek medical advice.

In the event of unconsciousness, apnea or cardiac arrest (no Pulse) apply cardiopulmonary resuscitation.

First-aid measures after skin contact

Immediately flush affected area with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoe.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



If irritation persists get medical advice/attention.

First-aid measures after eye contact

Flush eyes with water thoroughly and continuously for 15 minutes.

Remove contact lenses, if present and easy to do. Continue rinsing.

If irritation persists get medical attention. The patient should be seen by an ophthalmologist.

First-aid measures after ingestion

Clean mouth with water and drink afterwards plenty of water.

Do NOT induce vomiting.

Do not give milk or alcoholic beverages.

Never give anything by mouth to an unconscious person.

If vomiting does occur, have victim lean forward to reduce risk of aspiration.

Get medical attention immediately.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/effects: Absorption by Inhalation or Ingestion of high doses may cause CNS symptoms like headache, dizziness, fatigue, muscular, weakness, drowsiness and lack of coordination.

Symptoms/effects after inhalation: Coughing, choking, wheezing, difficulty in - breathing, chest congestion, shortness of breath and/or fever. The onset of respiratory symptoms may be delayed.

Symptoms/effects after skin contact: Reddening, irritation.

Symptoms/effects after eye contact: Slight irritation.

Symptoms/effects after ingestion: Headache, dizziness, fatigue, muscular, weakness, drowsiness and lack of coordination

4.3. Indication of any immediate medical attention and special treatment needed

Advice to physician

In case of ingestion the stomach should be emptied by gastric lavage under qualified medical supervision.

SECTION 5. FIRE-FIGHTING MEASURES

5.1. Extinguishing media

Suitable extinguishing media SMALL FIRE: Use dry chemicals, CO₂, water spray or alcohol-resistant foam.
LARGE FIRE: Use water spray, water fog or alcohol-resistant foam.

Unsuitable extinguishing media Do not use solid water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard: Releases flammable vapours below normal ambient temperatures. Flammable vapours may be heavier than air. May travel long distances along the ground before igniting and flashing back to vapour source.

Explosion hazard: When mixed with air and exposed to ignition source, vapours can burn in open or explode if confined.

Hazardous decomposition products in case of fire: Carbon monoxide, carbon dioxide and other toxic vapours.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



5.3. Advice for firefighters

Firefighting instructions:	Move containers from fire area if you can do it without risk. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not use straight streams. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. Always stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.
Protection during firefighting:	Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters protective clothing will only provide limited protection.
Further information:	Collect contaminated fire extinguishing water separately. This must not be discharged into drains. Fire residues and contaminated fire extinguishing water must be disposed of in accordance with local regulations.

SECTION 6. ACCIDENTAL RELEASE MEASURE

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

Emergency procedures Ventilate area. Remove ignition sources. Evacuate unnecessary personnel to safe areas..

6.1.2. For emergency responders

Emergency procedures Use personal protective equipment.
Ensure adequate ventilation.
Beware of vapours accumulating to form explosive concentrations.
Vapours can accumulate in low areas.

6.2. Environmental precautions

MTBE is highly volatile, partially water soluble and has only a minimal tendency to adhere to soil particles.

Even small volumes can pose a threat to the environment and nearby water resources.

Surface spills can reach groundwater through porous soil or cracked surfaces.

All efforts should be made to prevent any leaks or spills, and to protect water resources.

Where spills are possible, a comprehensive spill response plan should be developed and implemented.

If a leak or spill reaches the groundwater, the groundwater may become contaminated.

If the groundwater is a source of drinking water, the associated drinking water well(s) could become contaminated.

MTBE can impart an unpleasant taste and odour to water at very low concentrations.

6.3. Methods and material for containment and cleaning up

Extremely flammable liquid. Release can cause fire or explosion. Eliminate all sources of ignition.

All equipment used when handling this product must be grounded.

Do not touch or walk through spilled material.

Stop leak if you can do it without risk.

Prevent entry into waterways, sewers, basements or confined areas.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



A vapour suppressing foam may be used to reduce vapours.

Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

Use clean non-sparking tools to collect absorbed material.

Water spray may reduce vapour; but may not prevent ignition in closed spaces.

Dike large spills and place materials in salvage containers.

6.4. Reference to other sections

SECTION 8: Exposure controls/personal protection. SECTION 13: Disposal considerations.

SECTION 7. HANDLING AND STORAGE

7.1. Precautions for safe handling

Precautions for safe handling

Advice on protection against fire and explosion:

Keep container tightly closed when not in use. Extinguish all ignition sources. Wear recommended personal protective equipment. Ground /bond container and receiving equipment. All electrical equipment should be grounded and conform to applicable electric codes and regulatory requirements. Check atmosphere for explosiveness and oxygen deficiencies. Ensure adequate ventilation. Observe precautions pertaining to confined space entry. Use only non-sparking tools. Carefully vent any internal pressure before removing closure. Isolate, vent, drain, wash and purge systems or equipment before maintenance or repair. Handle empty containers with care; vapour/residue may be flammable. Avoid contact with incompatible agents. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Hygiene measures

Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use.

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Take off contaminated clothing and wash before reuse. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

7.2. Conditions for safe storage, including any incompatibilities

Incompatible materials

Strong oxidizing agents.

Storage area

Store only in tightly closed, properly vented containers away from heat, sparks, open flame and incompatible materials.

Store closed drums with bung in up position.

Vapour space above stored liquid may be flammable/explosive unless blanketed with inert gas.

Store in a well-ventilated place.

Electrical installations / working materials must comply with the technological safety standards.

No smoking.

Store in cool place.

Do not pressurize, cut, weld, braze solder, drill, or grind on containers.

Do not puncture or incinerate containers.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Empty pressure vessels should be returned to the supplier.

Packaging materials

Carbon steel; avoid most plastics, Viton and Fluorel.

7.3. Specific end use(s)

Not applicable.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

8.1.1. Occupational Exposure Limits

Tert-butyl methyl ether (CAS 1634-04-4)

	LTEL TWA ppm	LTEL TWA mg/m ³	STEL ppm	STEL mg/m ³	Note
European Union	50	183.5	100 (1)	367 (1)	Occupational Exposure Limit Values (1) 15 minutes average value
Austria	50	180	100	360	
Belgium	40	146	100	367	
Denmark	40	144	80	288	
France	50	183.5	100	367	
Germany (AGS)	50	180	75 (1)	270 (1)	(1) 15 minutes average value
Germany (DFG)	50	180	75	270	STV 15 minutes average value
Italy	50	183.5	100	367	
Poland		180		270	
Spain	40	147			
Sweden	30	110	100	367	
Switzerland	50	180	75	270	
The Netherlands		180		360	
United Kingdom	25	92	75	275	

Methanol (CAS 67-56-1)

	LTEL TWA ppm	LTEL TWA mg/m ³	STEL ppm	STEL mg/m ³	Note
European Union	200	260			
Austria	200	260	800	1040	
Belgium	200	266	250	333	
Denmark	200	260	400	520	
France	200	260	1000	1300	
Germany (AGS)	200	270	800	1080	
Germany (DFG)	200	270	800	1080	
Italy	200	260			
Poland		100		300	
Spain	200	266	250	333	
Sweden	200	250	250	350	

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Switzerland	200	260	800	1040	
The Netherlands		133			
United Kingdom	200	266	250	333	

8.1.2. DNEL/ PNEC values*Tert-butyl methyl ether (CAS 1634-04-4)***DNEL/DMEL (Workers)**

Acute - systemic effects, dermal	No-threshold effect and/or no dose-response information available
Acute - systemic effects, inhalation	No-threshold effect and/or no dose-response information available
Acute - local effects, dermal	No-threshold effect and/or no dose-response information available
Acute - local effects, inhalation	357 mg/m ³
Long-term - systemic effects, dermal	5100 mg/kg bw/day
Long-term - systemic effects, inhalation	178.5 mg/m ³
Long-term - local effects, dermal	No-threshold effect and/or no dose-response information available
Long-term - local effects, inhalation	No-threshold effect and/or no dose-response information available

DNEL/DMEL (General population)

Acute - systemic effects, dermal	No-threshold effect and/or no dose-response information available
Acute - systemic effects, inhalation	No-threshold effect and/or no dose-response information available
Acute - systemic effects, oral	No-threshold effect and/or no dose-response information available
Acute - local effects, dermal	No-threshold effect and/or no dose-response information available
Acute - local effects, inhalation	214 mg/m ³
Long-term - systemic effects, dermal	3570 mg/kg bw/day
Long-term - systemic effects, inhalation	53.6 mg/m ³
Long-term - systemic effects, oral	7.1 mg/kg bw/day
Long-term - local effects, dermal	No-threshold effect and/or no dose-response information available
Long-term - local effects, inhalation	No-threshold effect and/or no dose-response information available

PNEC (water)

PNEC aqua (freshwater)	5.1 mg/l
PNEC aqua (marine water)	0.26 mg/l
PNEC aqua (intermittent, freshwater)	47.2 mg/L

PNEC (Sediment)

PNEC sediment (freshwater)	23 mg/kg sediment dw
PNEC sediment (marine water)	1.17 mg/kg sediment dw

PNEC (Soil)

PNEC soil	1.56 mg/kg soil dw
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PNEC (Oral)

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



PNEC oral (secondary poisoning)	Not applicable
PNEC (STP)	
PNEC sewage treatment plant	71 mg/l

8.2. Exposure controls

Appropriate engineering controls:

Provide adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits.

Hand protection:

Chemical-resistant protective gloves (EN 374).

The selected protective gloves have to satisfy the standard EN 374 derived from it.

Glove material for example, Glove (multi-layer) – PE/EVAL/PE (PE=Polyethylene; EVAL=Ethylene-vinyl-alcohol-copolymer); Break through time \geq 480 min.

Source: GESTIS substance database (hazardous substance information system of commercial professional associations).

Suitability for specific workplaces should be clarified with protective glove manufacturers. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough.

Eye protection:

Wear safety glasses as minimum eye protection.

Conditions may warrant the use of tightly fitting chemical goggles and possibly a face shield.

Skin and body protection:

Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Use PPE that is chemical resistant to the product and prevents skin contact.

Fire retardant clothing is appropriate for routine occupational use.

Respiratory protection:

In case of dusts/vapours/aerosols being formed or if the limit values like TLV are exceeded: wear respirator conforming to EN140 with type A filter or better.

Environmental exposure controls:

Avoid release to the environment. Do not allow to enter drains or water courses. Assure that emissions are compliant with all applicable air pollution control regulations.

Other information:

Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use.

