PYROLYSIS FUEL OIL

Safety Data Sheet

according to Regulation (EC) No. 1907/2006 (REACH) with its amendment Regulation (EU) 2015/830

Date of issue: 8/8/2017 Supersedes: 4/4/2016 Version: 13.4

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form	:	Substance
Substance name	:	PYROLYSIS FUEL OIL
Chemical name	:	Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]
EC-No.	:	265-193-8
CAS-No.	:	64742-90-1
REACH registration No	:	Total Olefins Antwerp (01-2119485585-24-0011) -
Synonyms	:	PFO ; PYROLYSIS FUEL OIL ; HUILE DE PYROLYSE ; QUENCH OIL ; 64742-90-1
Product group	:	-

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

1.2.1. Relevant identified uses

Main use category	:	Professional use
Use of the substance/mixture	:	Manufacture of substances Distribution of substance Formulation & (re)packing of substances and mixtures Intermediates Functional Fluids Use as a fuel. For the detailed uses of the product see annex of the safety data sheet

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

REFINING & CHEMICALS BRANCH
TOTAL PETROCHEMICALS & REFINING SA/NV
Rue de l'Industrie 52 Nijverheidsstraat - B-1040 BRUSSELS - BELGIUM
T +32 (0)2.288.91.11
rc.fer-sds@total.com - www.total.com

1.4. Emergency telephone number

Emergency number : Emergency call Carechem 24 International :
• for English speaking countries: +44 (0) 1235 239 670
• for Europe (in local languages): + 33 1 49 00 00 49
• for Africa and Middle East: + 44 (0) 1235 239 671• for China:
+ 86 10 5100 3039
• for Asia Pacific (Hong-Kong, Singapore, Taiwan, Philippines, India, Vietnam, Sri Lanka, Japan, Korea, Malaysia, Indonesia, Thailand) :
+ 65 3158 1074

Country	Organisation/Company	Address	Emergency number	Comment
	National Poisons Emergency number		08 45 46 47	
Ireland	National Poisons Information Centre Beaumont Hospital	PO Box 1297 Beaumont Road 9 Dublin	+353 1 809 2566 (Healthcare professionals-24/7) +353 1 809 2166 (public, 8am - 10pm, 7/7)	

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flammable liquids, Category 3	H226
Acute toxicity (oral), Category 4	H302
Acute toxicity (inhal.), Category 4	H332
Skin corrosion/irritation, Category 2	H315

Germ cell mutagenicity, Category 1B	H340
Carcinogenicity, Category 1B	H350
Reproductive toxicity, Category 2	H361d
Specific target organ toxicity — Repeated exposure, Category 2	H373
Hazardous to the aquatic environment — Acute Hazard, Category 1	H400
Hazardous to the aquatic environment — Chronic Hazard, Category 1	H410

Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

Flammable liquid and vapour. May cause cancer. May cause genetic defects. Suspected of damaging the unborn child. Harmful if inhaled. Harmful if swallowed. Causes skin irritation. Very toxic to aquatic life with long lasting effects.

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS02 GHS08 GHS07 GHS09

Signal word (CLP) : Danger

Hazard statements (CLP) :
H226 - Flammable liquid and vapour
H302+H332 - Harmful if swallowed or if inhaled
H315 - Causes skin irritation
H340 - May cause genetic defects
H350 - May cause cancer
H361d - Suspected of damaging the unborn child
H373 - May cause damage to organs through prolonged or repeated exposure
H410 - Very toxic to aquatic life with long lasting effects

Precautionary statements (CLP) :
P201 - Obtain special instructions before use
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking
P243 - Take precautionary measures against static discharge
P262 - Do not get in eyes, on skin, or on clothing
P273 - Avoid release to the environment
P281 - Use personal protective equipment as required
P301+P330+P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing
P309+P311 - IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician
P403+P233 - Store in a well-ventilated place. Keep container tightly closed

2.3. Other hazards

Other hazards not contributing to the classification : Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Contact with hot material - prevent serious burns. In use, may form flammable/explosive vapour-air mixture. Handling this product may result in electrostatic accumulation. Use proper grounding procedures.

Contains PBT substances >= 0.1% assessed in accordance with REACH Annex XIII

SECTION 3: Composition/information on ingredients

3.1. Substances

Comments : UVCB

Chemical name : Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]

CAS-No. : 64742-90-1

EC-No. : 265-193-8

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]	(CAS-No.) 64742-90-1 (EC-No.) 265-193-8 (EC Index-No.) 649-018-00-6	100	Carc. 1B, H350
Naphthalene	(CAS-No.) 91-20-3 (EC-No.) 202-049-5 (EC Index-No.) 601-052-00-2	< 30	Acute Tox. 4 (Oral), H302 Carc. 2, H351 Aquatic Acute 1, H400 Aquatic Chronic 1, H410
Anthracene substance listed as REACH Candidate	(CAS-No.) 120-12-7 (EC-No.) 204-371-1	< 4	Not classified
polycyclic aromatic hydrocarbons (PCA or PAH)		> 0.1	Carc. 1B, H350
Hydrogen sulfide (traces)	(CAS-No.) 7783-06-4 (EC-No.) 231-977-3 (EC Index-No.) 016-001-00-4		Flam. Gas 1, H220 Press. Gas Acute Tox. 2 (Inhalation), H330 Aquatic Acute 1, H400

Full text of H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Get medical advice/attention if you feel unwell.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a physician immediately. If breathing is difficult, give oxygen. If breathing stops, give artificial respiration. Place under medical observation.

First-aid measures after skin contact : Remove/Take off immediately all contaminated clothing. Wash off immediately and plentifully with water for at least 20 minutes. Exposure to splashing of hot product: Treat the affected part with cold water (by spraying or immersion). Get medical advice/attention.

First-aid measures after eye contact : Immediately rinse with water for a prolonged period while holding the eyelids wide open. Consult an eye specialist.

First-aid measures after ingestion : Do not give anything to drink. Do not induce vomiting. Take immediately victim to hospital. If swallowed, rinse mouth with water (only if the person is conscious).

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

Symptoms/effects : Refer to § 11 for more details on effects.

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

Treat symptomatically.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Carbon dioxide. Dry powder. Foam.

Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Explosion hazard : Heavier than air, vapours may travel long distances along ground, ignite and flash back to source. Heat may build pressure, rupturing closed containers, spreading fire and increasing risk of burns and injuries.

Hazardous decomposition products in case of fire : Toxic fumes. Carbon oxides (CO, CO2). Aldehydes. Polycyclic-aromatic hydrocarbons (PAH). Carbon (C). Ketones.

5.3. Advice for firefighters

Protection during firefighting : Complete protective clothing. Do not enter fire area without proper protective equipment, including respiratory protection.

Other information : Notify fire brigade and environmental authorities. Evacuate unnecessary personnel. Use water spray or fog for cooling exposed containers.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : No flames, no sparks. Eliminate all sources of ignition. Do not smoke. Use special care to avoid static electric charges. Prevent any contact with hot surfaces.

6.1.1. For non-emergency personnel

Protective equipment : Do not attempt to take action without suitable protective equipment. Gloves. Safety glasses.

Emergency procedures for non-emergency personnel : Avoid contact with skin and eyes.

6.1.2. For emergency responders

Protective equipment : Do not attempt to take action without suitable protective equipment. Breathing apparatus.

Emergency procedures for emergency responders : Evacuate unnecessary personnel. Eliminate all ignition sources if safe to do so.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment : If spilled, may cause the floor to be slippery. Sweep up or vacuum up the product. Dike for recovery or absorb with appropriate material. Take up liquid spill into absorbent material, e.g.: sand, saw dust. On water, recover/skim from surface and pour out in disposal container.

Other information : Dispose of contaminated material at an authorized site. Notify authorities if product enters sewers or public waters.

6.4. Reference to other sections

For further information refer to section 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Ensure good ventilation of the work station. In use, may form flammable/explosive vapour-air mixture. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static discharge during blending and transfer operations. Explosion-free electrical equipment and lighting with earth.

Hygiene measures : Do not eat, drink or smoke when using this product. Keep away from food and drink. Always wash hands after handling the product. Take off contaminated clothing and wash before reuse.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Proper grounding procedures to avoid static electricity should be followed.

Storage conditions : Product may release Hydrogen Sulphide: a specific assessment of inhalation risks from the presence of hydrogen sulphide in tank headspaces, confined spaces, product residue, tank waste and waste water, and unintentional releases should be made to help determine controls appropriate to local circumstances. Store in a well-ventilated place. Keep container tightly closed. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Containers (tanks) should be grounded and provided with adequate pressure relief valve. Explosive vapour/air mixtures may be formed.

Storage area : Store away from heat. Earth the equipment. Store in a well-ventilated place.

Packaging materials : Stainless steel.

7.3. Specific end use(s)

Recommended to professional users.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Naphthalene (91-20-3)		
EU	IOELV TWA (mg/m³)	50 mg/m³
EU	IOELV TWA (ppm)	10 ppm
Ireland	OEL (8 hours ref) (mg/m³)	50 mg/m³
Ireland	OEL (8 hours ref) (ppm)	10 ppm
Ireland	OEL (15 min ref) (mg/m3)	75 mg/m³
Ireland	OEL (15 min ref) (ppm)	15 ppm
USA - ACGIH	ACGIH TWA (ppm)	10 ppm
USA - ACGIH	Biological Exposure Indices (BEI)	(Time: end of shift - Parameter: 1-Naphthol with hydrolysis plus 2-Naphthol with hydrolysis (nonquantitative, nonspecific)

Hydrogen sulfide (7783-06-4)		
EU	IOELV TWA (mg/m³)	7 mg/m³
EU	IOELV TWA (ppm)	5 ppm
EU	IOELV STEL (mg/m³)	14 mg/m³
EU	IOELV STEL (ppm)	10 ppm
Ireland	OEL (8 hours ref) (mg/m³)	7 mg/m³
Ireland	OEL (8 hours ref) (ppm)	5 ppm
Ireland	OEL (15 min ref) (mg/m3)	14 mg/m³
Ireland	OEL (15 min ref) (ppm)	10 ppm
United Kingdom	WEL TWA (mg/m³)	7 mg/m³
United Kingdom	WEL TWA (ppm)	5 ppm
United Kingdom	WEL STEL (mg/m³)	14 mg/m³
United Kingdom	WEL STEL (ppm)	10 ppm
USA - ACGIH	ACGIH TWA (ppm)	1 ppm
USA - ACGIH	ACGIH STEL (ppm)	5 ppm

PYROLYSIS FUEL OIL (64742-90-1)	
DNEL/DMEL (Workers)	
Acute - systemic effects, inhalation	4700 mg/m³
Long-term - systemic effects, dermal	0.065 mg/kg bodyweight/day
Long-term - systemic effects, inhalation	0.12 mg/m³
DNEL/DMEL (General population)	
Long-term - systemic effects,oral	0.015 mg/kg bodyweight/day
PNEC (Oral)	
PNEC oral (secondary poisoning)	66.7 mg/kg food

8.2. Exposure controls

Appropriate engineering controls:

The substance is flammable and therefore the following conditions must be met to ensure safe use: “Risks are controlled by storage and use under conditions which avoid all ignition sources.”
. Ensure adequate ventilation. Safety shower. Eye fountain.

Personal protective equipment:

Gas mask A.

Hand protection:

hydrocarbons resistant gloves. In case of repeated or prolonged contact wear gloves. recommended material: fluorinated polymer. polyvinyl alcohol. Layer thickness : all thicknesses. Breakthrough time : > 480 min. EN 374-3. In the event of contact with the liquid: Nitrile rubber gloves. Layer thickness : > 0,30 mm. Breakthrough time : > 60 min. EN 374-3. Gloves may degrade in contact with this chemical.

• Carefully check the glove for cracks or damage before reusing it, dispose of gloves where the penetration time is exceeded. • The penetration time depends on temperature, glove material, thickness and construction.
Penetration time is measured against EN 374 in laboratory conditions corresponding to permanent static contact and is not necessarily representative of the risk in the workplace. Contact the gloves' supplier for further information on the selection and resistance of gloves.

Eye protection:

Safety glasses. Do not wear contact lenses

Skin and body protection:

Wear suitable protective clothing. Safety foot-wear

Respiratory protection:

Where exposure through inhalation may occur from use, respiratory protection equipment is recommended

Environmental exposure controls:

Avoid release to the environment. Assure that emissions are compliant with all applicable air pollution control regulations.

