SAFETY DATA SHEET

Annex 3

Exposure scenario

HEAVY PYROLYSIS RESIN

CAS #:64742-90-1
EC #:265-193-8

Fuel Oils Category (LOA)
Residues (petroleum), steam-cracked

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EXPOSURE ASSESSMENT

The following generic uses were evaluated in the exposure assessment of Fuel Oils Category.

ES number	Linked to Identified Use	Sector of Use (SU)	Preparation Category (PC)	Process category (PROC)	Article category (AC)	Environmental Release Category (ERC)	EU tonnage (tonnes)	Regional fraction
ES 1 - Manufacture	1	3, 8, 9	NA	1, 2, 3, 4, 8a, 8b, 15	NA	1, 4	1.00E+06	0.2
ES 2 - Distribution	1A	3	NA	1, 2, 3, 4, 8a, 8b, 9,15	NA	1-7	2.00E+05	0.1
ES 3 – Intermediate Use	1B	3, 8, 9	NA	1, 2, 3, 4, 8a, 8b, 15	NA	6a	1.00E+06	0.1
ES 4 - Formulation	2	3, 10	NA	1, 2, 3, 4, 8a, 8b, 9, 14, 15	NA	2	8.00E+05	0.1
ES 5 – Fuels Industrial	12	3	NA	1, 2, 3, 4, 5, 8a, 8b, 16	NA	7	5.60E+05	0.2
ES 6 – Fuels Professional	12	22	NA	1, 2, 3, 4, 8a, 8b, 16	NA	9a, 9b	1.60E+05	0.1
ES 7 – Fuels Consumer	12	21	13	NA	NA	9a, 9b	8.00E+04	0.1
ES 8 – Functional fluids	13	3	NA	1, 2, 3, 4, 8a, 8b, 9	NA	7	1.00E+03	0.1

1.1. Exposure scenario 1: Manufacture of Fuel Oil Streams

1.1.1. 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.	
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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 a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 minimise 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 (tonnes/year)	2.0e5
Fraction of Regional tonnage used locally	0.8
Annual site tonnage (tonnes/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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation 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	*Confirm that RMMs and OCs are as described 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]*

1.1.2. Exposure estimation

1.1.2.1. Workers exposure

The worker exposure estimates for the activities associated with the manufacturing of Fuel Oils Category substances were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.1.2.2. Consumer exposure

Not applicable.

1.1.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.1.2.4. Environmental exposure

See Appendix B.

1.2. Exposure scenario 2:

Distribution of Fuel Oil Streams

1.2.1. 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**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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**
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 minimise 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]; Minimise 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 (tonnes/year)	1.0e5
Fraction of Regional tonnage used locally	0.002
Annual site tonnage (tonnes/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 treament 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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.2.2. Exposure estimation

1.2.2.1. Workers exposure

The worker exposure estimates for the activities associated with the distribution of Fuel Oils Category substances were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.2.2.2. Consumer exposure

Not applicable.

1.2.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.2.2.4. Environmental exposure

See Appendix B.

1.3. Exposure scenario 3:

Intermediate use of Fuel Oil Streams

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

1.3.1. 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**
Section 2.1	**Control of worker exposure**
See Exposure 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 (tonnes/year)	2.0e4
Fraction of Regional tonnage used locally	0.75
Annual site tonnage (tonnes/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	
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
Organisation 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]	

1.3.2. Exposure estimation

1.3.2.1. Workers exposure

Not applicable

1.3.2.2. Consumer exposure

Not applicable.

1.3.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.3.2.4. Environmental exposure

See Appendix B.

1.4. Exposure scenario 4: Formulation of Fuel Oil Streams

1.4.1. 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**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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 a good basic standard of occupational hygiene is implemented [G1].
Contributing Scenarios	**Risk Management Measures**
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 minimise 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]	Minimise 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].	Minimise 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 (tonnes/year)	8.0e4
Fraction of Regional tonnage used locally	0.375
Annual site tonnage (tonnes/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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.4.2. Exposure estimation

1.4.2.1. Workers exposure

The worker exposure estimates for the activities associated with the use in formulation using Fuel Oils Category substances were assessed using ECETOC TRAv2. See Appendix A. Appendix A contains Tables 1 and 2, used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.4.2.2. Consumer exposure

Not applicable.

1.4.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.4.2.4. Environmental exposure

See Appendix B.

1.5. Exposure scenario 5:

Use of Fuel Oils Category as a fuel - Industrial

1.5.1. 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.	
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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].
Contributing Scenarios	**Risk Management Measures**
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 (tonnes/year)	1.1e5
Fraction of Regional tonnage used locally	1.4
Annual site tonnage (tonnes/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 treament 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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.5.2. Exposure estimation

1.5.2.1. Workers exposure

The worker exposure estimates for the activities associated with the industrial use in fuels of Fuel Oils Category substances were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.5.2.2. Consumer exposure

Not applicable

1.5.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.5.2.4. Environmental exposure

See Appendix B.

1.6. Exposure scenario 6:

Use of Fuel Oil Streams as a fuel - Professional

1.6.1. 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**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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 > 20^0C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1].
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 (tonnes/year)	1.6e4
Fraction of Regional tonnage used locally	0.0005
Annual site tonnage (tonnes/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 operates 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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.6.2. Exposure estimation

1.6.2.1. Workers exposure

The worker exposure estimates for activities associated with the professional use of Fuel Oils Category substances as fuels were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.6.2.2. Consumer exposure

Not applicable

1.6.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.6.2.4. Environmental exposure

See Appendix B.

1.7. Exposure scenario 7:

Use of Fuel Oil Streams as a fuel - Consumer

1.7.1. 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**
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 Refuelling	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 cm^2 [ConsOC5]; for each use event, covers use amounts up to 37500g [ConsOC2]; covers outdoor use [ConsOC12]; covers use in room size of 100m^3[ConsOC11]; for each use event, covers exposure up to 0.05hr/event [ConsOC14];
	RMM	No specific RMMs developed beyong those OCs stated
PC13:Fuels--Liquid - subcategories added: Scooter Refuelling	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 cm^2 [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 beyong 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 100m^3 [ConsOC11]; for each use event, covers exposure up to 2.00hr/event [ConsOC14];
	RMM	No specific RMMs developed beyong 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 typcial 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 beyong 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 beyong 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 (tonnes/year)	8.0e3
Fraction of Regional tonnage used locally	0.0005
Annual site tonnage (tonnes/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
Organisation 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) and operational conditions (OCs) are observed, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.7.2. Exposure estimation

1.7.2.1. Workers exposure

Not applicable.