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Take off contaminated clothing and wash before reuse.

Handle in accordance with good industrial hygiene and safety practice.

Wash hands before breaks and at the end of workday.

For more information please see the relevant exposure scenario in Appendix II of this SDS.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical state at 20 °C and 101.3 kPa	liquid Colour: Colourless Odour: characteristic terpene-like
Melting / freezing point	-108.6 °C

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Boiling point	55.3 °C
Relative density	0.74 at 20 °C
Vapour pressure	33000 Pa at 25 °C (OECD 104)
Surface tension	72.5 mN/m at 21.5 °C (at concentration 1.07 g/l in water) 19.3 mN/m at 25 °C (neat liquid) 18.1 mN/m at 40 °C (neat liquid)
Water solubility	41850 mg/l at 20 °C
Partition coefficient n-octanol/water (log value)	1.06 at 20 °C
Flash point	-28 °C (closed cup)
Flammability	highly flammable
Explosive properties	not explosive
Self-ignition temperature	460 °C
Oxidising properties	The substance is not oxidising.
Viscosity	0.464 mm ² /s (static) at 20 °C (OECD 114) 0.409 mm ² /s (static) at 40 °C (OECD 114)
Granulometry	Not applicable
Stability in organic solvents and identity of relevant degradation products	Not applicable
Dissociation constant	Not applicable

9.2. Other information

Not available.

SECTION 10. STABILITY AND REACTIVITY

10.1. Reactivity

Stable under normal conditions. See Section 10.5.

10.2. Chemical stability

This material is stable when properly handled and stored.

10.3. Possibility of hazardous reactions

Not expected to occur under recommended handling and storage conditions.

10.4. Conditions to avoid

Heat, sparks, open flame, other ignition sources, and oxidizing conditions.

May accumulate static electrical charges, and may cause ignition of the vapours.

10.5. Incompatible materials

Contact with strong acids can decompose this material and generate extremely flammable isobutylene.

10.6. Hazardous decomposition products

Thermal decomposition may produce carbon monoxide and other toxic vapours.

SECTION 11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity

Tert-butyl methyl ether (CAS 1634-04-4)

LD50, oral, rats	> 2000 mg/kg bw (OECD Guideline 401)
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TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



LC50, inhalation, rats	85 mg/L (85000 mg/m ³ air) (OECD Guideline 403)
LD50, dermal, rats	> 2000 mg/kg bw (OECD Guideline 402)
Skin corrosion/irritation	Skin irritation: Category 2
Additional information	The substance is not corrosive. Rabbit: irritating (OECD Guideline 404). Erythema score: 2.9 of max. 4 (mean); time point: 24+48+72; fully reversible within: 8 days.
Serious eye damage/irritation	Not irritating
Additional information	Rabbit: not irritating (OECD Guideline 405)
Respiratory or skin sensitisation	Not sensitizing
Additional information	Guinea pig (intradermal): not sensitizing (Equivalent or similar to OECD Guideline 406)
Germ cell mutagenicity	Not classified
Additional information	In vitro: Genotoxicity: negative (EU Method B.13/14, OECD Guideline 471) In vivo: Genotoxicity: negative (Equivalent or similar to OECD Guideline 486)
Carcinogenicity	Not classified
<i>Tert-butyl methyl ether (CAS 1634-04-4)</i>	
NOAEC (carcinogenicity), inhalation, mouse	≥ 3000 ppm (10710 mg/m ³) (EPA OPPTS 870.4200)
Toxicity for reproduction	Not classified
<i>Tert-butyl methyl ether (CAS 1634-04-4)</i>	
NOAEC (effects on fertility), inhalation, rat	28560 mg/m ³ (8000 ppm) ()
NOAEC (developmental toxicity), inhalation, rat	2500 ppm (1428 mg/m ³) (OECD Guideline 414)
NOAEC (developmental toxicity), inhalation, mouse	1000 ppm (3570 mg/m ³) (EPA OTS 798.4350)
STOT-single exposure Repeated dose toxicity	Not classified In accordance to EU CLP Regulation (EC) No. 1272/2008: classification is not necessary for repeated dose toxicity.
<i>Tert-butyl methyl ether (CAS 1634-04-4)</i>	
NOAEL, subchronic, oral, rat	3 000 mg/L drinking water (209 mg/kg bw/d) (OECD TG 408)
NOAEL, subchronic, oral, rat, male	300 mg/kg bw/day (actual dose received) (OECD TG 408)
NOAEC (systemic), subchronic, inhalation, rat	800 ppm (2856 mg/m ³) (EPA OTS 798.2450)
Aspiration hazard	Not classified
Additional information	In accordance with EU CLP Regulation this substance does not meet the criteria for classification as an aspiration hazard. This substance has a

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



kinematic viscosity of 0.409 mm²/s at 40°C, a surface tension of 18.1 mN/m at 40°C, is partially water soluble (41850 mg/l at 20 °C), and is highly volatile (boiling point of 55.3 °C and vapour pressure of 33 kPa at 25 °C). Presented to lung tissues as a liquid droplet, this substance would be expected to dissolve into and disperse the lipophilic structures within the cells, potentially leading to loss of function. This is partially reflected in the observed dermal irritation and the hyperemia observed in lung tissues of rats exposed to high vapour concentrations. However, due to its finite water solubility and high vapour pressure it would eventually clear from these tissues.

Alcohols and ketones of similar carbon number are specifically mentioned in UN GHS for consideration as Category 2 aspiration hazards. Based on its lower polarity and lower hydrogen bonding capacity, this substance behaves even more like a light hydrocarbon than either alcohols or ketones of the same carbon number, and so would be expected to have greater impact. Thus on the basis of existing animal studies and expert judgment that takes into account surface tension, water solubility, boiling point, and volatility (Craan AG. 1996. Aspiration hazard and consumer products: A review. International Journal for Consumer Safety. 3(3): 153-164), this substance meets the criteria to be a Category 2 aspiration hazard according to UN GHS. (See Section 15)

SECTION 12. ECOLOGICAL INFORMATION	
12.1. Toxicity	
<i>Tert-butyl methyl ether (CAS 1634-04-4)</i>	
Fish (Short-term toxicity)	
LC50 (96h)	672 mg/l (Pimephales promelas/freshwater)(US EPA 1981)
LC50 (96h))	574 mg/l (Menidia beryllina/saltwater) (OECD Guideline 203)
Fish (Long-term toxicity)	
NOEC (31 d)	299 mg/l (Pimephales promelas/freshwater) (ASTM E1241-92)
Aquatic invertebrates (Short-term toxicity)	
EC50 (48 h)	472 mg/l (Daphnia Magna) (EPA OPPTS 850.1010)
EC50 (96 h)	106mg/l (Americamysis bahia)
Aquatic invertebrates (Long-term toxicity)	
NOEC (21 d)	51 mg/l (Daphnia Magna/Freshwater) (EPA OPPTS 850.1300)
NOEC (28 d):	26 mg/L (<i>Americamysis bahia</i> /saltwater)(EPA OPPTS 850.1350)
Algae and aquatic plants	
EC50/LC50 (96 h)	491 mg/L
EC10/LC10 or NOEC	103 mg/L (Freshwater/ algae - <i>Pseudokirchnerella subcapitata</i>) (ASTM E1218-90)
Toxicity to aquatic micro-organisms	
EC10 (18 h)	710 mg/l (<i>Pseudomonas putida</i> /freshwater) (estimated)
12.2. Persistence and degradability	
Abiotic degradation:	According to existing data, the degradation half-life of MTBE in the air is 3-6 days depending on environmental conditions (predominantly OH-radical concentration). Using a degradation rate constant of 2.84·10 ⁻¹²

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	<p>cm³/molecule/s and an OH –radical concentration of 5·10⁵ radicals/cm³ a half-life of 5.65 days is calculated. This half-life for degradation in air will be used in further assessment.</p> <p>Abiotic degradation rates: Degradation for hydrolysis: 0 d-1 Degradation for photolysis: 0 d-1 Degradation rate in air: 0.123 d-1</p>
Biodegradation	<p>In anaerobic, static sediment/water microcosms, MTBE does not biodegrade. Under mixed aerobic/anaerobic conditions biodegradation may be a significant removal process of MTBE in aerobic sediment.</p> <p>Biotic degradation rates: Degradation in a non-adapted STP: 0 d-1 Degradation in an adapted STP: Monod kinetics (default values) Degradation rate in surface water : 4.62·10⁻³ d-1 Degradation rate in aerated sediment: 2.31·10⁻³ d-1 Degradation rate in soil : 1.00·10⁻³ d-1</p>
Persistence and degradability	<p>A closed bottle test (OECD 301D) showed that MTBE is not readily biodegradable. The percentage of biodegradation ranged from 0 to 9.24. It may be concluded that MTBE is inherently biodegradable under certain conditions in aquatic aerobic environment. Therefore, in the further assessment the substance is assumed to be “inherently biodegradable, not fulfilling criteria” for professional and consumer releases and on the regional scale.</p> <p>There is good evidence for ready biodegradability when sewage sludge has become adapted to the substance. Such conditions will apply where there are continuous releases of MTBE to a STP, such as for large production and processing sites. Thus, the substance can be assumed to be readily biodegradable in such cases.</p>

12.3. Bioaccumulative potential

Aquatic bioaccumulation:	BCF: 1.5 (Cyprinus carpio) (whole body w.w.)
Secondary poisoning:	Considering the measured log KOW of MTBE of 1.06, it is not expected that MTBE would bioconcentrate in high extent or would accumulate in biota for long time periods.

12.4. Mobility in soil

Biodegradation in soil:	A half-life of 101.6 days in soil
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12.5. Results of PBT and vPvB assessment

Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfil the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

12.6. Other adverse effects

Not available.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste disposal recommendations	Contaminated product, soil or water may be hazardous waste due to potentially low flash point. Dispose of in compliance with respective national and local regulations.
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TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Assure effluent complies with applicable regulations. Landfill solids at permitted sites. Use registered transporters. Burn concentrated liquids in systems designed for low flash point material. Avoid flame-outs.

Assure emissions comply with applicable regulations. Avoid overloading/poisoning plant biomass. Dilute aqueous waste may biodegrade.

Contaminated adsorbent must be removed in sealed, plastic lined drums and disposed of via an authorised waste disposal contractor.

European List of Waste (LoW) code

13 07 02* – gasoline;

07 01 04* other organic solvents, washing liquids and mother liquors.