Other information:

Handle in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Viscous.
Colour	:	dark brown. Black.
Odour	:	Hydrocarbon.
Odour threshold	:	No data available
pH	:	No data available
Relative evaporation rate (butylacetate=1)	:	No data available
Melting point	:	No data available
Freezing point	:	No data available
Boiling point	:	110 - 750 °C
Flash point	:	> 30 - 310 °C
Auto-ignition temperature	:	> 250 °C
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapour pressure	:	< 10 hPa (150°C)
Relative vapour density at 20 °C	:	No data available
Relative density	:	No data available
Density	:	840 - 1100 kg/m³
Solubility	:	insoluble in water. Soluble in aromatic hydrocarbons. Aliphatic hydrocarbons.
Log Pow	:	No data available
Viscosity, kinematic	:	> 20.5 mm²/s (40°C)
Viscosity, dynamic	:	No data available
Explosive properties	:	No data available
Oxidising properties	:	No data available
Explosive limits	:	0.5 - 5 vol %

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Take precautionary measures against static discharge during blending and transfer operations.

10.2. Chemical stability

Stable at ambient temperature and under normal conditions of use.

10.3. Possibility of hazardous reactions

Flammable.

10.4. Conditions to avoid

No flames, no sparks. Eliminate all sources of ignition. High temperature. Heat.

10.5. Incompatible materials

No additional information available

10.6. Hazardous decomposition products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	:	Oral: Harmful if swallowed. Inhalation: Harmful if inhaled.
Additional information	:	May release poisonous hydrogen sulfide Inhalation may affect the nervous system causing headache, possibly dizziness, nausea, weakness, loss of coordination and unconsciousness

PYROLYSIS FUEL OIL (64742-90-1)	
LD50 oral rat	> 5000 mg/kg
LD50 dermal rabbit	> 2000 mg/kg
LC50 inhalation rat	4.1 mg/l/4h

Naphthalene (91-20-3)	
LD50 oral rat	490 mg/kg
LD50 dermal rabbit	> 20 g/kg
LC50 inhalation rat	> 340 mg/m³ (Exposure time: 1 h)

Hydrogen sulfide (7783-06-4)	
LC50 inhalation rat	820 mg/m³

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Not classified

Additional information : May cause eye irritation

Respiratory or skin sensitisation : Not classified

Additional information : Based on available data, the classification criteria are not met

Germ cell mutagenicity : May cause genetic defects.

Carcinogenicity : May cause cancer.

Reproductive toxicity : Suspected of damaging the unborn child.

STOT-single exposure : Not classified

STOT-repeated exposure : May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard : Not classified

PYROLYSIS FUEL OIL (64742-90-1)	
Viscosity, kinematic	> 20.5 mm²/s (40°C)

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : Very toxic to aquatic life with long lasting effects. Do not allow product to spread into the environment.

Ecology - air : Product evaporates when in contact with the air.

Ecology - water : the product spreads out on the surface of the water, a small fraction of the constituents may be dissolved.

PYROLYSIS FUEL OIL (64742-90-1)	
LC50 fish 1	79 mg/l
EC50 Daphnia 1	0.22 mg/l
ErC50 (algae)	0.32 mg/l
NOEC chronic fish	0.1 mg/l
NOEC chronic crustacea	0.27 mg/l

Naphthalene (91-20-3)	
LC50 fish 1	5.74 - 6.44 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
LC50 fish 2	1.6 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss [flow-through])
EC50 Daphnia 1	2.16 mg/l (Exposure time: 48 h - Species: Daphnia magna)
EC50 Daphnia 2	1.96 mg/l (Exposure time: 48 h - Species: Daphnia magna [Flow through])
EC50 other aquatic organisms 1	0.4 mg/l (Exposure time: 72 h - Species: Skeletonema costatum)

Hydrogen sulfide (7783-06-4)	
LC50 fish 1	0.0448 mg/l
LC50 fish 2	0.016 mg/l

12.2. Persistence and degradability

PYROLYSIS FUEL OIL (64742-90-1)	
Persistence and degradability	Not readily biodegradable.

12.3. Bioaccumulative potential

Naphthalene (91-20-3)	
BCF fish 1	30 - 430
Log Pow	3.3 (at 20 °C)

Hydrogen sulfide (7783-06-4)	
Log Pow	0.45 (25°C)

12.4. Mobility in soil

PYROLYSIS FUEL OIL (64742-90-1)	
Ecology - soil	Avoid sub-soil penetration. it may pass through the soil and is likely to contaminate ground water.

12.5. Results of PBT and vPvB assessment

PYROLYSIS FUEL OIL (64742-90-1)	
Results of PBT assessment	Not classified

Component	
Anthracene (120-12-7)	This substance/mixture meets the PBT criteria of REACH regulation, annex XIII This substance/mixture does not meet the vPvB criteria of REACH regulation, annex XIII

12.6. Other adverse effects

No additional information available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste treatment methods : Hazardous waste. Dispose of in accordance with relevant local regulations. Use only registered transporters. Do not discharge the product into the environment. Empty containers should be taken for recycling, recovery or waste in accordance with local regulation.

Additional information : Handle empty containers with care because residual vapours are flammable.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN Number				
3295	3295	3295	3295	3295
14.2. UN proper shipping name				
HYDROCARBONS, LIQUID,N.O.S.	HYDROCARBONS, LIQUID, N.O.S.	Hydrocarbons, liquid, n.o.s.	HYDROCARBONS, LIQUID, N.O.S.	HYDROCARBONS, LIQUID, N.O.S.
Transport document description				
UN 3295 HYDROCARBONS, LIQUID,N.O.S., 3, III, (D/E), ENVIRONMENTALLY HAZARDOUS	UN 3295 HYDROCARBONS, LIQUID, N.O.S., 3, III, MARINE POLLUTANT/ENVIRONMENTALLY HAZARDOUS	UN 3295 Hydrocarbons, liquid, n.o.s., 3, III, ENVIRONMENTALLY HAZARDOUS	UN 3295 HYDROCARBONS, LIQUID, N.O.S., 3, III, ENVIRONMENTALLY HAZARDOUS	UN 3295 HYDROCARBONS, LIQUID, N.O.S., 3, III, ENVIRONMENTALLY HAZARDOUS
14.3. Transport hazard class(es)				
3	3	3	3	3
				