1.7.2.2. Consumer exposure

See Appendix A.

1.7.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.7.2.4. Environmental exposure

See Appendix B.

1.8. Exposure scenario 8:

Use of Fuel Oil Streams as functional fluids

1.8.1. 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**
Section 2.1	**Control of worker exposure**
Product characteristics	
Physical form of product	Liquid, vapour pressure 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**
General measures (carcinogens) [G18]	Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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 (tonnes/year)	1.0e2
Fraction of Regional tonnage used locally	1
Annual site tonnage (tonnes/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 treament 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
Organisation 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, exposures are not expected to exceed the predicted DNELs and the resulting risk characterisation ratios are expected to be less than 1 as indicated in Appendix A.*
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	*Confirm that RMMs and OCs are as described or of equivalent efficiency. See Appendix A for details of efficiencies and OC.*
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]*

1.8.2. Exposure estimation

1.8.2.1. Workers exposure

The worker exposure estimates for activities associated with the industrial use of Fuel Oils Category substances as functional fluids were assessed using ECETOC TRAv2 (See Appendix A). Appendix A contains Tables 1 and 2 used to model the worker exposures. These tables contain all the operating conditions, and the efficiencies of the exposure modifiers including RPE, PPE and LEV. A separate table (also in Appendix A) contains the associated RMMs.

1.8.2.2. Consumer exposure

Not applicable

1.8.2.3. Indirect exposure of humans via the environment (oral)

See Appendix B.

1.8.2.4. Environmental exposure

See Appendix B.

1.9 Regional Exposure Concentrations

See Appendix B.

APPENDIX A: HUMAN HEALTH EXPOSURE

Appendix A.1 ES1 Manufacturing of Fuel Oils Category

Table A.1.1 ES1 General Information

Substance specific information				
Substance	Fuel Oils Streams	**Reference Values**		
CAS RN	71-43-2	DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#				
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).			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU8, SU9)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC1, ERC4, ERC6a			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated			

Table A.1.2 ES 1: Manufacturing Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario			Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
ES#	Manufacture of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]						
		Industrial - SU3	General exposures (closed systems) [CS15].		ambient temp. Closed process. No exposure. >4 hours.	Continuous; daily; 15 - 1 hour; product temp. Outdoor	Closed processes	No	1 - Use in closed process, no likelihood of exposure
		Industrial - SU3	General exposures (closed systems) [CS15]. With sample collection [CS56].	With occasional controlled exposure [CS137]	>4 hours, ambient temp.	Continuous; daily; 15 mins - 1 hour; product temp. Outdoor	Enclosed process; Outdoor location; closed/semi-closed sampling point	Yes	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial - SU3	General exposures (closed systems) [CS15].	Use in contained batch processes [CS37].	>4 hours, ambient temp.	Batch process; daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	General exposures (open systems) [CS16].	Batch process [CS55]. With sample collection [CS56].	>4 hours, ambient temp.	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial - SU3	Process sampling [CS2].		>4 hours, ambient temp.	Daily; <15 mins; product temp.; Indoor/Outdoor	Closed or ventilated sampling points	No	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Laboratory activities [CS36].		>4 hours, ambient temp.	Daily; 15 mins - 1 hour; product temp.; Indoor	Fume cupboard. PPE.	Yes	15 - Use of laboratory reagents in small scale laboratories
		Industrial - SU3	Bulk transfers [CS14]. (open systems) [CS108]	With potential for aerosol generation [CS138].	>4 hours, ambient temp. **aerosols**	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, clear lines prior to decoupling	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Bulk transfers [CS14]. (closed systems) [CS107];		daily; ambient temp.	Daily; 15 - 1 hour; product temp.; Indoor/Outdoor	Enclosed transfers, vented transfer points; clear lines prior to decoupling	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Equipment cleaning and maintenance [CS39].		>4 hours; ambient temp.	Daily; 15 mins -1 hour; product temp; collection of line waste in container; Indoor/Outdoor	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation. PPE.	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS137]	daily; ambient temp.	Daily; 8 hrs; product temp;	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure

Table A.1.3 ES 1: Manufacturing Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure									Dermal exposure							Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV - efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES#	Manufacture of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]																				
		Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34						0.34	0.01	0.01	0.02
		Industrial - SU3	General exposures (closed systems) [CS15]. With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	10	90			1-4 hours				0.60	1.37	0.1					0.14	0.60	0.01	0.61
		Industrial - SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.00	0.35
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	30		1-4 hours				0.84	6.86	0.1					0.69	0.84	0.03	0.87
		Industrial - SU3	Process sampling [CS2].	No	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50		30		15 min-1 hour		0.05	Efficient sampling device [E8] gives 95% inhalation efficiency	0.35	6.86						6.86	0.35	0.29	0.64
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	10	90	70						0.30	0.34	0.1					0.03	0.30	0.00	0.30
		Industrial - SU3	Bulk transfers [CS14]. (open systems) [CS108]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97	30		1-4 hours				0.63	6.86	0.1					0.69	0.63	0.03	0.66
		Industrial - SU3	Bulk transfers [CS14]. (closed systems) [CS107];	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97			1-4 hours				0.90	6.86	0.1					0.69	0.90	0.03	0.93
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50	90	30			half mask		LEV effectiveness assumed to equate to SOP relating to draining etc prior to maintence; additional LEV (90%)	0.35	13.71	0.01					0.14	0.35	0.01	0.36
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	10		30				0.05	Efficient sampling device [E8] gives 95% inhalation efficiency	0.35	1.37						1.37	0.35	0.06	0.41

Table A.1.4 ES 1: Manufacturing Risk Management Measures

Table 1: Mapping Uses in the Supply Chain						
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code];}
ES#	Manufacture of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]			Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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].
		Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15]. With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	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
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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
		Industrial - SU3	Process sampling [CS2].	No	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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].{Ensure operatives are trained to minimise exposures [EI119]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	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 minimise exposure. [E12].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Bulk transfers [CS14]. (open systems) [CS108]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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].{Wear suitable gloves tested to EN374 [PPE15]}. ; {Wear suitable coveralls to prevent exposure to the skin [PPE27]}.
		Industrial - SU3	Bulk transfers [CS14]. (closed systems) [CS107];	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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].{Clear transfer lines prior to de-coupling [E39]}. {Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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]. {Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	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]{Avoid dip sampling [E42]}. {Provide a good standard of general or controlled ventilation (5 to 10 air changes per hour) [E40]}. {Wear suitable gloves tested to EN374 [PPE15]}.