SECTION 14. TRANSPORT INFORMATION

14.1. Land transport (ADR/ RID)

UN-No. 2398
Proper Shipping Name: METHYL tert-BUTYL ETHER
Hazard class: 3
Packing group: II
Hazard label: 3



Classification Code: F1
Hazard identification number (HIN): 33
Tunnel restriction code (ADR): D/E
Environmental hazard: NO

14.2. Inland waterway transport (ADN)

UN-No. 2398
Proper Shipping Name: METHYL tert-BUTYL ETHER
Hazard class: 3
Packing group: II
Hazard label: 3



Classification Code: F1
Hazard identification number (HIN): 33
Environmental hazard: NO

14.3. Sea transport (IMDG)

UN-No. 2398
Proper Shipping Name: METHYL tert-BUTYL ETHER
Hazard class: 3
Packing group: II
Hazard label: 3



EmS-No. (Fire) F - E

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



EmS-No. (Spillage) S - D

Marine pollutant: NO

14.4. Air transport (IATA/ICAO)

UN-No. 2398

Proper Shipping Name: Methyl tert-butyl ether

Hazard class: 3

Packing group: II

Hazard label: 3



ERG Code 3L

Environmental hazard: NO

14.5. Special precautions for user

Always transport in closed containers. Ensure that persons transporting the product know what to do in the event of an accident or spillage. For information regarding Exposure Controls/Personal Protection see Section 8 of the SDS

14.6. Transport in bulk according to Annex II of Marpol and the IBC Code

Marpol Details:

Marpol Annex: II

IMO Ship Type: 3

IMO Pollution Category: Z

SECTION 15. REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Authorisations and/or restrictions on use (Annex XVII): Not applicable.

MTBE is not on the REACH Candidate List.

MTBE is not on the REACH Annex XIV List.

Other information, restriction and prohibition regulations Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer. Annex II - Not listed.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances- (SEVESO III):
Physical Hazard – P5b - Flammable liquids.

Directive 2013/39/EU priority substances in the field of water policy (amending Directive 2006/60/EC – Water Framework Directive and Directive 2008/105/EC on environmental quality standards in the field of water policy): Not listed.

Regulation (EC) No 850/2004 on persistent organic pollutants:
Annex III – Not listed.

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



chemicals: Not listed.

15.1.2. Globally Harmonized System of Classification and Labelling of Chemicals (UN-GHS)

Classification according to UN-GHS:

H225 Flammable Liquid Cat. 2

H303 Acute toxicity Category 5

H305 Aspiration hazard Category 2

H316 Skin corrosion/irritation Cat. 3

Labelling according to UN-GHS:

Hazard pictogram(s) GHS02: flame, GHS08: health hazard



Signal word(s)

Danger

Hazard Statement(s):

H225: Highly flammable liquid.

H303: May be harmful if swallowed.

H305: May be harmful if swallowed and enters airways.

H316: Causes mild skin irritation.

Precautionary statement(s)

P210 - Keep away from heat/sparks/open flames/.../hot surfaces. ... No smoking

P243 - Take precautionary measures against static discharge

P280 - Wear protective gloves/protective clothing/eye protection/face protection

P301+310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P331 Do NOT induce vomiting.

P302+352 - IF ON SKIN: Wash with plenty of soap and water.

P403+P235 - Store in a well-ventilated place. Keep cool.

15.1.3. National regulations

AwSV (Germany, 2017): Wassergefährdungsklasse (WGK) 1 (low danger for water pollution).

15.2. Chemical safety assessment

Chemical Safety Report has been performed for tert-butyl methyl ether.

SECTION 16. OTHER INFORMATION

16.1. Indication of changes

Version	Date of change	Section	Description of changes
1.0	17/03/2010		Version was created according to Regulations (EC) No 1907/2006 (Article 31.1).
2.1	08/02/2011		Version was created according to Regulation (EC) No 1272/2008 (Regulation CLP) & 453/2010.
2.2	11/04/2012	1.1; 2.2; 3; 8; 9; 11; 12; 14; 15; 16; Annex I; II.	Version was created according to recommendations of Guidance on the compilation of safety data sheets (ECHA. Version 1.0 – September 2011) and due to update of CSR by Lead Registrant (31/10/2011): 1. Phrases “For the detailed identified uses of the product see Annex I” and “The use of the substance

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



			<p>should be limited to those specified in Annex I” were added to Section 1.1.</p> <p>2. UN-GHS LABELLING was added to Section 2.2.</p> <p>3. Phrase “Other hazards” was added to Section 2.2.</p> <p>4. Phrase “The Full Text for all S, P-Phrases is displayed in Section 16” was added to Section 2.2.</p> <p>5. Index No (CLP) was added to table of Section 3.</p> <p>6. Phrase “M-factor: none” was added to Section 3.</p> <p>7. Section 8 was fully updated.</p> <p>8. Remarks/Justification was added to table of Section</p> <p>9. Section 11 was reconfigured and Remarks/Justification were added to table.</p> <p>10. Section 12 was reconfigured and Remarks/Justification were added to table.</p> <p>11. Section 14 was reconfigured.</p> <p>12. Sections 15, 16 were fully updated.</p> <p>13. Specific Environmental Release Categories (SpERC) were added to Appendix I for IU: 1; 2; 3; 4; 5; 6; 7; 8.</p> <p>14. Appendix II was fully reconfigured.</p>
2.3	06/07/2016	Title, 1.3; 2	<p>Title, Section 1.3: Company name of the Supplier was changed from «Togliattikauchuk» on «SIBUR Togliatti».</p> <p>Section 2: Only classification and labelling according CLP are given.</p>
3.0	17/04/2018	1-16, Annex	<p>SDS has been corrected in according to new data of Registration dossier, Chemical Safety Report, and new Transport information.</p>

16.2. Abbreviations and acronyms

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
AGS	The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)
BCF	Bioconcentration factor
DFG	Germany Research Foundation
DNEL	Derived No Effect Level
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
K _{oc}	Adsorption coefficient
K _{ow}	octanol-water partition coefficient
LC50	Lethal Concentration to 50 % of a test population
LD50	Lethal Dose to 50% of a test population (Median Lethal Dose)
LOAEC	Lowest Observable Adverse Effect Concentration
LTEL	Long Term Exposure Limit
NIOSH	National Institute for Occupational Safety and Health (USA CDC)
NOEC	No Observed Effect Concentration

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



NOAEL	No Observed Adverse Effect Level
OECD	Organization for Economic Co-operation and Development
OSHA	Occupational Safety & Health Administration (<i>USA</i>)
PNEC	Predicted No Effect Concentration
PBT	Persistent, bioaccumulative, toxic chemical
vPvB	Very Persistent, Very Bioaccumulative
RID	Regulations concerning the International Carriage of Dangerous Goods by Rail
SCOEL	Scientific Committee on Occupational Exposure Limits
STEL	Short Term Exposure Limit
STP	sewage treatment plant
STOT	Specific Target Organ Toxicity
(STOT) RE	Repeated Exposure
(STOT) SE	Single Exposure
TWA	Time Weighted Average
UN	United Nations
WGK	Wassergefährdungsklasse (<i>German: Water Hazard Class</i>)

16.3. Full text of H- and EUH-statements:

H225:	Flammable Liquid Cat. 2.	Highly flammable liquid.
H315:	Skin irritation Cat. 2.	Causes skin irritation.
H301:	Acute Tox. 3(oral)	Toxic if swallowed.
H311:	Acute Tox. 3(dermal)	Toxic in contact with skin.
H331:	Acute Tox. 3 (Inhalation)	Toxic if inhaled.
H370:	STOT SE 1	Causes damage to organs. Target organs: Optic nerve (nervus opticus), central nervous system.
H371:	STOT SE 2	May cause damage to organs. Target organs: Optic nerve (nervus opticus), central nervous system.

16.4. List of ES (exposure scenario) given in Appendix I to the extended SDS

ES1	Formulation
ES2	Use as intermediate
ES3	Use as process solvent and extraction agent
ES4	Industrial distribution of MTBE and gasoline containing MTBE
ES5	Fuel use – Industrial
ES6	Fuel use – Professional
ES7	Fuel use – Consumer

16.5. Key literature references and sources

DOCUMENTS, PROVIDED BY FERC CONSORTIUM:

CHEMICAL SAFETY REPORT to tert-butyl methyl ether (CAS 1634-04-4).

EU DIRECTIVES

REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Regulation (EC) No 1272/2008 REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Regulations. Commission regulation (EU) no 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

DIRECTIVE 1999/45/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.

COMMISSION DECISION of 16 January 2001 amending Decision 2000/532/EC as regards the list of wastes (notified under document number (2001/118/EC).

UK REGULATORY REFERENCES

Chemicals (Hazard Information & Packaging) Regulations. The Control of Substances Hazardous to Health Regulations 1988. Health and Safety at Work Act 1974.

ENVIRONMENTAL LISTING

Control of Pollution Act 1974.

STATUTORY INSTRUMENTS

Notification of New Substances Regulations (NONS) 1993. The Export and Import of Dangerous Chemicals Regulations 2005 number 928.

APPROVED CODE OF PRACTICE

Classification and Labelling of Substances and Preparations Dangerous for Supply (EU 2001/59/EC). Safety Data Sheets for Substances and Preparations (REACH).

GUIDANCE NOTES

Workplace Exposure Limits EH40. Introduction to Local Exhaust Ventilation HS(G)37. CHIP for everyone HSG(108).