14.4. Packing Group				
III	III	III	III	III
14.5. Environmental hazards				
Dangerous for the environment : Yes	Dangerous for the environment : Yes Marine Pollutant : Yes	Dangerous for the environment : Yes	Dangerous for the environment : Yes	Dangerous for the environment : Yes
No supplementary information available				

14.6. Special precautions for user

- Overland transport

Classification code (ADR) : F1

Limited quantities (ADR) : 5l

Excepted quantities (ADR) : E1

Packing instructions (ADR) : P001, IBC03, LP01, R001

Mixed packing provisions (ADR) : MP19

Portable tank and bulk container instructions (ADR) : T4

Portable tank and bulk container special provisions (ADR) : TP1, TP29

Tank code (ADR)	:	LGBF
Vehicle for tank carriage	:	FL
Transport category (ADR)	:	3
Special provisions for carriage - Packages (ADR)	:	V12
Special provisions for carriage - Operation (ADR)	:	S2
Hazard identification number (Kemler No.)	:	30
Orange plates	:	
Tunnel restriction code (ADR)	:	D/E
EAC code	:	3YE

- Transport by sea (IMDG)

Special provisions (IMDG)	:	223
Limited quantities (IMDG)	:	5 L
Excepted quantities (IMDG)	:	E1
Packing instructions (IMDG)	:	P001, LP01
IBC packing instructions (IMDG)	:	IBC03
Tank instructions (IMDG)	:	T4
Tank special provisions (IMDG)	:	TP1, TP29
EmS-No. (Fire)	:	F-E
EmS-No. (Spillage)	:	S-D
Stowage category (IMDG)	:	A

- Air transport (IATA)

PCA Excepted quantities (IATA)	:	E1
PCA Limited quantities (IATA)	:	Y344
PCA limited quantity max net quantity (IATA)	:	10L
PCA packing instructions (IATA)	:	355
PCA max net quantity (IATA)	:	60L
CAO packing instructions (IATA)	:	366
CAO max net quantity (IATA)	:	220L
Special provisions (IATA)	:	A3, A224
ERG code (IATA)	:	3L

- Inland waterway transport

Classification code (ADN)	:	F1
Limited quantities (ADN)	:	5 L
Excepted quantities (ADN)	:	E1
Carriage permitted (ADN)	:	T
Equipment required (ADN)	:	PP, EX, A
Ventilation (ADN)	:	VE01
Number of blue cones/lights (ADN)	:	0

- Rail transport

Classification code (RID)	:	F1
Limited quantities (RID)	:	5L
Excepted quantities (RID)	:	E1
Packing instructions (RID)	:	P001, IBC03, LP01, R001
Mixed packing provisions (RID)	:	MP19
Portable tank and bulk container instructions (RID)	:	T4
Portable tank and bulk container special provisions (RID)	:	TP1, TP29
Tank codes for RID tanks (RID)	:	LGBF
Transport category (RID)	:	3
Special provisions for carriage – Packages (RID)	:	W12

Colis express (express parcels) (RID) : CE4

Hazard identification number (RID) : 30

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

Not applicable

SECTION 15: Regulatory information

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

15.1.1. EU-Regulations

The following restrictions are applicable according to Annex XVII of the REACH Regulation (EC) No 1907/2006:

3. Liquid substances or mixtures which are regarded as dangerous in accordance with Directive 1999/45/EC or are fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008	Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]
3(a) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 2.1 to 2.4, 2.6 and 2.7, 2.8 types A and B, 2.9, 2.10, 2.12, 2.13 categories 1 and 2, 2.14 categories 1 and 2, 2.15 types A to F	PYROLYSIS FUEL OIL
3(b) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard classes 3.1 to 3.6, 3.7 adverse effects on sexual function and fertility or on development, 3.8 effects other than narcotic effects, 3.9 and 3.10	PYROLYSIS FUEL OIL - Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]
3(c) Substances or mixtures fulfilling the criteria for any of the following hazard classes or categories set out in Annex I to Regulation (EC) No 1272/2008: Hazard class 4.1	PYROLYSIS FUEL OIL
28. Substances which appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 classified as Carcinogen category 1A or 1B (Table 3.1) or Carcinogen category 1 or 2 (Table 3.2) and listed as follows: Carcinogen category 1A (Table 3.1)/Carcinogen category 1 (Table 3.2) listed in Appendix 1 Carcinogen category 1B (Table 3.1)/Carcinogen category 2 (Table 3.2) listed in Appendix 2	PYROLYSIS FUEL OIL - Residues (petroleum), steam-cracked, Heavy Fuel oil, [A complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260 °C (500 °F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.]
40. Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to Regulation (EC) No 1272/2008 or not.	Hydrogen sulfide

PYROLYSIS FUEL OIL is not on the REACH Candidate List

PYROLYSIS FUEL OIL is not on the REACH Annex XIV List

15.1.2. National regulations

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Complies the United States TSCA (Toxic Substances Control Act) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on the Canadian DSL (Domestic Substances List)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on the China Inventory of Existing Chemical Substances (IECSC)

15.2. Chemical safety assessment

A chemical safety assessment has been carried out for the substance or the mixture by the supplier

SECTION 16: Other information

Training advice : Training staff on good practice. Manipulations are to be done only by qualified and authorised persons.

Other information : Use good personal hygiene practices.