Appendix A.2 ES2 Distribution of Fuel Oils Category

Table A.2.1 ES2 General information

Substance specific information				
Substance	Fuel Oils Streams	**Reference Values**		
CAS RN	71-43-2	DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#	2			
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			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU8, SU9)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC1 (loading) ERC2 (repacking)			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use				

Table A.2.2 ES 2: Distribution Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario			Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
ES #	Distribution of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]						
		Industrial - SU3	General exposures (closed systems) [CS15].		>4 hours, ambient temp.	Continuous; Outdoor; daily; 15 - 1 hour; product temp.	Closed process. No exposure.	No	1 - Use in closed process, no likelihood of exposure
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	With occasional controlled exposure [CS137]	>4 hours, ambient temp.	Continuous; Outdoor; daily; 15 mins - 1 hour; product temp.	Enclosed process; closed/semi-closed sampling point	Yes	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial - SU3	General exposures (closed systems) [CS15].	Use in contained batch processes [CS37].	>4 hours, ambient temp.	Batch process; Outdoor; daily; 15 - 1 hour; product temp. ambient	Closed equipment, enclosed or vented sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	General exposures (open systems) [CS16].	Batch process [CS55]. ; With sample collection [CS56].	>4 hours, ambient temp.	Daily; Indoor/Outdoor; 15 - 1 hour; product temp. ambient	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial - SU3	Process sampling [CS2].		>4 hours, ambient temp.	Daily; <15 mins; product temp. ambient; Outdoor	Closed or ventilated sampling points	No	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	Laboratory activities [CS36].		>4 hours, ambient temp.	Daily; 15 mins - 1 hour; product temp. ambient; Indoor	Fume cupboard. PPE.	Yes	15 - Use of laboratory reagents in small scale laboratories
		Industrial - SU3	Bulk transfers [CS14]. ; (closed systems) [CS107]		>4 hours, ambient temp.	Outdoor; Daily; 15 - 1 hour; product temp. ambient; exposure potential during breaking of hose connection	Enclosed transfers, clear lines prior to decoupling	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Bulk transfers [CS14]. ; (open systems) [CS108]		daily; ambient temp.	Outdoor; Daily; 1 - 4 hours ; product temp ambient; exposure potential from vapour emissions from tank opening	Enclosed transfers, submerged loading via tank opening, collection of drips from loading arm. May involve LEV and/or RPE.	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Drum and small package filling [CS6].		daily; ambient temp.	Indoor; Continuous ; daily; 8 hour; product temp.	Enclosed transfers, vented transfer points, dedicated filling line	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)
		Industrial - SU3	Equipment cleaning and maintenance [CS39].		daily; ambient temp.	Daily; 15 min - 1 hour; product temp; collection of line waste in container	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation. PPE.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS137]	daily; ambient temp.	Daily; 8 hrs; product temp; Outdoors	Samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure

Table A.2.3 ES 2: Distribution Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																
Generic Exposure Scenario		Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure									Dermal exposure						Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category (scroll list)	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV - efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier- [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	extra exposure modifier- [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES #	Distribution of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [CS18]																				
		Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34						0.34	0.01	0.01	0.02
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	10	90	30						0.70	1.37	0.1					0.14	0.70	0.01	0.71
		Industrial - SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	30		15 min-1 hour				0.35	0.34	0.1					0.03	0.35	0.00	0.35
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	30		1-4 hours				0.84	6.86	0.1					0.69	0.84	0.03	0.87
		Industrial - SU3	Process sampling [CS2].	No	3 - Use in closed batch process (synthesis or formulation)	25		30				0.05	Closed loop sampling 95% inhalation efficeincy	0.88	0.34						0.34	0.88	0.01	0.89
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	10	97							0.30	0.34	0.1					0.03	0.30	0.00	0.30
		Industrial - SU3	Bulk transfers [CS14]. ; (closed systems) [CS107]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97	30		1-4 hours				0.63	6.86	0.1					0.69	0.63	0.03	0.66
		Industrial - SU3	Bulk transfers [CS14]. ; (open systems) [CS108]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97	30		1-4 hours				0.63	6.86	0.1					0.69	0.63	0.03	0.66
		Industrial - SU3	Drum and small package filling [CS6].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	50	95	70						0.75	6.86	0.1					0.69	0.75	0.03	0.78
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50					half mask	0.1	LEV effectiveness assumed to equate to SOP relating to draining etc prior to maintenance.	0.50	13.71	0.1					1.37	0.50	0.06	0.56
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	10		30				0.05	Closed loop sampling 95% inhalation efficeincy	0.35	1.37						1.37	0.35	0.06	0.41

Table A.2.4 ES 2 Distribution Risk Management Measures

Table 1: Mapping Uses in the Supply Chain						
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
ES#	Distribution of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]			Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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].
		Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	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
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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
		Industrial - SU3	Process sampling [CS2].	No	3 - Use in closed batch process (synthesis or formulation)	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].{Avoid dip sampling [E42]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. [E12].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Bulk transfers [CS14]. ; (closed systems) [CS107]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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].{Clear transfer lines prior to de-coupling [E39]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Bulk transfers [CS14]. ; (open systems) [CS108]	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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].{Clear transfer lines prior to de-coupling [E39]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Drum and small package filling [CS6].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour) [E40].; Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. {Put lids on containers immediately after use [E9]}. ; {Clear spills immediately [C&H13]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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]. {Transfer via enclosed lines [E52]}. {Apply vessel entry procedures including use of forced supplied air [AP15]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	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]{Avoid dip sampling [E42]}. {Wear suitable gloves tested to EN374 [PPE15]}.