Training advice

Personnel handling ammonia has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

DISCLAIMER

This information is based on our current level of knowledge. This information may be subject to revision as new knowledge and experience becomes available, and SIBUR makes no warranties and assumes no liability in connection with any use of this information. Since SIBUR cannot be aware of all aspects of your business and the impact the REACH Regulation has for your company, SIBUR strongly encourages you to get familiar with the REACH Regulation in order to comply with its requirements and timelines.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



ANNEX. EXPOSURE SCENARIOS

1. Exposure scenario 1 (ES1)

Section 1	Exposure Scenario Title
Title	MTBE Formulation & (re)packing of substances and mixtures. - Industrial. CAS: 1634-04-4
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC2; ESVOC SpERC 2.2v1
Processes, tasks, activities covered	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, large and small scale packing, maintenance and associated laboratory activities [GES2_I]
Assessment method:	Health: Used ECETOC TRA model [EE1]. (v3).Environment: Used EUSES model [EE4]. Used ESVOC SpERC #4.
Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure:
Product characteristics	Substance is a unique structure [PrC1]. Predominantly hydrophobic [PrC4a]. Readily biodegradable [PrC5a].
Regional tonnage of MTBE (tonne per year).	659,000 tpa. (2,197,125 kg/day.)
Fraction of EU production volume for region	0.25
Fraction of tonnage for application	0.985
Frequency and duration of use:	Continuous process [CS54]. 300 days per year of operation
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor[EF2]: 100
Other operational conditions of use affecting environmental exposure.	No specific measures required
Technical onsite conditions and measures to reduce or limit discharges, air emissions.	Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29]. ES2-E1: ERC2. ESVOC SpERC 2.2v1. Release fraction to air from process (initial release prior to RMM) [OOC4]: 0.025. Release fraction to wastewater from process (initial release prior to RMM) [OOC5]: 0.005. Release fraction to soil from process (initial release prior to RMM) [OOC6]: 0.0001. Fraction of main source: 0.05 No air emission controls required; required removal efficiency is 0% [TCR5]. Soil emission controls are not applicable as there is no direct release to soil [TCR4]. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) [TCR8]: 99. Assumed industrial waste water treatment plant flow (m3/d): 2000.
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: 99. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000.
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].
Other environmental control measures additional to above:	none.
Section 2.2	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to	Common practices vary across sites thus conservative process release estimates used [TCS1].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



control dispersion from source towards workers:	
Contributing Scenarios	Risk Management Measures
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES2-CS1: PROC1. General exposures (closed systems) [CS15].	No specific measures identified [EI18].
ES2-CS2: PROC2. General exposures (closed systems) [CS15]. ; With sample collection [CS56].	Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour) [E11].
ES2-CS3: PROC3. General exposures (closed systems) [CS15]. ; Use in contained batch processes [CS37]. ; With sample collection [CS56].	Provide extract ventilation to points where emissions occur [E54].
ES2-CS4: PROC4. General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Provide extract ventilation to points where emissions occur [E54].
ES2-CS5: PROC3. General exposures (closed systems) [CS15]. ; Batch processes at elevated temperatures [CS136]. With sample collection [CS56].	Formulate in enclosed or ventilated mixing vessels [E46]. Provide extract ventilation to points where emissions occur [E54].
ES2-CS6: PROC3. Process sampling [CS2].	Provide extract ventilation to points where emissions occur [E54]. Avoid carrying out activities involving exposure for more than 15 minutes [OC26]. ,or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES2-CS7: PROC15. Laboratory activities [CS36]. Cleaning [CS47] [wiping, brushing, flushing]	Handle in a fume cupboard or under extract ventilation [E83].
ES2-CS8: PROC8b. Bulk transfers [CS14]. Dedicated facility [CS81]. (eg road/railcar bottom loading/unloading, marine vessel/barge loading/unloading).	Provide extract ventilation to material transfer points and other openings [E82].
ES2-CS9: PROC5. Mixing operations (open systems) [CS30]. Batch process [CS55].	Provide extract ventilation to points where emissions occur [E54].
ES2-CS10: PROC8a. Manual [CS34]. Transfer from/pouring from containers [CS22]. Non-dedicated facility [CS82].	Ensure material transfers are under containment or extract ventilation [E66].
ES2-CS11: PROC8b. Drum/batch transfers [CS8]. Dedicated facility [CS81].	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. Avoid carrying out activities involving exposure for more than 1 hour [OC27]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22]. Use drum pumps [E53].
ES2-CS12: PROC9. Drum and small package filling [CS6]. Dedicated facility [CS81].	Fill containers/cans at dedicated fill points supplied with local extract ventilation [E51]. Use drum pumps [E53].
ES2-CS13: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Avoid carrying out activities involving exposure for more than 4 hours [OC28], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
ES2-CS14: PROC1. Storage [CS67]. General exposures (closed systems) [CS15]	No specific measures identified [EI18].
ES2-CS15: PROC2. Storage [CS67]. General exposures (closed systems) [CS15]. with sample collection [CS56].	Avoid carrying out activities involving exposure for more than 4 hours [OC28], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	ES2-E1: PEC for microorganisms in STP: 0.0101mg/l. Risk characterisation ratio: 1.42E-04. Local PEC in surface water: 0.00185mg/l. Risk characterisation ratio: 3.63E-04. Local PEC in fresh water sediment: 0.00177mg/kgww. Risk characterisation ratio: 3.54E-04. Local PEC in sea water during emission episode: 0.000211mg/l. Risk characterisation ratio: 8.12E-04. Local PEC in marine sediment: 0.000201mg/kgww. Risk characterisation ratio: 8.04E-04. Local PEC in agricultural soil (30 day average): 0.0995mg/kgww. Risk characterisation ratio: 7.21E-02. Local PEC in grassland (180 day average): 0.106mg/kgww. Risk characterisation ratio: 7.68E-02. Risk from environmental exposure is driven by soil [TCR1f].
Health: Inhalation (vapour)	exposure resulting from contributing scenario ES2-CS1: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	<p>exposure resulting from contributing scenario ES2-CS2: 8 hour average 18ppm - Risk characterisation ratio: 0.35. 15 minute average 35ppm - Risk characterisation ratio: 0.35.</p> <p>exposure resulting from contributing scenario ES2-CS3: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm - Risk characterisation ratio: 0.2.</p> <p>exposure resulting from contributing scenario ES2-CS4: 8 hour average 10ppm - Risk characterisation ratio: 0.2. 15 minute average 40ppm - Risk characterisation ratio: 0.4.</p> <p>exposure resulting from contributing scenario ES2-CS5: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm - Risk characterisation ratio: 0.2.</p> <p>exposure resulting from contributing scenario ES2-CS6: 8 hour average 0.5ppm - Risk characterisation ratio: 0.01. 15 minute average 20ppm - Risk characterisation ratio: 0.2.</p> <p>exposure resulting from contributing scenario ES2-CS7: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm - Risk characterisation ratio: 0.2.</p> <p>exposure resulting from contributing scenario ES2-CS8: 8 hour average 7.5ppm - Risk characterisation ratio: 0.15. 15 minute average 30ppm - Risk characterisation ratio: 0.3.</p> <p>exposure resulting from contributing scenario ES2-CS9: 8 hour average 25ppm - Risk characterisation ratio: 0.5. 15 minute average 50ppm - Risk characterisation ratio: 0.5.</p> <p>exposure resulting from contributing scenario ES2-CS10: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 50ppm - Risk characterisation ratio: 0.5.</p> <p>exposure resulting from contributing scenario ES2-CS11: 8 hour average 0.3ppm - Risk characterisation ratio: <0.01. 15 minute average 6ppm - Risk characterisation ratio: <0.01.</p> <p>exposure resulting from contributing scenario ES2-CS12: 8 hour average 4ppm - Risk characterisation ratio: 0.08. 15 minute average 16ppm - Risk characterisation ratio: 0.16.</p> <p>exposure resulting from contributing scenario ES2-CS13: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm - Risk characterisation ratio: 0.5.</p> <p>exposure resulting from contributing scenario ES2-CS14: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01.</p> <p>exposure resulting from contributing scenario ES2-CS15: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm - Risk characterisation ratio: 0.5.</p> <p>Risk management measures described will protect against acute exposure.</p>
Health: Dermal:	<p>exposure resulting from contributing scenario ES2-CS1: 0.03mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS2: 0.27mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS3: 0.013mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS4: 0.13mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS5: 0.013mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS6: 0.0013mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS7: 0.0068mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS8: 0.13mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS9: 0.27mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS10: 0.054mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS11: 0.027mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS12: 0.13mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS13: 1.6mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS14: 0.03mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES2-CS15: 0.16mg/kg/day. Risk characterisation ratio: <0.001.</p>

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].
Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required [DSU8]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].
Health:	No data