Full text of H- and EUH-statements:

Acute Tox. 2 (Inhalation)	Acute toxicity (inhal.), Category 2
Acute Tox. 4 (Inhalation)	Acute toxicity (inhal.), Category 4
Acute Tox. 4 (Oral)	Acute toxicity (oral), Category 4
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Carc. 1B	Carcinogenicity, Category 1B
Carc. 2	Carcinogenicity, Category 2
Flam. Gas 1	Flammable gases, Category 1
Flam. Liq. 3	Flammable liquids, Category 3
Muta. 1B	Germ cell mutagenicity, Category 1B
Press. Gas	Gases under pressure
Repr. 2	Reproductive toxicity, Category 2
Skin Irrit. 2	Skin corrosion/irritation, Category 2
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
H220	Extremely flammable gas
H226	Flammable liquid and vapour
H302	Harmful if swallowed
H315	Causes skin irritation
H330	Fatal if inhaled
H332	Harmful if inhaled
H340	May cause genetic defects
H350	May cause cancer
H351	Suspected of causing cancer
H361d	Suspected of damaging the unborn child
H373	May cause damage to organs through prolonged or repeated exposure
H400	Very toxic to aquatic life
H410	Very toxic to aquatic life with long lasting effects

SDS EU (REACH Annex II)

This information applies to the PRODUCT AS SUCH and conforming to specifications of TOTAL.
In case of formulations or mixtures, it is necessary to ascertain that a new danger will not appear.
The information contained is based on our knowledge of the product, at the date of publishing and it is given quite sincerely. However the revision of some data is in progress.
Users are advised of possible additional hazards when the product is used in applications for which it was not intended. This sheet shall only be used and reproduced for prevention and security purposes.
The references to legislative, regulatory and codes of practice documents cannot be considered as exhaustive.
It is the responsibility of the person receiving the product to refer to the totality of the official documents concerning the use, the possession and the handling of the product.
It is also the responsibility of the handlers of the product to pass on to any subsequent persons who will come into contact with the product. (usage, storage, cleaning of containers, other processes) the totality of the information contained within this safety data sheet and necessary for safety at work, the protection of health and the protection of environment.

Exposure Scenarios for Fuel Oil Streams

1. Exposure scenario 1: Manufacture of Fuel Oil Streams - Industrial

1.1. Exposure scenario

Section 1	Exposure Scenario Title
Title	**Manufacture of Fuel Oils Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC1, ERC4
Processes, tasks, activities covered	Manufacture of the substance or use as an intermediate or process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
Concentration of substance in product	
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% Assumes a good basic standard of occupational hygiene is implemented [G1]. unless otherwise specified
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures, 4. Personal protection. Phrases between brackets are good practice advice only.
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for

	certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]. With sample collection [CS56]. With occasional controlled exposure [CS137]	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
General exposures (open systems) [CS16]. Batch process [CS55]. With sample collection [CS56].	Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Process sampling [CS2].	Sample via a closed loop or other system to avoid exposure [E8] Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Laboratory activities [CS36].	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Handle within a fume cupboard or implement suitable equivalent methods to minimize exposure. [E12].
Bulk transfers [CS14]. (open systems) [CS108]With potential for aerosol generation [CS138].	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or[G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Bulk transfers [CS14]. (closed systems) [CS107];	Handle substance within a closed system [E47].Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Provide extract ventilation to points where emissions occur [E54]. ; Ensure operation is undertaken outdoors [E69]. Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS137]	Sample via a closed loop or other system to avoid exposure [E8] Store substance within a closed system [E84].; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.2
Regional use tonnage (tons/year)	2.0e5
Fraction of Regional tonnage used locally	0.8
Annual site tonnage (tons/year)	1.6e5
Maximum daily site tonnage (kg/day)	5.3e5
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	40
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 1.1.v1) but have been amended taking into account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-4
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). [TCR1k] If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9]. Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) [TCR8] Treatment may be onsite or via a municipal sewage treatment plant.	43.6
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9

Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	5.3e5
Assumed domestic sewage treatment plant flow (m^3/d)	10000
Conditions and measures related to external treatment of waste for disposal	
During manufacturing no waste of the substance is generated. [ETW 4].	
Conditions and measures related to external recovery of waste	
During manufacturing no waste of the substance is generated. [EWR 2].	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

2. Exposure scenario 2: Distribution of Fuel Oil Streams - Industrial

2.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Distribution of Fuel Oils Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
	Environmental Release Categories: ERC1-7
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 distribution and associated laboratory activities
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
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]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures, 4. Personal protection. Phrases between brackets are good practice advice only.
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely.

	Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]. ; With sample collection [CS56]. With occasional controlled exposure [CS137]	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69].
General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
General exposures (open systems) [CS16]. Batch process [CS55]. ; With sample collection [CS56].	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Process sampling [CS2].	Handle substance within a closed system [E47].; Sample via a closed loop or other system to avoid exposure [E8]Provide a good standard of general or controlled ventilation (no less than 3 to 5 air changes per hour) [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC 27].
Laboratory activities [CS36].	Handle within a fume cupboard or implement suitable equivalent methods to minimize exposure. [E12].
Bulk transfers [CS14]. ; (closed systems) [CS107]	Ensure material transfers are under containment or extract ventilation [E66]. ; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Bulk transfers [CS14]. ; (open systems) [CS108]	Ensure material transfers are under containment or extract ventilation [E66]. ; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC 28].
Drum and small package filling [CS6].	Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour) [E40].; Minimize exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS137]	Sample via a closed loop or other system to avoid exposure [E8]Ensure operation is undertaken outdoors [E69] ; Store substance within a closed system [E84]

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	1.0e5
Fraction of Regional tonnage used locally	0.002
Annual site tonnage (tons/year)	2.0e2
Maximum daily site tonnage (kg/day)	1e4
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	20
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Conditions given in SPERC fact sheet (ESVOC SpERC 1.1b.v1) give rise to following releases fractions	
Release fraction to air from process (initial release prior to RMM)	1.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	1.0e-5
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1j] No wastewater treatment required [TCR6] Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	90
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9

Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	2.6e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to external treatment of waste for disposal	
During manufacturing no waste of the substance is generated. [ETW 4].	
Conditions and measures related to external recovery of waste	
During manufacturing no waste of the substance is generated. [EWR 2].	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

3. Exposure scenario 3: Intermediate use of Fuel Oil Streams - Industrial

Intermediate use of Fuel Oil Streams by workers is covered within exposure scenario 1: Manufacture of Fuel Oil Streams

3.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Intermediate use of Fuel Oil Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU8, SU9)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
	Environmental Release Categories: ERC 6a
Processes, tasks, activities covered	Use as a isolated intermediate not under strictly controlled conditions
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
See Exposure scenario 1: Manufacture of Fuel Oil Streams	

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	2.0e4
Fraction of Regional tonnage used locally	0.75
Annual site tonnage (tons/year)	1.5e4
Maximum daily site tonnage (kg/day)	5e4
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 6.1a.v1) but have been amended taking into	

account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	2.0e-4
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-3
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1j] If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9]. Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	80
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	99.7
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%)	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	99.7
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	5.0e4
Assumed domestic sewage treatment plant flow (m^3/d)	2000
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. [ETW 5]	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated. [EWR 3]	

4. Exposure scenario 4: Formulation of Fuel Oil Streams - Industrial

4.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Formulation & (re)packaging of substances and mixtures of Fuel Oils Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15
	Environmental Release Categories: ERC2
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
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
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]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures, 4. Personal protection. Phrases between brackets are good practice advice only.