Appendix A.3 ES3 Use as an intermediate of Fuel Oil Streams

See Appendix A.1 ES1 Manufacture of Fuel Oil Streams

Appendix A.4 ES4 Formulation of Fuel Oil Streams

Table A.4.1 ES4 General Information

Substance specific information				
Substance	Fuel Oil Streams	**Reference Values**		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#				
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			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC14, PROC15			
Applicable Use Descriptors (ERC or SpERC)	ERC2			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20oC above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated			

Table A.4.2 ES 4: Formulation Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario			Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
ES#	Formulation & (re)packaging of substances and mixtures of Benzene for Category G	Industrial - SU3	General exposures (closed systems) [CS15].		>4 hours, ambient temp.	Continuous; daily; 15 1 hour; product temp.	Closed processes	No	1 - Use in closed process, no likelihood of exposure
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	With occasional controlled exposure [CS137]	>4 hours, ambient temp.	Continuous; daily; 15 mins - 1 hour	Enclosed process; closed/semi-closed sampling point	Yes	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial - SU3	General exposures (closed systems) [CS15].	Use in contained batch processes [CS37].	>4 hours, ambient temp.	Batch process; daily; 15 - 1 hour; product temp.	Closed equipment, enclosed or vented sampling points	No	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	General exposures (open systems) [CS16].	Batch process [CS55]. ; With sample collection [CS56]. ; With potential for aerosol generation [CS138].	>4 hours, ambient temp.	Daily; Indoor; 15 - 1 hour; product temp.	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial - SU3	Batch processes at elevated temperatures [CS136].		>4 hours, ambient temp.	Batch process; daily; 15 - 1 hour; product temp. (elevated)	Closed equipment, enclosed or vented sampling points, vented mixing/process vessels	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	Process sampling [CS2].		>4 hours, ambient temp.	Daily; <15 mins; product temp.	Closed or ventilated sampling points	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial - SU3	Laboratory activities [CS36].		>4 hours, ambient temp.	Daily; 15 mins - 1 hour; product temp. (ambient); Indoor	Fume cupboard. PPE.	Yes	15 - Use of laboratory reagents in small scale laboratories
		Industrial - SU3	Bulk transfers [CS14].		daily; ambient temp.	Daily; 15 min - 1 hour; product temp (ambient); collection of line waste in container	Enclosed transfers, vented transfer points; clear lines prior to decoupling	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Mixing operations (open systems) [CS30].	With potential for aerosol generation [CS138].	daily; ambient temp.	Indoor, Batch process; daily; 8 hours; product temp (ambient)	LEV, PPE	Yes	5 -Mixing or blending in batch processes (multistage and/or significant contact)
		Industrial - SU3	Manual [CS34]. ; Transfer from/pouring from containers [CS22].		daily; ambient temp.	Indoor; daily; 15 - 1 hour; product temp. (ambient)	Manual transfers; LEV, PPE, RPE	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial - SU3	Drum/batch transfers [CS8].		daily; ambient temp.	Indoor; daily; 15 - 1 hour; product temp. (ambient)	Drum pump or dedicated drum handling equipment	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial - SU3	Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]		daily; ambient temp.	Indoor; daily; 8 hours; product temp. (ambient)	LEV, PPE	Yes	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation
		Industrial - SU3	Drum and small package filling [CS6].		daily; ambient temp.	Indoor, Continuous; daily; 8 hour; product temp. (ambient)	Enclosed transfers, vented transfer points	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)
		Industrial - SU3	Equipment cleaning and maintenance [CS39].		daily; ambient temp.	Indoor, Daily; 1 - 4 hours; product temp (ambient); collection of line waste in container	Enclosed lines; retain wash down in sealed storage pending disposal or use as recycled material for subsequent formulation. PPE.	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial - SU3	Storage [CS67]	With occasional controlled exposure [CS137]	daily; ambient temp.	Daily; <15 mins (sampling) product temp (ambient);	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure

Table A.4.3 ES 4: Formulation Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																	
Generic Exposure Scenario		Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure									Dermal exposure							Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV : efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier - [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	extra exposure modifier - [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES#	Formulation & (re)packaging of substances and mixtures of Benzene for Category G	Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34						0.34	0.01	0.01	0.02
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	10	90	30						0.70	1.37						1.37	0.70	0.06	0.76
		Industrial - SU3	General exposures (closed systems) [CS15].	No	3 - Use in closed batch process (synthesis or formulation)	25	90	70						0.75	0.34						0.34	0.75	0.01	0.76
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	70						0.60	6.86	0.1					0.69	0.60	0.03	0.63
		Industrial - SU3	Batch processes at elevated temperatures [CS136].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	70						0.75	0.34	0.1					0.03	0.75	0.00	0.75
		Industrial - SU3	Process sampling [CS2].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	70						0.75	0.34						0.34	0.75	0.01	0.76
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	10	97							0.30	0.34	0.1					0.03	0.30	0.00	0.30
		Industrial - SU3	Bulk transfers [CS14].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97			1-4 hours				0.90	6.86	0.1					0.69	0.90	0.03	0.93
		Industrial - SU3	Mixing operations (open systems) [CS30].	Yes	5 -Mixing or blending in batch processes (multistage and/or significant contact)	50	90	70		1-4 hours				0.90	13.71	0.005					0.07	0.90	0.00	0.90
		Industrial - SU3	Manual [CS34]. ; Transfer from/pouring from containers [CS22].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50	97	70						0.45	13.71	0.01					0.14	0.45	0.01	0.46
		Industrial - SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97	70						0.45	6.86	0.1					0.69	0.45	0.03	0.48
		Industrial - SU3	Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]	Yes	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation	50	90	70		1-4 hours				0.90	3.43	0.1					0.34	0.90	0.01	0.91
		Industrial - SU3	Drum and small package filling [CS6].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	50	95	70						0.75	6.86	0.1					0.69	0.75	0.03	0.78
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50					half mask	0.1	LEV effectiveness assumed to equate to SOP relating to draining etc prior to maintence. RPE (0.1x)	0.50	13.71			gloves			2.74	0.50	0.12	0.62
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	10	90	30						0.70	1.37			gloves			0.27	0.70	0.01	0.71