2. Exposure scenario 2 (ES2)

Section 1	Exposure Scenario Title
Title	MTBE. Use as an intermediate. CAS:1634-04-4.
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC6a.; ESVOC SpERC 6.1a.v1
Processes, tasks, activities covered	Use of substance as an intermediate (not related to Strictly Controlled Conditions). Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container) [GES1B_I].
Assessment method:	Health: Used ECETOC TRA model [EE1]. (v3).Environment: Used EUSES model [EE4]. Used ESVOC SpERC #2..
Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1].
	Predominantly hydrophobic [PrC4a].
	Readily biodegradable [PrC5a].
Operational conditions	Outdoor use [OOC1].
Amounts used	
Regional tonnage of MTBE (tone per year).	8,030 tpa. (26767 kg/day.)
Fraction of EU production volume for region	0.25
Fraction of tonnage for application	0.012
Fraction of chemical in formulation	1
Frequency and duration of use	
Type of release	Continuous release [FD2].
Emission days (days/year) [FD4]:	300
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.
Other operational conditions of use affecting environmental exposure.	No specific measures required. Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29]. ES3-E1: ERC6a. ESVOC SpERC 2. Release fraction to air from process (initial release prior to RMM) [OOC4]: 0.005. Release fraction to wastewater from process (initial release prior to RMM) [OOC5]: 0.01. Release fraction to soil from process (initial release prior to RMM) [OOC6]: 0.001. Fraction of main source: 1.0
Technical onsite conditions and measures to reduce or limit discharges, air emissions	No air emission controls required; required removal efficiency is 0% [TCR5]. Soil emission controls are not applicable as there is no direct release to soil [TCR4]. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) [TCR8]: 90. Assumed industrial waste water treatment plant flow (m3/d): 2000..
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: 90. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000.
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Other environmental control measures additional to above:	none.
Section 2.2.	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to control dispersion from source towards workers:	Common practices vary across sites thus conservative process release estimates used [TCS1].
Contributing Scenarios	Risk Management Measures
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES3-CS1: PROC1. General exposures (closed systems) [CS15].	No specific measures identified [EI18].
ES3-CS2: PROC2. General exposures (closed systems) [CS15]. with sample collection [CS56].	Ensure operation is undertaken outdoors [E69].
ES3-CS3: PROC3. General exposures (closed systems) [CS15]. Use in contained batch processes [CS37]. with sample collection [CS56].	Provide extract ventilation to points where emissions occur [E54].
ES3-CS4: PROC4. General exposures (open systems) [CS16]. Batch process [CS55]. with sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Ensure material transfers are under containment or extract ventilation [E66].
ES3-CS5: PROC8b. Process sampling [CS2]. Dedicated facility [CS81].	Provide extract ventilation to points where emissions occur [E54].
ES3-CS6: PROC15. Laboratory activities [CS36]. Cleaning [CS47]. Wiping [CS50]. Rolling, Brushing [CS51].	Handle in a fume cupboard or under extract ventilation [E83].
ES3-CS7: PROC8b. Bulk closed loading and unloading [CS501]. Dedicated facility [CS81].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES3-CS8: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES3-CS9: PROC1. Storage [CS67]. Bulk transfers [CS14].	No specific measures identified [EI18].
ES3-CS10: PROC2. Storage [CS67]. General exposures (closed systems) [CS15]. Batch process [CS55].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	<p>ES3-E1:</p> <p>PEC for microorganisms in STP: 0.0101mg/l. Risk characterisation ratio: 1.42E-04.</p> <p>Local PEC in surface water: 0.00185mg/l. Risk characterisation ratio: 3.63E-04.</p> <p>Local PEC in fresh water sediment: 0.00177mg/kgww. Risk characterization ratio: 3.63E-04.</p> <p>Local PEC in sea water during emission episode: 0.000211mg/l. Risk characterisation ratio: 8.12E-04.</p> <p>Local PEC in marine sediment: 0.0002mg/kgww. Risk characterisation ratio: 8.00E-04.</p> <p>Local PEC in agricultural soil (30 day average): 0.00514mg/kgww. Risk characterisation ratio: 3.72E-03.</p> <p>Local PEC in grassland (180 day average): 0.00522mg/kgww. Risk characterisation ratio: 3.78E-03.</p> <p>Risk from environmental exposure is driven by soil [TCR1f].</p>
Health: Inhalation (vapour).	exposure resulting from contributing scenario ES3-CS1: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01
	exposure resulting from contributing scenario ES3-CS2: 8 hour average 18ppm - Risk characterisation ratio: 0.35. 15 minute average 35ppm - Risk characterisation ratio: 0.35.
	exposure resulting from contributing scenario ES3-CS3: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm - Risk characterisation ratio: 0.2.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	<p>exposure resulting from contributing scenario ES3-CS4: 8 hour average 10ppm - Risk characterisation ratio: 0.2. 15 minute average 40ppm – Risk characterisation ratio: 0.4.</p> <p>exposure resulting from contributing scenario ES3-CS5: 8 hour average 1.5ppm - Risk characterisation ratio: 0.03. 15 minute average 30ppm -Risk characterisation ratio: 0.3.</p> <p>exposure resulting from contributing scenario ES3-CS6: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm – Risk characterisation ratio: 0.2.</p> <p>exposure resulting from contributing scenario ES3-CS7: 8 hour average 27ppm - Risk characterisation ratio: 0.54. 15 minute average 49ppm – Risk characterisation ratio: 0.49</p> <p>exposure resulting from contributing scenario ES3-CS8: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm – Risk characterisation ratio: 0.5.</p> <p>exposure resulting from contributing scenario ES3-CS9: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm -Risk characterisation ratio: <0.01.</p> <p>exposure resulting from contributing scenario ES3-CS10: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm – Risk characterisation ratio: 0.5.</p> <p>Risk management measures described will protect against acute exposure.</p>
Health: Dermal:	<p>exposure resulting from contributing scenario ES3-CS1: 0.03mg/kg/day. Risk characterisation ratio: <0.001.</p>
	<p>exposure resulting from contributing scenario ES3-CS2: 0.27mg/kg/day. Risk characterisation ratio: <0.001</p> <p>exposure resulting from contributing scenario ES3-CS3: 0.013mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS4: 0.13mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS5: 0.13mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS6: 0.0068mg/kg/day. Risk characterisation ratio: <0.001</p> <p>exposure resulting from contributing scenario ES3-CS7: 1.6mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS8: 1.6mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS9: 0.03mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>exposure resulting from contributing scenario ES3-CS10: 0.16mg/kg/day. Risk characterisation ratio: <0.001.</p> <p>Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].</p>
Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	<p>Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required [DSU8]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].</p>
Health:	No data

3. Exposure scenario 3 (ES3)

Section 1	Exposure Scenario Title
Title	MTBE. Use as a process chemical or extraction solvent. CAS:1634-04-4.
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC4.; ESVOC SpERC 4.24.v1
Processes, tasks, activities covered	Covers the use a process chemical or extraction solvent, including exposures during use (including product transfer, mixing and preparation plus manual and automated application) and equipment cleaning.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1].
	Predominantly hydrophobic [PrC4a].
	Readily biodegradable [PrC5a].
Amounts used	
Regional tonnage of MTBE (tone per year).	2010 tpa. (6692 kg/day.)
Fraction of EU production volume for region	0.25
Fraction of tonnage for application	0.003
Fraction of chemical in formulation	1
Frequency and duration of use:	Continuous process [CS54]. 20 days per year of operation.
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.
Other operational conditions of use affecting environmental exposure.	No specific measures required.
Technical onsite conditions and measures to reduce or limit discharges, air emissions.	<p>Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29].</p> <p>ES4-E1: ERC4. ESVOC SpERC 38.</p> <p>Release fraction to air from process (initial release prior to RMM) [OOC4]: 0.025.</p> <p>Release fraction to wastewater from process (initial release prior to RMM) [OOC5]: 0.02.</p> <p>Release fraction to soil from process (initial release prior to RMM) [OOC6]: 0.0001.</p> <p>Fraction of main source: 0.3</p> <p>No air emission controls required; required removal efficiency is 0% [TCR5].</p> <p>Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) [TCR8]: 99.</p> <p>Assumed industrial waste water treatment plant flow (m3/d): 2000.</p>
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: 99. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000.
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].
Other environmental control measures additional to above:	none
Section 2.2	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to control dispersion from source towards workers:	Common practices vary across sites thus conservative process release estimates used [TCS1].
Contributing Scenarios	Risk Management Measures
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES4-CS1: PROC1. General exposures (closed systems) [CS15].	No specific measures identified [E118].
ES4-CS2: PROC2. General exposures (closed systems) [CS15]. with sample collection [CS56].	Ensure operation is undertaken outdoors [E69].
ES4-CS3: PROC3. General exposures (closed systems) [CS15]. Use in contained batch processes [CS37]. with sample collection [CS56]. [CS56].	Provide extract ventilation to points where emissions occur [E54].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



ES4-CS4: PROC4. General exposures (open systems) [CS16]. Batch process [CS55]. with sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Ensure material transfers are under containment or extract ventilation [E66].
ES4-CS5: PROC8b. Process sampling [CS2]. Dedicated facility [CS81].	Provide extract ventilation to points where emissions occur [E54]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
ES4-CS6: PROC15. Laboratory activities [CS36]. Cleaning [CS47]. Wiping [CS50]. Rolling, Brushing [CS51].	Handle in a fume cupboard or under extract ventilation [E83].
ES4-CS7: PROC8b. Bulk closed loading and unloading [CS501]. Dedicated facility [CS81].	Avoid carrying out activities involving exposure for more than 4 hours [OC28], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
ES4-CS8: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82].	Drain down and flush system prior to equipment break-in or maintenance [E55]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES4-CS9: PROC1. Storage [CS67]. General exposures (closed systems) [CS15].	No specific measures identified [EI18].
ES4-CS10: PROC2. Storage [CS67]. General exposures (closed systems) [CS15]. with sample collection [CS56].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	<p>ES4-E1: PEC for microorganisms in STP: 0.0101mg/l. Risk characterisation ratio: 1.42E-04. Local PEC in surface water: 0.00185mg/l. Risk characterisation ratio: 3.63E-04. Local PEC in fresh water sediment: 0.00177mg/kgww. Risk characterization ratio: 3.54E-04. Local PEC in sea water during emission episode: 0.00021mg/l. Risk characterisation ratio: 8.08E-04. Local PEC in marine sediment: 0.0002mg/kgww. Risk characterisation ratio: 8.00E-04. Local PEC in agricultural soil (30 day average): 0.00199mg/kgww. Risk characterisation ratio: 1.44E-03. Local PEC in grassland (180 day average): 0.00198mg/kgww. Risk characterisation ratio: 1.43E-03. Risk from environmental exposure is driven by soil [TCR1f].</p>
Health: Inhalation (vapour).	exposure resulting from contributing scenario ES4-CS1: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES4-CS2: 8 hour average 18ppm - Risk characterisation ratio: 0.35. 15 minute average 35ppm – Risk characterisation ratio: 0.35.
	exposure resulting from contributing scenario ES4-CS3: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm – Risk characterisation ratio: 0.2.
	exposure resulting from contributing scenario ES4-CS4: 8 hour average 10ppm - Risk characterisation ratio: 0.2. 15 minute average 40ppm – Risk characterisation ratio: 0.4.
	exposure resulting from contributing scenario ES4-CS5: 8 hour average 1.5ppm - Risk characterisation ratio: 0.03. 15 minute average 30ppm - Risk characterisation ratio: 0.3.
	exposure resulting from contributing scenario ES4-CS6: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm – Risk characterisation ratio: 0.2.
	exposure resulting from contributing scenario ES4-CS7: 8 hour average 27ppm - Risk characterisation ratio: 0.54. 15 minute average 49ppm – Risk characterisation ratio: 0.49.
	exposure resulting from contributing scenario ES4-CS8: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm – Risk characterisation ratio: 0.5.
	exposure resulting from contributing scenario ES4-CS9: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES4-CS10: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 50ppm – Risk characterisation ratio: 0.5.
	Risk management measures described will protect against acute exposure.
Health: Dermal:	exposure resulting from contributing scenario ES4-CS1: 0.03mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS2: 0.27mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS3: 0.013mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS4: 0.13mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS5: 0.13mg/kg/day. Risk characterisation ratio: <0.001.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	exposure resulting from contributing scenario ES4-CS6: 0.0068mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS7: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS8: 8.2mg/kg/day. Risk characterisation ratio: 0.002.
	exposure resulting from contributing scenario ES4-CS9: 0.006mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES4-CS10: 0.82mg/kg/day. Risk characterisation ratio: <0.001.
	Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].
Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required [DSU8]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].
Health:	No data