General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]. ; With sample collection [CS56]. With occasional controlled exposure [CS137]	Handle substance within a closed system [E47].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; Provide extract ventilation to points where emissions occur [E54].
General exposures (closed systems) [CS15]. Use in contained batch processes [CS37].	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. Batch process [CS55]. ; With sample collection [CS56]. ; With potential for aerosol generation [CS138].	Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Batch processes at elevated temperatures [CS136].	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. ; Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 15 minutes [OC26].
Process sampling [CS2].	Handle substance within a closed system [E47]; Sample via a closed loop or other system to avoid exposure [E8] Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69].
Laboratory activities [CS36].	Handle within a fume cupboard or implement suitable equivalent methods to minimize exposure. [E12].
Bulk transfers [CS14].	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Mixing operations (open systems) [CS30]. With potential for aerosol generation [CS138].	Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Manual [CS34]. ; Transfer from/pouring from containers [CS22].	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69].
Drum/batch transfers [CS8].	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]	Minimize exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Drum and small package filling [CS6].	Minimize exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Clear spills immediately [C&H13]. Wear suitable gloves tested to EN374 [PPE15]. ; Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]; Wear suitable coveralls to prevent exposure to the skin [PPE27].Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]With occasional controlled exposure [CS137]	Ensure operation is undertaken outdoors [E69]. ; Ensure material transfers are under containment or extract ventilation [E66]. ; Store substance within a closed system [E84].Wear suitable gloves tested to EN374 [PPE15].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	8.0e4
Fraction of Regional tonnage used locally	0.375
Annual site tonnage (tons/year)	3.0e4
Maximum daily site tonnage (kg/day)	1.0e5
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 2.2.v1) but have been amended taking into	

account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	2.0e-4
Release fraction to soil from process (initial release prior to RMM)	1.0e-4
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion).[TCR1j] If discharging to domestic sewage treatment plant, no on-site wastewater treatment required [TCR9]. Prevent discharge of undissolved substance to or recover from wastewater [TCR14]. Release fraction to air from process (after typical onsite RMMs consistent with EU Solvent Emissions Directive requirements): [OOC11]	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	82.8
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	1.0e5
Assumed domestic sewage treatment plant flow (m^3/d)	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. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].

Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

5. Exposure scenario 5: Use of Fuel Oils Category as a fuel - Industrial

5.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Use in Fuels of Fuel Oils Streams**
Use Descriptor	Sector of Use: Industrial (SU3, SU10)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16
	Environmental Release Categories: ERC8B
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.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes Benzene content >25% Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures,4. Personal protection. Phrases between brackets are good practice advice only.

General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
Bulk transfers [CS14].	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Drum/batch transfers [CS8].	Use drum pumps [E53].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69].
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]. With occasional controlled exposure [CS137]	Handle substance within a closed system [E47].; Sample via a closed loop or other system to avoid exposure [E8] Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].
General exposures (closed systems) [CS15]. Batch process [CS55].	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].
General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide extract ventilation to points where emissions occur [E54].
General exposures (open systems) [CS16]. ; (closed systems) [CS107] Batch process [CS55].	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Equipment maintenance [CS5].	Drain down system prior to equipment break-in or maintenance [E65].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Vessel and container cleaning [CS103]	Drain down and flush system prior to equipment break-in or maintenance [E55].Provide extract ventilation to points where emissions occur [E54]. Clear spills immediately [C&H13]. Retain drain downs in sealed storage pending disposal or for subsequent

	recycle [ENVT4].
Storage [CS67]	Store substance within a closed system [E84].
Storage [CS67]With occasional controlled exposure [CS137]	Sample via a closed loop or other system to avoid exposure [E8] Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; Store substance within a closed system [E84].
Disposal of wastes [CS28].	Sample via a closed loop or other system to avoid exposure [E8] Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.2
Regional use tonnage (tons/year)	1.1e5
Fraction of Regional tonnage used locally	1.4
Annual site tonnage (tons/year)	1.6e5
Maximum daily site tonnage (kg/day)	5.3e5
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	300
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Emissions were based on those in SPERC fact sheet (ESVOC SpERC 7.12a.v1) but have been amended taking into account the requirement that the local air concentration for benzene cannot exceed 5 ug/m3 as specified by EU directive 2000/69/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 November, 2000	
Release fraction to air from process (initial release prior to RMM)	2.5e-4
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	0
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). [TCR1k] No wastewater treatment required [TCR6] Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	

Treat air emission to provide a typical removal efficiency of (%)	95
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	1.9e5
Assumed domestic sewage treatment plant flow (m^3/d)	2000
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.[ETW 5]	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated.[ERW 3]	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

6. Exposure scenario 6: Use of Fuel Oil Streams as a fuel - Professional

6.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Use in Fuels of Fuel Oils Streams**
Use Descriptor	Sector of Use: Professional (SU22)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16
	Environmental Release Categories: ERC 9A, ERC 9B
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.
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes use at not > 20^{0}C above ambient [G15]; Assumes benzene content >25% Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures, 4. Personal protection. Phrases between brackets are good practice advice only.