Table A.4.4 ES 4 Formulation Risk Management Measures

Table 1: Mapping Uses in the Supply Chain						
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
ES#	Formulation & (re)packaging of substances and mixtures of Benzene for Category G	Industrial - SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15]. ; With sample collection [CS56].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15].	No	3 - Use in closed batch process (synthesis or formulation)	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Batch processes at elevated temperatures [CS136].	Yes	3 - Use in closed batch process (synthesis or formulation)	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Ensure material transfers are under containment or extract ventilation [E66]. {Formulate in enclosed or ventilated mixing vessels [E46]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Process sampling [CS2].	Yes	3 - Use in closed batch process (synthesis or formulation)	Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Ensure material transfers are under containment or extract ventilation [E66]. {Avoid dip sampling [E42]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Laboratory activities [CS36].	Yes	15 - Use of laboratory reagents in small scale laboratories	Handle in a fume cupboard or under extract ventilation [E83].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Bulk transfers [CS14].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]{Clear transfer lines prior to de-coupling [E39]}. {Clear spills immediately [C&H13]}. {Wear suitable gloves tested to EN374 [PPE15]}. {Return IBCs or tanks to supplier for re-use [ENVT7]}.
		Industrial - SU3	Mixing operations (open systems) [CS30].	Yes	5 -Mixing or blending in batch processes (multistage and/or significant contact)	Provide extract ventilation to points where emissions occur [E54]. ; 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 4 hours [OC28]{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Manual [CS34]. ; Transfer from/pouring from containers [CS22].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].{Avoid spillage when withdrawing pump [C&H16]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Production or preparation or articles by tabletting, compression, extrusion or pelletisation [CS100]	Yes	14 - Production of preparations or articles by tabletting, compression, extrusion, pelletisation	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. ; 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 4 hours [OC28]{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Drum and small package filling [CS6].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings [E60]. ; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].{Clear spills immediately [C&H13]}. ; {Put lids on containers immediately after use [E9]}. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Equipment cleaning and maintenance [CS39].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	Drain down and flush system prior to equipment break-in or maintenance [E55].Apply vessel entry procedures including use of forced supplied air [AP15]. 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].{Transfer via enclosed lines [E52]}. {Retain drain downs in sealed storage pending disposal or for subsequent recycle
		Industrial - SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	Ensure operation is undertaken outdoors [E69]. ; Ensure material transfers are under containment or extract ventilation [E66]. Wear suitable gloves tested to EN374 [PPE15]. {Avoid dip sampling [E42]}.

Appendix A.5 ES5 Use as a fuel of Fuel Oil Streams(Industrial)

Table A.5.1 ES5 General Information

Substance specific information				
Substance	Fuel Oils Streams	**Reference Values**		
CAS RN	71-43-2	DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#				
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.			
Life Cycle Stage / Sector of Use	Industrial (SU3, SU10)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16			
Applicable Use Descriptors (ERC or SpERC)	ERC8B			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20°C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated			

Table A.5.2 ES5: Use as a fuel (Industrial) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario			Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No]	Process Category [scroll list]
ES#13	Use in Fuels of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]						
		Industrial -SU3	Bulk transfers [CS14].			Daily; 1 - 4 hours; ambient temp.	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial -SU3	Drum/batch transfers [CS8].			Daily; 1 - 4 hours; ambient temp.	Pumped transfer from drum to equipment	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial -SU3	General exposures (closed systems) [CS15].			Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	No	1 - Use in closed process, no likelihood of exposure
		Industrial - SU3	General exposures (closed systems) [CS15].	With occasional controlled exposure [CS137]		Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	No	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial -SU3	General exposures (closed systems) [CS15].	Batch process [CS55].		Indoor; Daily; >4 hours	Closed equipment; designed for ease of maintenance; PPE	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]			Daily; >4 hours, to 100%	Closed equipment	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch process [CS55].		Daily; >4 hours, to 100%	Closed equipment	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial -SU3	Equipment maintenance [CS5].			Daily; >4 hours, to 100%	PPE. Operator training.	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial -SU3	Vessel and container cleaning [CS103]			Infrequent; >4 hours	vessel entry procedures, retain wash down in sealed storage pending disposa,. PPE.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial - SU3	Storage [CS67]			Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	1 - Use in closed process, no likelihood of exposure
		Industrial -SU3	Storage [CS67]	With occasional controlled exposure [CS137]		Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial -SU3	Disposal of wastes [CS28].			Daily; 8 hrs;	samples collected	No	8a -Transfer of chemicals

Table A.5.3 ES5 Use as a fuel (Industrial) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure								Dermal exposure						Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV - efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES#13	Use in Fuels of Fuel Oils Streams	Industrial - SU3	General measures (carcinogens) [G18]																			
		Industrial -SU3	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	30		1-4 hours				0.84	6.86	0.1				0.69	0.84	0.03	0.87
		Industrial -SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	90	30				0.2	Use of drum pump equivalent to 80% efficiency	0.70	6.86	0.1				0.69	0.70	0.03	0.73
		Industrial -SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.03					0.03	0.01	0.00	0.01
		Industrial - SU3	General exposures (closed systems) [CS15].	No	2 - Use in closed, continuous process with occasional controlled exposure	10		30				0.05	Closed loop sampling equivalent to 95% inhalation efficiency	0.35	1.37					1.37	0.35	0.06	0.41
		Industrial -SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	70						0.75	0.34	0.1				0.03	0.75	0.00	0.75
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected	5	90							0.50	0.34	0.1				0.03	0.50	0.00	0.50
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	30		15 min-1 hour				0.35	0.34	0.1				0.03	0.35	0.00	0.35
		Industrial -SU3	Equipment maintenance [CS5].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50		30			half mask	0.2	SOP equivalent to 80% efficiency	0.70	13.71	0.2				2.74	0.70	0.12	0.82
		Industrial -SU3	Vessel and container cleaning [CS103]	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50	90					0.1	SOP equivalent to 90% efficiency	0.50	13.71	0.01				0.14	0.50	0.01	0.51
		Industrial - SU3	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.03					0.03	0.01	0.00	0.01
		Industrial -SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	10	90	30						0.70	1.37	0.1				0.14	0.70	0.01	0.71
		Industrial -SU3	Disposal of wastes [CS28].	No	8a -Transfer of chemicals	50	95			15 min-1				0.50	1.37	0.1				0.14	0.50	0.01	0.51