4. Exposure scenario

Section 1	Exposure Scenario Title
Title	MTBE. Distribution of substance. CAS:1634-04-4.
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC1, ERC2
	Specific Environmental Release Categories: ESVOC SpERC 1.1b.v1
Processes, tasks, activities covered	Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities [GES1A_I].
Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. Predominantly hydrophobic [PrC4a]. Readily biodegradable [PrC5a].
Regional tonnage of MTBE (tonne per year) – transport	659,000 tpa. (2,197,125 kg/day.)
Fraction of EU production volume for region – transport	0.25
Fraction of tonnage for application – transport	0.985
Fraction of chemical in formulation – transport	0.15
Regional tonnage of MTBE (kg per day) – storage (see Annex C)	8.4
Frequency and duration of use:	Continuous process [CS54]. 300 days per year of operation.
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.
Other operational conditions of use affecting environmental exposure.	No specific measures required.
Technical onsite conditions and measures to reduce or limit discharges, air emissions.	<u>Transport [CS58]</u> Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29]. ES5-E1: ERC1, ERC2. ESVOC SpERC 3. Release fraction to air from process (initial release prior to RMM) [OOC4]: 0.0001. Release fraction to wastewater from process (initial release prior to RMM) [OOC5]: 0.00001. Release fraction to soil from process (initial release prior to RMM) [OOC6]: 0. Fraction of main source: 0.05 <u>Bulk Product Storage [CS85]</u> Assessment of storage conditions give rise to the following release estimates. See annex C for details.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	<p>ES5-E2: ERC1, ERC2. Local release to air: 0kg/day. Local release to water: 8.4kg/day. Local release to soil: 0kg/day. Fraction of main source: 1.0</p> <p>No air emission controls required; required removal efficiency is 0% [TCR5]. Soil emission controls are not applicable as there is no direct release to soil [TCR4]. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) [TCR8]: Transport: 95. Storage: 99. Assumed industrial waste water treatment plant flow (m3/d): 2000.</p>
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: Transport: 95. Storage: 99. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].
Other environmental control measures additional to above:	none.
Section 2.2	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to control dispersion from source towards workers:	Common practices vary across sites thus conservative process release estimates used [TCS1].
Contributing Scenarios	Risk Management Measures
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES5-CS1: PROC1. General exposures (closed systems) [CS15].	No specific measures identified [E118].
ES5-CS2: PROC2. General exposures (closed systems) [CS15]. with sample collection [CS56].	Ensure operation is undertaken outdoors [E69].
ES5-CS3: PROC3. General exposures (closed systems) [CS15]. Use in contained batch processes [CS37]. with sample collection [CS56]	Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
ES5-CS4: PROC4. General exposures (open systems) [CS16]. Batch process [CS55]. with sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Provide extract ventilation to points where emissions occur [E54]; Ensure samples are obtained under containment or extract ventilation [E76]
ES5-CS5: PROC3. Process sampling [CS2].	Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 15 minutes [OC26]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES5-CS6: PROC15. Laboratory activities [CS36]. Cleaning [CS47]. Wiping [CS50]. Rolling, Brushing [CS51].	Handle in a fume cupboard or under extract ventilation [E83].
ES5-CS7: PROC8b. Bulk closed loading and unloading [CS501]. Dedicated facility [CS81].	Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
ES5-CS8: PROC8a. Bulk open loading and unloading [CS503]. Non-dedicated facility [CS82].	Ensure material transfers are under containment or extract ventilation [E66]. , or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
ES5-CS9: PROC9. Drum and small package filling [CS6]. Dedicated facility [CS81].	Use drum pumps [E53]. Fill containers/cans at dedicated fill points supplied with local extract ventilation [E51].
ES5-CS10: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82].	Drain down and flush system prior to equipment break-in or maintenance [E55].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



ES5-CS11: PROC1. Storage [CS67]. General exposures (closed systems) [CS15].	No specific measures identified [EI18].
ES5-CS12: PROC2. Storage [CS67]. General exposures (closed systems) [CS15]. with sample collection [CS56].	Avoid carrying out activities involving exposure for more than 1 hour [OC27], or: Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	<p>ES5-E1 (transport [CS58]): PEC for microorganisms in STP: 0.00964mg/l. Risk characterisation ratio: 1.36E-04. Local PEC in surface water: 0.00181mg/l. Risk characterisation ratio: 3.55E-04. Local PEC in fresh water sediment: 0.00173mg/kgww. Risk characterization ratio: 3.46E-04. Local PEC in sea water during emission episode: 0.00542mg/l. Risk characterisation ratio: 2.08E-02. Local PEC in marine sediment: 0.00531mg/kgww. Risk characterisation ratio: 2.12E-02. Local PEC in agricultural soil (30 day average): 0.00164mg/kgww. Risk characterisation ratio: 1.19E-03. Local PEC in grassland (180 day average): 0.000520mg/kgww. Risk characterisation ratio: 3.77E-04. Risk from environmental exposure is driven by marine sediment [TCR1d].</p>
	<p>ES5-E2 (bulk product storage [CS85]): PEC for microorganisms in STP: 0.00978mg/l. Risk characterisation ratio: 1.38E-04. Local PEC in surface water: 0.00182mg/l. Risk characterisation ratio: 3.57E-04. Local PEC in fresh water sediment: 0.00174mg/kgdw. Risk characterization ratio: 3.48E-04. Local PEC in sea water during emission episode: 0.000208mg/l. Risk characterisation ratio: 8.00E-04. Local PEC in marine sediment: 0.000198mg/kgdw. Risk characterisation ratio: 7.92E-04. Local PEC in agricultural soil (30 day average): 0.00902mg/kgdw. Risk characterisation ratio: 6.54E-03. Local PEC in grassland (180 day average): 0.00062mg/kgdw. Risk characterisation ratio: 4.49E-04 Risk from environmental exposure is driven by soil [TCR1f].</p>
Health: Inhalation (vapour).	<p>exposure resulting from contributing scenario ES5-CS1: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01. exposure resulting from contributing scenario</p>
	<p>ES5-CS2: 8 hour average 18ppm - Risk characterisation ratio: 0.35. 15 minute average 35ppm – Risk characterisation ratio: 0.35.</p>
	<p>exposure resulting from contributing scenario ES5-CS3: 8 hour average 21ppm - Risk characterisation ratio: 0.42. 15 minute average 35ppm – Risk characterisation ratio: 0.35.</p>
	<p>exposure resulting from contributing scenario ES5-CS4: 8 hour average 10ppm - Risk characterisation ratio: 0.2. 15 minute average 40ppm – Risk characterisation ratio: 0.4.</p>
	<p>exposure resulting from contributing scenario ES5-CS5: 8 hour average 3.4ppm - Risk characterisation ratio: 0.07. 15 minute average 35ppm -Risk characterisation ratio: 0.35.</p>
	<p>exposure resulting from contributing scenario ES5-CS6: 8 hour average 5ppm - Risk characterisation ratio: 0.1. 15 minute average 20ppm – Risk characterisation ratio: 0.2.</p>
	<p>exposure resulting from contributing scenario ES5-CS7: 8 hour average 21ppm - Risk characterisation ratio: 0.42. 15 minute average 49ppm – Risk characterisation ratio: 0.49.</p>
	<p>exposure resulting from contributing scenario ES5-CS8: 8 hour average 25ppm - Risk characterisation ratio: 0.5. 15 minute average 50ppm – Risk characterisation ratio: 0.5</p>
	<p>exposure resulting from contributing scenario ES5-CS9: 8 hour average 4ppm - Risk characterisation ratio: 0.08. 15 minute average 16ppm – Risk characterisation ratio: 0.16.</p>
	<p>exposure resulting from contributing scenario ES5-CS10: 8 hour average 25ppm - Risk characterisation ratio: 0.5. 15 minute average 50ppm – Risk characterisation ratio: 0.5. exposure resulting from contributing scenario</p>
	<p>ES5-CS11: 8 hour average 0.01ppm - Risk characterisation ratio: <0.01. 15 minute average 0.04ppm - Risk characterisation ratio: <0.01.</p>
	<p>exposure resulting from contributing scenario ES5-CS12: 8 hour average 18ppm - Risk characterisation ratio: 0.35. 15 minute average 35ppm -Risk characterisation ratio: 0.35. Risk management measures described will protect against acute exposure.</p>
Health: Dermal:	<p>exposure resulting from contributing scenario ES5-CS1: 0.03mg/kg/day. Risk characterisation ratio: <0.001.</p>
	<p>exposure resulting from contributing scenario ES5-CS2: 0.27mg/kg/day. Risk characterisation ratio: <0.001.</p>
	<p>exposure resulting from contributing scenario ES5-CS3: 0.082mg/kg/day. Risk characterisation ratio: <0.001.</p>

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	exposure resulting from contributing scenario ES5-CS4: 0.13mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS5: 0.013mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS6: 0.0068mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS7: 0.54mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS8: 0.27mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS9: 0.13mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS10: 2.7mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS11: 0.03mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES5-CS12: 0.27mg/kg/day. Risk characterisation ratio: <0.001.
	Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].
Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required [DSU8]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].
Health:	No data

5. Exposure scenario 5 (ES5)

Section 1	Exposure Scenario Title
Title	MTBE. Use as a fuel . CAS:1634-04-4.
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16
	Environmental Release Categories: ERC6b.; ESVOC SpERC 7.12a.v1
	Specific Environmental Release Categories: ESVOC3 SpERC
Processes, tasks, activities covered	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste [GES12_I].
Assessment method:	Health: Used ECETOC TRA model [EE1]. (v3).Environment: Used EUSES model [EE4]. Used ESVOC SpERC #28.
Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1].
	Predominantly hydrophobic [PrC4a].
	Readily biodegradable [PrC5a].
Regional tonnage of MTBE (tonneper year).	659,000 tpa. (2,197,125 kg/day)
Fraction of EU production volume for region	0.25
Fraction of tonnage for application	0.985
Fraction of chemical in formulation	0.15
Frequency and duration of use:	Continuous process [CS54]. 365 days per year of operation
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.
Other operational conditions of use affecting environmental exposure.	No specific measures required.
Technical onsite conditions and measures to reduce or limit discharges, air emissions.	Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29]. ES6-E1: ERC7. ESVOC SpERC 28.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	<p>Release fraction to air from process (initial release prior to RMM) [OOC4]: 0.0025. Release fraction to wastewater from process (initial release prior to RMM) [OOC5]: 0.00001. Release fraction to soil from process (initial release prior to RMM) [OOC6]: 0. Fraction of main source: 0.02</p> <p>No air emission controls required; required removal efficiency is 0% [TCR5]. Soil emission controls are not applicable as there is no direct release to soil [TCR4]. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) [TCR8]: 95. Assumed industrial waste water treatment plant flow (m3/d): 2000.</p>
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: 95. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000.
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].
Other environmental control measures additional to above:	none.
Section 2.2	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	See contributing scenarios below.
Amounts used	<i>Not applicable</i>
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to control dispersion from source towards workers:	Common practices vary across sites thus conservative process release estimates used [TCS1].
Contributing Scenarios	Risk Management Measures
Risk management measures common to all contributing scenarios.	Limit the substance in product to 15 % [OC20].
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES6-CS1: PROC8b. Bulk transfers [CS14]. Batch process [CS55]. with sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Use vapour recovery units when necessary [A7]. Ensure material transfers are under containment or extract ventilation [E66].
ES6-CS2: PROC8b. Drum/batch transfers [CS8]. Filling / preparation of equipment from drums or containers. [CS45]. Bulk transfers [CS14]. Dedicated facility [CS81].	Use drum pumps [E53].
ES6-CS3: PROC1. General exposures (closed systems) [CS15].	No other specific measures identified [EI20].
ES6-CS4: PROC2. General exposures (closed systems) [CS15]. with sample collection [CS56].	No other specific measures identified [EI20].
ES6-CS5: PROC3. General exposures (closed systems) [CS15]. Use in contained batch processes [CS37]. with sample collection [CS56].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES6-CS6: PROC16. Use as a fuel . (closed systems) [CS107].	No other specific measures identified [EI20].
ES6-CS7: PROC3. Batch process [CS55]. (closed systems) [CS107].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22].
ES6-CS8: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82]. For example: fuel pump repair. Indoor [OC8].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22]. Drain down and flush system prior to equipment break-in or maintenance [E55]
ES6-CS9: PROC1. Storage [CS67]. General exposures (closed systems) [CS15].	No other specific measures identified [EI20].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