General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
Bulk transfers [CS14].	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] Clear transfer lines prior to de-coupling [E39].
Drum/batch transfers [CS8].	Use drum pumps or carefully pour from container [E64].Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Dipping, immersion and pouring [CS4].	Use drum pumps or carefully pour from container [E64].Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
General exposures (closed systems) [CS15].	Handle substance within a closed system [E47].
General exposures (closed systems) [CS15]. With occasional controlled exposure [CS137]	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. ; (closed systems) [CS107] Batch process [CS55].	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Handle substance within a closed system [E47].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Equipment cleaning and maintenance [CS39].	Drain down and flush system prior to equipment break-in or maintenance [E55].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Clear spills immediately [C&H13]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Vessel and container cleaning [CS103]	Drain down system prior to equipment break-in or maintenance [E65].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; or [G9]; Ensure operation is undertaken outdoors [E69]. Clear spills immediately [C&H13]. Avoid carrying out activities involving exposure for more than 4 hours [OC28] Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]	Store substance within a closed system [E84].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	1.6e4
Fraction of Regional tonnage used locally	0.0005
Annual site tonnage (tons/year)	8.0e0
Maximum daily site tonnage (kg/day)	21.9
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Conditions given in SPERC fact sheet (ESVOC SpERC 9.12b.v1) give rise to following releases fractions	
Release fraction to air from process (initial release prior to RMM)	1.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	1.0e-5
Release fraction to soil from process (initial release prior to RMM)	1.0e-5
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion). [TCR1j]	

No wastewater treatment required [TCR6]. Negligible air emissions as process operate in a contained system.	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organization measures to prevent/limit release from site	
Prevent environmental discharge consistent with regulatory requirements. [OMS 4]	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	8.0e2
Assumed domestic sewage treatment plant flow (m^3/d)	2000
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.[ETW 5]	
Conditions and measures related to external recovery of waste	
This substance is consumed during use and no waste of the substance is generated.[ERW 3]	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

7. Exposure scenario 7: Use of Fuel Oil Streams as a fuel - Consumer

7.1. Exposure scenario

Section 1		**Exposure Scenario Title**
Title		**Use as a fuel of Fuel Oil Streams**
Sector of Use (SU code)		21
Use Descriptor (PC codes)		PC13
Processes, tasks, activities covered		Covers consumer uses in liquid fuels
Environmental Release Category		ERC 9A, ERC 9B
Specific Environmental Release Category		ESVOC SpERC 9.12c.v1
Section 2		**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required - pending better understanding from ECHA		Consumer exposure was estimated using ECETOC TRAv2.
Section 2.1		**Control of consumer exposure**
Product characteristics		
Physical form of product		liquid
Vapour pressure		>11Pa
Concentration of substance in product		Unless otherwise stated, cover concentrations up to 100% [ConsOC1]
Amounts used		Unless otherwise stated, covers use amounts up to37500g [ConsOC2]; covers skin contact area up to 420cm2 [ConsOC5]
Frequency and duration of use/exposure		Unless otherwise stated, covers use frequency up to 0.143 times per day [ConsOC4]; covers exposure up to 2 hours per event [ConsOC14]
Other Operational Conditions affecting exposure		Unless otherwise stated assumes use at ambient temperatures [ConsOC15]; assumes use in a 20 m^3 room [ConsOC11]; assumes use with typical ventilation [ConsOC8].
Section 2.1.1		**Product categories**
PC13:Fuels--Liquid - subcategories added: Automotive Refueling	OC	Unless otherwise stated, covers concentrations up to 95% [ConsOC1]; covers use up to 52 days/year[ConsOC3]; covers use up to 1 time/on day of use[ConsOC4]; covers skin contact area up to 210.00 cm2 [ConsOC5]; for each use event, covers use amounts up to 37500g [ConsOC2]; covers outdoor use [ConsOC12]; covers use in room size of 100m3[ConsOC11]; for each use event, covers exposure up to 0.05hr/event[ConsOC14];
	RMM	No specific RMMs developed beyond those OCs stated
PC13:Fuels--Liquid - subcategories added: Scooter Refueling	OC	Unless otherwise stated, covers concentrations up to 95% [ConsOC1]; covers use up to 52 days/year[ConsOC3]; covers use up to 1 time/on day of use[ConsOC4]; covers skin contact area up to 210.00 cm2 [ConsOC5]; for each use event, covers use amounts up to 3750g [ConsOC2]; covers outdoor use [ConsOC12]; covers use in room size of 100m3[ConsOC11]; for each use event, covers exposure up to 0.03hr/event[ConsOC14];

	RMM	No specific RMMs developed beyond those OCs stated
PC13:Fuels--Liquid - subcategories added: Garden Equipment - Use	OC	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 26 days/year[ConsOC3]; covers use up to 1 time/on day of use[ConsOC4]; for each use event, covers use amounts up to 750g [ConsOC2]; covers outdoor use [ConsOC12]; covers use in room size of 100m3[ConsOC11]; for each use event, covers exposure up to 2.00hr/event[ConsOC14];
	RMM	No specific RMMs developed beyond those OCs stated
PC13:Fuels--Liquid (subcategories added): Garden Equipment - Refueling	OC	Unless otherwise stated, covers concentrations up to 50% [ConsOC1]; covers use up to 26 days/year[ConsOC3]; covers use up to 1 time/on day of use[ConsOC4]; covers skin contact area up to 420.00 cm2 [ConsOC5]; for each use event, covers use amounts up to 750g [ConsOC2]; Covers use in a one car garage (34m3) under typical ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.03hr/event[ConsOC14];
	RMM	No specific RMMs developed beyond those OCs stated
PC13:Fuels--Liquid - subcategories added: Lamp oil	OC	Unless otherwise stated, covers concentrations up to 100% [ConsOC1]; covers use up to 52 days/year[ConsOC3]; covers use up to 1 time/on day of use[ConsOC4]; covers skin contact area up to 210.00 cm2 [ConsOC5]; for each use event, covers use amounts up to 100g [ConsOC2]; covers use in room size of 20m3[ConsOC11]; for each use event, covers exposure up to 0.01hr/event[ConsOC14];
	RMM	No specific RMMs developed beyond those OCs stated

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	8.0e3
Fraction of Regional tonnage used locally	0.0005
Annual site tonnage (tons/year)	4.0e0
Maximum daily site tonnage (kg/day)	10.9
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	365
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Conditions given in SPERC fact sheet (ESVOC SpERC 9.12c.v1) give rise to following releases fractions	

Release fraction to air from wide dispersive use (regional only) [OOC7]	1.0e-3
Release fraction to wastewater from wide dispersive use [OOC8]	1.0e-5
Release fraction to soil from wide dispersive use (regional only) [OOC9]	1.0e-5
Technical conditions and measures at process level (source) to prevent release	
Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily ingestion). [TCR1j]	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organization measures to prevent/limit release from site	
Prevent environmental discharge consistent with regulatory requirements. [OMS4]	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	4.0e4
Assumed domestic sewage treatment plant flow (m^3/d)	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]	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) when available and operational conditions (OCs) are observed, exposure of consumers and indirect human exposure via the environment is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental

	exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.
4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]