Table A 4 ES5 Use as a fuel (Industrial) Risk Management Measures

Table 1: Mapping Uses in the Supply Chain						
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS **REACH ADVISED: phrase [RMM code]** **Recommended: {phrase [RMM code].}**
ES#13	**Use in Fuels of Fuel Oils Streams**	Industrial - SU3	General measures (carcinogens) [G18]			Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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
		Industrial -SU3	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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]{Wear
		Industrial -SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	General exposures (closed systems) [CS15].	No	2 - Use in closed, continuous process with occasional controlled exposure	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (closed systems) [CS15].	Yes	3 - Use in closed batch process (synthesis or formulation)	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected	Handle substance within a predominantly closed system provided with extract ventilation [E49].Provide extract ventilation to points where emissions occur [E54]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	3 - Use in closed batch process (synthesis or formulation)	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].{Wear
		Industrial -SU3	Equipment maintenance [CS5].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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
		Industrial -SU3	Vessel and container cleaning [CS103]	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial - SU3	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	Store substance within a closed system [E84].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Disposal of wastes [CS28].	No	8a -Transfer of chemicals	Sample via a closed loop or other system to avoid exposure

Appendix A.6 ES 6 Use as a fuel of Fuel Oil Streams(professional)

Table A.6.1 ES6 General information

Substance specific information				
Substance	Fuel Oil Streams	**Reference Values**		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#				
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.			
Life Cycle Stage / Sector of Use	Professional (SU22)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC16			
Applicable Use Descriptors (ERC or SpERC)	ERC 9A, ERC 9B			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20 □C above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated			

Table A.6.2 ES6 Use as a fuel (professional) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
	Generic Exposure Scenario		Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No)	Process Category [scroll list]
ES#14	Use in Fuels of Benzene for Category G	Professional - SU22	Bulk transfers [CS14].			Daily; 1-4 hour; ambient temp.	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Professional - SU22	Drum/batch transfers [CS8].			Daily; 15 mins - 1 hour; ambient temp	Pumped transfer from drum to equipment	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Professional - SU22	Dipping, immersion and pouring [CS4].			Daily; >4 hours, to 100%	Pumped transfer to vehicle	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Professional - SU22	General exposures (closed systems) [CS15].			Daily; >4 hours	Closed equipment	No	1 - Use in closed process, no likelihood of exposure
		Professional - SU22	General exposures (closed systems) [CS15].	With occasional controlled exposure [CS137]		Daily; >4 hours	Closed equipment	Yes	2 - Use in closed, continuous process with occasional controlled exposure
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Batch process [CS55].		Daily; >4 hours, to 100%	Enclosed or ventilated mixing vessel	Yes	3 - Use in closed batch process (synthesis or formulation)
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]			Daily; >4 hours, to 100%	Closed equipment	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected
		Professional - SU22	Equipment cleaning and maintenance [CS39].			Daily; >4 hours, to 100%	PPE. Operator training.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Professional - SU22	Vessel and container cleaning [CS103]			Daily; >4 hours, to 100%	vessel entry procedures, retain wash down in sealed storage pending disposa,. PPE.	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Professional - SU22	Storage [CS67]			Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	1 - Use in closed process, no likelihood of exposure

Table A.6.3 ES6 Use as a fuel (professional) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																
Generic Exposure Scenario		Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure								Dermal exposure							Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	TRA Predicted Exposure - (ppm) - **no modifiers**	TRA LEV : efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - **modified**	TRA Predicted Dermal exposure (mg/kg/d) - **no modifiers**	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - **modified**	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES#14	**Use in Fuels of Benzene for Category G**	Professional - SU22	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	50	80	70				0.2	clear lines prior to de-coupling	0.60	6.86	0.1					0.69	0.60	0.03	0.63
		Professional - SU22	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	80	70				0.2	Drume pumps equivalent to 80% efficiency	0.60	3.43	0.1					0.34	0.60	0.01	0.61
		Professional - SU22	Dipping, immersion and pouring [CS4].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	80	70				0.2	Drume pumps equivalent to 80% efficiency	0.60	3.43	0.1					0.34	0.60	0.01	0.61
		Professional - SU22	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34						0.34	0.01	0.01	0.02
		Professional - SU22	General exposures (closed systems) [CS15].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	20	80	70		1-4 hours				0.72	1.37	0.1					0.14	0.72	0.01	0.73
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90	70						0.75	0.34						0.34	0.75	0.01	0.76
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected	10	80	70						0.60	0.34						0.34	0.60	0.01	0.61
		Professional - SU22	Equipment cleaning and maintenance [CS39].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	100	90	70			half mask		SoP equivalent to 90% LEV efficiency	0.30	13.71	0.01					0.14	0.30	0.01	0.31
		Professional - SU22	Vessel and container cleaning [CS103]	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	100	80	70			half mask			0.60	13.71	0.01					0.14	0.60	0.01	0.61
		Professional - SU22	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34						0.34	0.01	0.01	0.02