ES6-CS10: PROC2. Storage [CS67]. General exposures (closed systems) [CS15]. with sample collection [CS56].	Ensure operation is undertaken outdoors [E69].
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	<p>ES6-E1: PEC for microorganisms in STP: 0.00943mg/l. Risk characterisation ratio: 1.33E-04. Local PEC in surface water: 0.00178mg/l. Risk characterisation ratio: 3.49E-04. Local PEC in fresh water sediment: 0.00171mg/kgww. Risk characterization ratio: 3.42E-04. Local PEC in sea water during emission episode: 0.000204mg/l. Risk characterisation ratio: 7.85E-04. Local PEC in marine sediment: 0.000194mg/kgww. Risk characterization ratio: 7.76E-04. Local PEC in agricultural soil (30 day average): 0.00442mg/kgww. Risk characterisation ratio: 3.20E-03. Local PEC in grassland (180 day average): 0.00418mg/kgww. Risk characterisation ratio: 3.03E-03 Risk from environmental exposure is driven by soil [TCR1f].</p>
Health: Inhalation (vapour).	exposure resulting from contributing scenario ES6-CS1: 8 hour average 18ppm - Risk characterisation ratio: 0.36. 15 minute average 50ppm – Risk/ characterisation ratio: 0.5.
	exposure resulting from contributing scenario ES6-CS2: 8 hour average 18ppm - Risk characterisation ratio: 0.36. 15 minute average 50ppm – Risk characterisation ratio: 0.5.
	exposure resulting from contributing scenario ES6-CS3: 8 hour average 0.006ppm - Risk characterisation ratio: <0.01. 15 minute average 0.024ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES6-CS4: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 15ppm – Risk characterisation ratio: 0.15.
	exposure resulting from contributing scenario ES6-CS5: 8 hour average 18ppm - Risk characterisation ratio: 0.36. 15 minute average 15ppm – Risk characterisation ratio: 0.15.
	exposure resulting from contributing scenario ES6-CS6: 8 hour average 15ppm - Risk characterisation ratio: 0.3. 15 minute average 15ppm – Risk characterisation ratio: 0.15.
	exposure resulting from contributing scenario ES6-CS7: 8 hour average 18ppm - Risk characterisation ratio: 0.36. 15 minute average 15ppm – Risk characterisation ratio: 0.15.
	exposure resulting from contributing scenario ES6-CS8: 8 hour average 18ppm - Risk characterisation ratio: 0.36. 15 minute average 30ppm – Risk characterisation ratio: 0.30.
	exposure resulting from contributing scenario ES6-CS9: 8 hour average 0.006ppm - Risk characterisation ratio: <0.01. 15 minute average 0.024ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES6-CS10: 8 hour average 11ppm - Risk characterisation ratio: 0.21. 15 minute average 42ppm - Risk characterisation ratio: 0.42
	Risk management measures described will protect against acute exposure.
Health: Dermal:	exposure resulting from contributing scenario ES6-CS1: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS2: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS3: 0.018mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS4: 0.16mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS5: 0.082mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS6: 0.04mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS7: 0.082mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS8: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS9: 0.018mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES6-CS10: 0.16mg/kg/day. Risk characterisation ratio: <0.001.
	Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures [DSU1]. If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required [DSU8]. Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4].
Health:	No data

6. Exposure scenario 6 (ES6)

Section 1	Exposure Scenario Title
Title	MTBE. Use as a fuel . CAS:1634-04-4.
Use Descriptor	
	Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC16.
	Environmental Release Categories: ERC8b, ERC8e.; ESVOC SpERC 29
	Specific Environmental Release Categories: ESVOC3 SpERC
Processes, tasks, activities covered	Covers the use as a fuel (or fuel additive) and includes activities associated with its transfer, use, equipment maintenance and handling of waste [GES12_P].
Assessment method:	Health: Used ECETOC TRA model [EE1]. (v3).Environment: Used EUSES model [EE4]. Used ESIG SpERCs.
Section 2	Operational conditions and risk management measures
Section 2.1	Control of environmental exposure
Product characteristics	Substance is a unique structure [PrC1]. Predominantly hydrophobic [PrC4a]. Readily biodegradable [PrC5a].
Regional tonnage of MTBE (tonneper year).	659,000 tpa. (2,197,125 kg/day)
Fraction of EU production volume for region	0.25
Fraction of tonnage for application	0.985
Fraction of chemical in formulation	0.15
Frequency and duration of use:	Continuous process [CS54]. 365 days per year of operation
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.
Other operational conditions of use affecting environmental exposure.	No specific measures required.
Technical onsite conditions and measures to reduce or limit discharges, air emissions.	Conditions given in SPERC fact sheet give rise to following releases fractions [OOC29]. ES7-E1: ERC8b, ERC8e. ESVOC SpERC 29. Release fraction to air from wide dispersive use (regional only) [OOC7]: 0.01. Release fraction to wastewater from wide dispersive use [OOC8]: 0.00005. Release fraction to soil from wide dispersive use (regional only) [OOC9]: 0.00005. Fraction of main source: 6.24E-04 No air emission controls required; required removal efficiency is 0% [TCR5]. Soil emission controls are not applicable as there is no direct release to soil [TCR4]. Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of ≥ (%) [TCR8]: 37. Assumed industrial waste water treatment plant flow (m3/d): 2000.
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].
Conditions and measures related to municipal sewage treatment plant.	Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]: 37. Assumed domestic sewage treatment plant flow (m3/d) [STP5]: 2000.
Conditions and measures related to external treatment of waste for disposal.	External treatment and disposal of waste should comply with applicable local and/or national regulations [ETW3].
Conditions and measures related to external recovery of waste.	External recovery and recycling of waste should comply with applicable local and/or national regulations [ERW1].
Other environmental control measures additional to above:	none.
Section 2.2	Control of worker exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Concentration of substance in product	Limit the substance in product to 15 % [OC20].
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]. Continuous process [CS54].
Human factors not influenced by risk management	<i>Not applicable</i>
Other Operational Conditions affecting worker exposure	Assumes a good basic standard of occupational hygiene is implemented [G1]. Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15]. Outdoor use [OOC1].
Technical conditions and measures at a process level to prevent release and technical conditions and measures to control dispersion from source towards workers:	Common practices vary across sites thus conservative process release estimates used [TCS1].
Contributing Scenarios	Risk Management Measures
General measures (skin irritants) [G19].	Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop [E3].
ES7-CS1: PROC8b. Bulk transfers [CS14]. Batch process [CS55]. with sample collection [CS56]. Filling / preparation of equipment from drums or containers. [CS45].	Use vapour recovery units when necessary [A7]. Ensure material transfers are under containment or extract ventilation [E66].
ES7-CS2: PROC8b. Drum/batch transfers [CS8]. Filling / preparation of equipment from drums or containers. [CS45]. Bulk transfers [CS14]. Dedicated facility [CS81].	Use vapour recovery units when necessary [A7]. Ensure material transfers are under containment or extract ventilation [E66].
ES7-CS3: PROC8b. refueling vehicles.	Ensure operation is undertaken outdoors [E69].
ES7-CS4: PROC2. General exposures (closed systems) [CS15]. with sample collection [CS56]	No specific measures identified [EI18].
ES7-CS5: PROC3. General exposures (closed systems) [CS15]. Use in contained batch processes [CS37]. with sample collection [CS56].	Ensure operation is undertaken outdoors [E69].
ES7-CS6: PROC9. Drum and small package filling [CS6]. Dedicated facility [CS81].	Avoid carrying out activities involving exposure for more than 1 hour [OC27]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22]. Use drum pumps or carefully pour from container [E64].
ES7-CS7: PROC16. Use as a fuel . (closed systems) [CS107].	Ensure operation is undertaken outdoors [E69].
ES7-CS8: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82]. For example: fuel pump repair. Indoor [OC8].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22]. Drain down system prior to equipment break-in or maintenance [E65].
ES7-CS9: PROC8a. Equipment cleaning and maintenance [CS39]. Non-dedicated facility [CS82]. For example: fuel pump repair. Outdoor [OC9].	Avoid carrying out activities involving exposure for more than 4 hours [OC28]. , or, Wear a respirator conforming to EN140 with Type A filter or better [PPE22]. Drain down system prior to equipment break-in or maintenance [E65].
ES7-CS10: PROC1. Storage [CS67]. General exposures (closed systems) [CS15].	No specific measures identified [EI18].
Section 3:	Exposure estimation:
Environment:	Maximum exposure resulting from contributing scenarios described.
	ES7-E1: PEC for microorganisms in STP: 0.00000294mg/l. Risk characterisation ratio: 4.14E-08. Local PEC in surface water: 0.000844mg/l. Risk characterisation ratio: 1.65E-04. Local PEC in fresh water sediment: 0.000783mg/kgww. Risk characterization ratio: 1.57E-04. Local PEC in sea water during emission episode: 0.000109mg/l. Risk characterisation ratio: 4.19E-04. Local PEC in marine sediment: 0.000102mg/kgww. Risk characterization ratio: 4.08E-04. Local PEC in agricultural soil (30 day average): 0.000121mg/kgww. Risk characterisation ratio: 8.77E-05. Local PEC in grassland (180 day average): 0.0000357mg/kgww. Risk characterisation ratio: 2.59E-05. Risk from environmental exposure is driven by marine water [TCR1c].
Health: Inhalation (vapour).	exposure resulting from contributing scenario ES7-CS1: 8 hour average 0.39ppm - Risk characterisation ratio: <0.01. 15 minute average 16ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES7-CS2: 8 hour average 0.39ppm - Risk characterisation ratio: <0.01. 15 minute average 16ppm - Risk characterisation ratio: <0.01.
	exposure resulting from contributing scenario ES7-CS3: 8 hour average 0.4ppm - Risk characterisation ratio: <0.01. 15 minute average 16ppm - Risk characterisation ratio: <0.01.