8. Exposure scenario 8: Use of Fuel Oil Streams as functional fluids - Industrial

8.1. Exposure scenario

Section 1	**Exposure Scenario Title**
Title	**Use in functional fluids of Fuel Oil Streams**
Use Descriptor	Sector of Use: Industrial (SU3)
	Process Categories: PROC1, PROC2, PROC3, PROC4, PROC 8a, PROC 8b, PROC9
	Environmental Release Categories: ERC 7
Processes, tasks, activities covered	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers
Section 2	**Operational conditions and risk management measures**
Field for additional statements to explain scenario if required.	Worker exposure was estimated using ECETOC TRAv2.
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure is 0.5 - 10 kPa [OC4].
Concentration of substance in product	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Amounts used	Not applicable
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]
Human factors not influenced by risk management	Not applicable
Other Operational Conditions affecting worker exposure	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated
Contributing Scenarios	**Risk Management Measures** Note: list RMM standard phrases according to the control hierarchy indicated in the ECHA template: 1. Technical measures to prevent release, 2. Technical measures to prevent dispersion, 3. Organizational measures, 4. Personal protection. Phrases between brackets are good practice advice only.

General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimize exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean / flush equipment, where possible, prior to maintenance. Where there is potential for exposure: Restrict access to authorized persons; provide specific activity training to operators to minimize exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. [G20].
Bulk transfers [CS14]. Bulk transfers to/from storage	Handle substance within a closed system [E47].
Bulk transfers [CS14]. With occasional controlled exposure [CS137]Bulk transfers to/from storage	Handle substance within a closed system [E47].Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].; or [G9]; Ensure operation is undertaken outdoors [E69].
Bulk transfers [CS14]. Batch process [CS55]. Bulk transfers to/from storage	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Bulk transfers [CS14]. Bulk transfers to/from storage	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].
Drum/batch transfers [CS8]. Dedicated facility [CS81].Transfers from drums to filling machinery	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]
Pelletizing [CS53]. ; (closed systems) [CS107]Dedicated facility [CS81].filling articles from predominantly enclosed machines	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].Avoid carrying out activities involving exposure for more than 1 hour [OC27]
Filling / preparation of equipment from drums or containers. [CS45]. Manual [CS34]. manual filling of machines	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].Avoid carrying out activities involving exposure for more than 1 hour [OC27].
General exposures (closed systems) [CS15]. operation of closed equipment containing functional fluids	Handle substance within a closed system [E47].Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11]; Provide extract ventilation to points where emissions occur [E54].
General exposures (open systems) [CS16]. operation of open equipment containing functional fluids	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Provide extract ventilation to points where emissions occur [E54].
General exposures (open systems) [CS16]. operation of open equipment containing functional fluids at elevated temperatures	Use dry break couplings for material transfer [E75].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Avoid carrying out activities involving exposure for more than 1 hour [OC27].

Remanufacture of reject articles [CS19]. Re-work on off specification articles	Drain down system prior to equipment break-in or maintenance [E65].Provide extract ventilation to points where emissions occur [E54]. ; Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). [E11].Clear spills immediately [C&H13]. Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Equipment maintenance [CS5]. maintenance of equipment	Drain down and flush system prior to equipment break-in or maintenance [E55].Clear spills immediately [C&H13]. Wear a respirator conforming to EN140 with Type A filter or better. [PPE22]Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4].
Storage [CS67]	Sample via a closed loop or other system to avoid exposure [E8]; Store substance within a closed system [E84].
Storage [CS67]With occasional controlled exposure [CS137]	Sample via a closed loop or other system to avoid exposure [E8]; Store substance within a closed system [E84].

Section 2.2 Control of environmental exposure	
Product characteristics	
Substance is complex UVCB [PrC3]. Predominantly hydrophobic [PrC4a]. Not readily biodegradable.	
Amounts used	
Fraction of EU tonnage used in region	0.1
Regional use tonnage (tons/year)	1.0e2
Fraction of Regional tonnage used locally	1
Annual site tonnage (tons/year)	1.0e2
Maximum daily site tonnage (kg/day)	5.0e3
Frequency and duration of use	
Continuous release [FD2].	
Emission days (days/year)	20
Environmental factors not influenced by risk management	
Local freshwater dilution factor	10
Local marine water dilution factor	100
Other given operational conditions affecting environmental exposure	
Conditions given in SPERC fact sheet (ESVOC SpERC 7.13a v1) give rise to following releases fractions	
Release fraction to air from process (initial release prior to RMM)	5.0e-3
Release fraction to wastewater from process (initial release prior to RMM)	3.0e-5
Release fraction to soil from process (initial release prior to RMM)	1.0e-3
Technical conditions and measures at process level (source) to prevent release	

Common practices vary across sites thus conservative process release estimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	
Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation). [TCR1k] No wastewater treatment required [TCR6] Prevent discharge of undissolved substance to or recover from wastewater [TCR14].	
Treat air emission to provide a typical removal efficiency of (%)	0
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency ≥ (%) Treatment may be onsite or via a municipal sewage treatment plant.	0
Organization measures to prevent/limit release from site	
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be incinerated, contained or reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment plant	
Estimated substance removal from wastewater via domestic sewage treatment (%) [STP3]	94.9
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%) [STP4]	94.9
Maximum allowable site tonnage (M_{Safe}) based on domestic sewage treatment release (kg/d)	1.1e4
Assumed domestic sewage treatment plant flow (m^3/d)	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. [ETW 3]	
Conditions and measures related to external recovery of waste	
External recovery and recycling of waste should comply with applicable local and/or national regulations. [EWR 1]	

Section 3	**Exposure Estimation**
3.1. Health	When the recommended risk management measures (RMMs) and operational conditions (OCs) are observed, exposure of workers and indirect human exposure is not expected to exceed the predicted DNELs and the resulting risk characterization ratios are expected to be less than 1.
3.2. Environment	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model [EE2].
Section 4	**Guidance to check compliance with the Exposure Scenario**
4.1. Health	Check that RMMs and OCs are as described above or of equivalent efficiency.

4.2. 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]. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite technologies, either alone or in combination [DSU3]. Further details on scaling and control technologies are provided in factsheet for ESVOC (http://cefic.org/en/reach-for-industries-libraries.html) [DSU4]