Table A.6.4 ES6 Use as a fuel (professional) Risk Management Measures

	Table 1: Mapping Uses in the Supply Chain					
	Generic Exposure Scenario		Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS **REACH ADVISED: phrase [RMM code]** **Recommended: {phrase [RMM code].}**
ES#14	**Use in Fuels of Benzene for Category G**	Professional - SU22	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	Ensure material transfers are under containment or extract ventilation [E66]. ; Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].Clear transfer lines prior to de-coupling [E39].{Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Use drum pumps or carefully pour from container [E64].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Ensure material transfers are under containment or extract ventilation [E66]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	Dipping, immersion and pouring [CS4].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Use drum pumps or carefully pour from container [E64].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].; Ensure material transfers are under containment or extract ventilation [E66]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	General exposures (closed systems) [CS15].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	General exposures (closed systems) [CS15].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	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].Avoid carrying out activities involving exposure for more than 4 hours [OC28]{Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	3 - Use in closed batch process (synthesis or formulation)	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	General exposures (open systems) [CS16]. ; (closed systems) [CS107]	Yes	16 - Using material as fuel sources, limited exposure to unburned product to be expected	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	Equipment cleaning and maintenance [CS39].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	Drain down and flush system prior to equipment break-in or maintenance [E55].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	Vessel and container cleaning [CS103]	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	Drain down system prior to equipment break-in or maintenance [E65].Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour) [E40].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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Professional - SU22	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.

Appendix A.7 ES 7 Use as a fuel of Fuel Oil Streams (consumer)

Table A.7.1 ES7 General information

Substance Properties:	Substance Name	Naphthalene	Molecular Weight (g/mole)	128.18	Physical property	liquid	Substance volatility (Pa):	11	TRA volatility range	**High**	Saturated Vapour Concentration (mg/m3)	569.1
Common Parameter Defaults:	Thickness Layer (cm)	0.01	Density (g/cm3)	1.2	Body Weight (kg)	60.0	Inhalation Rate (m3/hr)	1.4	fraction released to air	**0.01**	Life Cycle Stage / Sector of Use	Consumer (SU21)
References Values or DNELs :	DNEL dermal systemic (mg/kg/day)	**42.4**	Reference dermal local (mg/cm2)		oral systemic (mg/kg/day)	**4.2**	Reference inhalation systemic (mg/kg/24 hr day)	4.2	DNEL inhalation systemic (mg/m3) for 24 hr day	**14.7**	Reference inhalation local (mg/m3)	

Table A.7.2 ES7 Use as a fuel (consumer) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Consumer Uses in the Supply Chain			
Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels
Short Title	Area of Application / UD		
Use as a fuel of Fuel Oil Streams	Consumer|SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling
PC13	Consumer|SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling
	Consumer|SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use
	Consumer|SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refueling
	Consumer|SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil

Table A.7.3 ES7 Use as a fuel (consumer) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

Table 1: Mapping Consumer Uses in the Supply Chain				Table 2a: Characterising the Risk - based on defaults (ECETOC TRA Consumers)										
				all	all			all	d	o	i	i	i	
Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels	Product ingredient (g/g)	adult / child			Product is spray? (S)	frequency (events per day)	Skin surface contact area (cm^2)	Amount Swallowed (g)	Amount Used per event (g)	room volume (m^3)	exposure time (hr)
Short Title	Area of Application / UD				d	o	i							
Use as a fuel of Fuel Oil Streams	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling	0.5	A		A		1	857.5		5000	20	4
PC13	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling	0.5	A		A		1	857.5		5000	20	4
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use	0.5	A		A		1	857.5		5000	20	4
	Consumer-SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refueling	0.5	A		A		1	857.5		5000	20	4
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil	0.5	A		A		1	857.5		5000	20	4

Table 1: Mapping Consumer Uses in the Supply Chain

Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels	TIER1 Predicted Exposure - ECETOC TRA based on defaults						Risk Characterization based on defaults				
Short Title	Area of Application / UD			Predicted Dermal Exposure (mg/kg/d)	Predicted Oral Exposure (mg/kg/d)	Predicted Inhalation Exposure (mg/kg/d)	Predicted Inhalation Exposure (mg/m^3)	Predicted Inhalation Exposure - upper bounded with SVC (mg/m^3)	Total Predicted Exposure (mg/kg/d)	RCR (dermal)	RCR (oral)	RCR (inhalation mg/kg/day)	RCR (SVC-upper bounded inhalation mg/m3)	RCR (all routes - sum of mg/kg/day values)
Use as a fuel of Fuel Oil Streams	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling	82.9	0	114.2	1250.0	569.1	197	1.95	0.00	26.99	38.72	28.94
PC13	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling	82.9	0	114.2	1250.0	569.1	197	1.95	0.00	26.99	38.72	28.94
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use	82.9	0	114.2	1250.0	569.1	197	1.95	0.00	26.99	38.72	28.94
	Consumer-SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refueling	82.9	0	114.2	1250.0	569.1	197	1.95	0.00	26.99	38.72	28.94
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil	82.9	0	114.2	1250.0	569.1	197	1.95	0.00	26.99	38.72	28.94