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



	exposure resulting from contributing scenario ES7-CS4: 8 hour average 0.8ppm - Risk characterisation ratio: 0.02. 15 minute average 17ppm - Risk characterisation ratio: 0.17.
	exposure resulting from contributing scenario ES7-CS5: 8 hour average 0.8ppm - Risk characterisation ratio: 0.02. 15 minute average 17ppm - Risk characterisation ratio: 0.17.
	exposure resulting from contributing scenario ES7-CS6: 8 hour average 6ppm - Risk characterisation ratio: 0.12. 15 minute average 30ppm - Risk characterisation ratio: 0.3.
	exposure resulting from contributing scenario ES7-CS7: 8 hour average 21ppm - Risk characterisation ratio: 0.42. 15 minute average 21ppm - Risk characterisation ratio: 0.21.
	exposure resulting from contributing scenario ES7-CS8: 8 hour average 12ppm - Risk characterisation ratio: 0.25. 15 minute average 25ppm - Risk characterisation ratio: 0.25.
	exposure resulting from contributing scenario ES7-CS9: 8 hour average 6.5ppm - Risk characterisation ratio: 0.13. 15 minute average 13.2ppm - Risk characterisation ratio: 0.13.
	exposure resulting from contributing scenario ES7-CS10: 8 hour average 0.006ppm - Risk characterisation ratio: <0.01. 15 minute average 0.024ppm - Risk characterisation ratio: <0.01.
	Risk management measures described will protect against acute exposure.
Health: Dermal:	exposure resulting from contributing scenario ES7-CS1: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS2: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS3: 1.6mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS4: 0.16mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS5: 0.082mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS6: 0.16mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS7: 0.04mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS8: 0.98mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS9: 0.98mg/kg/day. Risk characterisation ratio: <0.001.
	exposure resulting from contributing scenario ES7-CS10: 0.018mg/kg/day. Risk characterisation ratio: <0.001.
	Available hazard data do not enable the derivation of a DNEL for dermal irritant effects [G32]. Risk Management Measures are based on qualitative risk characterisation [G37].
Section 4:	Guidance to check compliance with the exposure scenario:
Environment:	Not applicable for wide dispersive uses [DSU5].
Health:	No data

7. Exposure scenario 7 (ES7)

Section 1	Exposure Scenario Title
Title	Use in Fuels of MTBE; CAS RN1634-04-4
Use Descriptor	Sector of Use: Consumer (SU21)
	Product Categories: PC13
	Environmental Release Categories: ERC8b, ERC8e.
	Specific Environmental Release Categories: ESVOC SpERC 30
Processes, tasks, activities covered	Covers consumer uses in liquid fuels [GES12_C].
Assessment method:	Health: Based on ESIG GES Consumer with refined exposure modifiers from SCEDS. Environment: Used EUSES model [EE4].
Section 2	Operational conditions and risk management measures
Section 2.1	Control of consumer exposure
Product characteristics	
Physical form of product	Liquid, vapour pressure > 10 kPa [OC5].
Concentration of substance in product	Limit the substance in product to 15 % [OC20].
Amounts used	Not applicable

TERT-BUTYL METHYL ETHER

VERSION: 3.0

DATE CREATED: 17/04/2018

LANGUAGE: ENGLISH



Contributing Scenarios:		Product categories:
Fuels [PC13]. --Liquid: Automotive Refuelling [PC13_1].	OC	Covers concentrations up to [ConsOC1]: 15%. For each use event, covers use amounts up to [ConsOC2]: 37500g. Covers use up to [ConsOC3]: 1 times per week [CSL111]. Covers use up to [ConsOC3]: 3 minutes per event [CSL113]. Covers skin contact area up to [ConsOC5]: 210cm ² . Covers outdoor use [ConsOC12].
	RMM	No specific measures identified [EI18].
Fuels [PC13]. --Liquid: Garden Equipment - Refuelling [PC13_4].	OC	Covers concentrations up to [ConsOC1]: 15%. For each use event, covers use amounts up to [ConsOC2]: 750g. Covers use up to [ConsOC3]: 26 times per year [CSL112]. Covers use up to [ConsOC3]: 2 minutes per event [CSL113]. Covers skin contact area up to [ConsOC5]: 420cm ² . Covers outdoor use [ConsOC12].
	RMM	No specific measures identified [EI18].
Fuels [PC13]. --Liquid Scooter Refuelling [PC13_2].	OC	Covers concentrations up to [ConsOC1]: 15%. For each use event, covers/ use amounts up to [ConsOC2]: 3750g. Covers use up to [ConsOC3]: 1 times per week [CSL111]. Covers use up to [ConsOC3]: 2 minutes per event [CSL113]. Covers skin contact area up to [ConsOC5]: 210cm ² . Covers outdoor use [ConsOC12].
	RMM	No specific measures identified [EI18].
Fuels [PC13]. --refuelling of boats:	OC	Covers concentrations up to [ConsOC1]: 15%. For each use event, covers use amounts up to [ConsOC2]: 225000g. Covers use up to [ConsOC3]: 1 times per week [CSL111]. Covers use up to [ConsOC3]: 18 minutes per event [CSL113]. Covers skin contact area up to [ConsOC5]: 210cm ² . Covers outdoor use [ConsOC12].
	RMM	No specific measures identified [EI18].
Fuels [PC13]. --refuelling of boats:	OC	Covers concentrations up to [ConsOC1]: 15%. For each use event, covers use amounts up to [ConsOC2]: 127500g. Covers use up to [ConsOC3]: 1 times per week [CSL111]. Covers use up to [ConsOC3]: 12 minutes per event [CSL113]. Covers skin contact area up to [ConsOC5]: 210cm ² . Covers outdoor use [ConsOC12].
	RMM	No specific measures identified [EI18].
Section 2.2		Control of environmental exposure
Product characteristics		Substance is a unique structure [PrC1].
		Predominantly hydrophobic [PrC4a].
		Readily biodegradable [PrC5a].
Amounts used	See contributing scenarios above	
Frequency and duration of use:	See contributing scenarios above	
Environmental factors not influenced by risk management:	Local freshwater dilution factor [EF1]: 10. Local marine water dilution factor [EF2]: 100.	
Other operational conditions of use affecting environmental exposure.	Assumes use at not more than 20°C above ambient temperature, unless stated differently [G15].	
Organisation measures to prevent/limit release from site.	Prevent discharge of undissolved substance to or recover from onsite wastewater [TCR14].	
Conditions and measures related to municipal sewage treatment plant.	Assumed domestic sewage treatment plant flow (m ³ /d) [STP5]. 2000 Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]. 95	
Conditions and measures related to external treatment of waste for disposal.	This substance is consumed during use and no waste of the substance is generated [ERW3]	
Conditions and measures related to external recovery of waste.	none.	
Section 3:		Exposure estimation:
Health: Inhalation (vapour).		Maximum exposure resulting from contributing scenarios described:
		Fuels [PC13]. Liquid: Automotive Refuelling [PC13_1]. Short term concentration during exposure event (mg/m ³) 32.6mg/m ³ . Risk characterisation ratio: 0.152.
		Fuels [PC13]. Liquid: Garden Equipment - Refuelling [PC13_4]. Short term concentration during exposure event (mg/m ³) 28.6mg/m ³ . Risk characterisation ratio: 0.133.
		Fuels [PC13]. Liquid Scooter Refuelling [PC13_2]. Short term concentration during exposure event (mg/m ³) 32.8mg/m ³ . Risk characterisation ratio: 0.153.
		Fuels [PC13]. refuelling of boats: Short term concentration during exposure event (mg/m ³) 182mg/m ³ . Risk characterisation ratio: 0.85.
		Fuels [PC13]. refuelling of boats: Short term concentration during exposure event (mg/m ³) 107mg/m ³ . Risk characterisation ratio: 0.5.
Health: Dermal:		Maximum exposure resulting from contributing scenarios described:
		Fuels [PC13]. Liquid: Automotive Refuelling [PC13_1]. Chronic systemic dermal exposure: 0.0105mg/kg/day. Risk characterisation ratio: 0.00000294.
		Fuels [PC13]. Liquid: Garden Equipment - Refuelling [PC13_4]. Chronic systemic dermal exposure: 10.5mg/kg/day. Risk characterisation ratio: 0.00294.
		Fuels [PC13]. Liquid Scooter Refuelling [PC13_2]. Chronic systemic dermal exposure: 5.25mg/kg/day. Risk characterisation ratio: 0.00147.

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	Fuels [PC13]. refuelling of boats: Chronic systemic dermal exposure: 0.0105mg/kg/day. Risk characterisation ratio: 0.00000294.
	Fuels [PC13]. refuelling of boats: Chronic systemic dermal exposure: 0.0105mg/kg/day. Risk characterisation ratio: 0.00000294.
Health: Oral:	Maximum exposure resulting from contributing scenarios described:
	Fuels [PC13]. Liquid: Automotive Refuelling [PC13_1]. Not applicable.
	Fuels [PC13]. Liquid: Garden Equipment - Refuelling [PC13_4]. Not applicable.
	Fuels [PC13]. Liquid Scooter Refuelling [PC13_2]. Not applicable.
	Fuels [PC13]. refuelling of boats: Not applicable.
	Fuels [PC13]. refuelling of boats: Not applicable.
Environment:	Maximum exposure resulting from contributing scenarios described:
	ES8-E1: EC for microorganisms in STP: 0.00000294mg/l. Risk characterisation ratio: 4.14E-08. Local PEC in surface water: 0.000844mg/l. Risk characterisation ratio: 1.65E-04. Local PEC in fresh water sediment: 0.000783mg/kgww. Risk characterisation ratio: 1.57E-04. Local PEC in sea water during emission episode: 0.000109mg/l. Risk characterisation ratio: 4.19E-04. Local PEC in marine sediment: 0.000102mg/kgww. Risk characterisation ratio: 4.08E-04. Local PEC in agricultural soil (30 day average): 0.000121mg/kgww. Risk characterisation ratio: 8.77E-05. Local PEC in grassland (180 day average): 0.0000357mg/kgww. Risk characterisation ratio: 2.59E-05. Risk from environmental exposure is driven by marine water [TCR1c].
Section 4:	Guidance to check compliance with the exposure scenario:
Health	Not applicable.
Environment	Not applicable for wide dispersive uses [DSU5].

END OF SAFETY DATA SHEET