Table A.7.4 ES7 Use as a fuel (consumer) Risk Management Measures

Table 1: Mapping Consumer Uses in the Supply Chain				Table 2b: Characteris																									
				all		all		dermal		al		l		dermal	oral	inhalation		n		inhalation	inhalation		inhalation	inhalation		inhalation			
Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels	TIER1+ ECETOC TRA - exposure modifiers																									
Short Title	Area of Application / UD			Product ingredient (weight fraction) (g/g)		Frequency (events per day): if < 1, only used for chronic assessment		Skin surface contact area (cm^2)		Use Dilution Factor		Dermal Factor		Glove effiency	Amount Swallowed (g)		Amount Used per event (g)		Inhalation Factor (fraction of total use spilled/evaporated, i.e., amount lost)		Location (indoors, outdoors, garage)	Air Exchange Rate (1/hr)		Dilution Factor incorporating Air Exchange Rate applied to TRA for mg/kg inhalation calc.	Room Volume (m3)		Exposure time (hours)	
				Value	Comments	Value	Comments	Value	Comments	Value	Comments	Value	Comments		Value	Comments	Value	Comments	Value	Comments		Value	Comments		Value	Comment	Value	Comments
Fuels	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling	0.95	increased above TRA default	0.143	est. as 1 per week	210	est. as palm of one hand								37500	est. fuel tank size 50 L converted using gasoline density of 750 kg/m3	0.002	expect low % loss during refueling due to evaporation /spill	outdoor	0.6	est. conservative value for outdoor	0.985148882	100	Stoffenmanager volume used for outdoors	0.05	3mins, 97th percentile - Vainiotalo et al. 1999
PC13	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling	0.95	increased above TRA default	0.143	est. as 1 per week	210	est. as palm of one hand								3750	est. fuel tank size 5 L converted using gasoline density of 750 kg/m3	0.02	expect low % loss during refueling but more than for automotive	outdoor	0.6	est. conservative value for outdoor	0.990165018	100	Stoffenmanager volume used for outdoors	0.033	2mins, Est. as shorter than vehicle
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use	1	increased above TRA default	0.07	est. as 1 per two weeks										750	1 L: Conv from L to g based upon density for mogas = 750 kg/m3.	0.02	expect low % loss during equipment use	outdoor	0.6	est. conservative value for outdoor	0.582338157	100	Stoffenmanager volume used for outdoors	2	Est. 2 hours per day
	Consumer-SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refuelling	0.5	Assumed Value	0.07	est. as 1 per two weeks	420	Est. half of each hand								750	1 L: Conv from L to g based upon density for mogas = 750 kg/m3.	0.03	expect low % loss but may be more from pouring than using filling station equipment	garage	1.5	RIVM general fact sheet	0.977833737	34	RIVM general fact sheet	0.03	Est. 2mins
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil	1	increased above TRA default	0.143	est. as 1 per week	210	est. as palm of one hand								100	0.13L: Conv from L to g based upon density for mogas = 750 kg/m3.	0.05	expect low loss but % increased because lower use volume	indoor, typical	0.6	RIVM general fact sheet	0.99611012	20	TRA default	0.013	Est. 0.75 min

Table 1: Mapping Consumer Uses in the Supply Chain

Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels	dermal			oral		inhalation				Local Use		On Day of Use				Chronic Considering Yearly Use Frequency			
				TRA Tier 1+ Predicted Exposure - ECETOC TRA - refined estimates									TRA Tier1+ Risk Characterization - refined estimates									
Short Title	Area of Application / UD			Predicted Dermal Exposure, Daily (mg/kg/d)	Predicted Dermal Exposure, Chronic (mg/kg/d)	Predicted Dermal Exposure, Local (mg/cm2)	Predicted Oral Exposure, daily (mg/kg/d)	Predicted Oral Exposure, Chronic (mg/kg/d)	Predicted Inhalation Exposure, daily (mg/kg/d)	Mean Inhalation Event Concentration (mg/m^3)	Mean Inhalation Concentration (24hr TWA) on Day of Exposure (mg/m3)	Mean Inhalation Concentration Yearly (mg/m3)	Total Predicted Exposure (mg/kg/d) - day of use for TRA comparison only	RCR dermal local (based on mg/cm2)	RCR inhalation local (based on Activity TWA mg/m3)	RCR systemic (dermal, daily, based on mg/kg/d))	RCR systemic (oral, daily, based on mg/kg/d))	RCR systemic (24hr TWA inhalation mg/m3)	RCR systemic (all routes, daily)	RCR systemic (dermal, chronic, based on mg/kg/d))	RCR systemic (oral, chronic, based on mg/kg/d))	RCR systemic (inhalation, yearly, based on mg/m3)	RCR systemic (all routes, chronic)
				day of use	chronic	event	day of use	chronic	day of use	event	day of use	chronic				#REF!	#REF!	#REF!		#REF!	#REF!	#REF!	
Fuels	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling	38.57	5.51551	11.02	0	0	0.801357043	569.13786	1.185703875	0.169555654	39.37135704	Not Applicable	Not Applicable	0.909669811	0	0.080660128	0.990329939	0.130082783	0	0.011534398	0.141617181
PC13	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling	38.57	5.51551	11.02	0	0	0.531588655	569.13786	0.782564557	0.111906732	39.10158866	Not Applicable	Not Applicable	0.909669811	0	0.053235684	0.962905496	0.130082783	0	0.007612703	0.137695486
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use	0	0	11.6	0	0	3.989016374	87.35072352	7.27922696	0.509545887	3.989016374	Not Applicable	Not Applicable	0	0	0.495185507	0.495185507	0	0	0.034662986	0.034662986
	Consumer-SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refueling	40.6	2.842	5.8	0	0	0.22163033	323.5479277	0.40443491	0.028310444	40.82163033	Not Applicable	Not Applicable	0.95754717	0	0.027512579	0.985059749	0.067028302	0	0.001925881	0.068954182
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil	40.6	5.8058	11.6	0	0	0.073919672	249.0275301	0.134889912	0.019289257	40.67391967	Not Applicable	Not Applicable	0.95754717	0	0.009176184	0.966723354	0.136929245	0	0.001312194	0.13824144

Table 1: Mapping Consumer Uses in the Supply Chain

Generic Exposure Scenario		Relevant Use Sentinel Product	Product sub Category Sentinels	Operation Conditions (OCs)	Risk Management Measures (RMMs)		Risk Characterization - including RMMs when needed (substance Specific)				TRA+ Predicted Exposure - including RMM when needed (substance specific)		
Short Title	Area of Application / UD				RMMs for communication - Consolidate into GES or e-SDS **REACH ADVISED: phrase [RMM code]** **Recommended: {phrase [RMM code].}**	**Indicator for Basis of Exposure Estimate**	**RCR systemic (dermal, based on mg/kg/d))**	**RCR systemic (oral, based on mg/kg/d))**	**RCR systemic (based on daily TWA inhalation mg/m3)**	**RCR systemic (all routes, daily inhalation TWA in mg/m3)**	Predicted Dermal Exposure (mg/kg/d)	Predicted Oral Exposure (mg/kg/d)	Predicted Inhalation Exposure (mg/m3)
							d	o	i	t	d	o	i
Fuels	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Automotive Refuelling	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];	No specific RMMs developed beyong those OCs stated	Based upon daily use	0.909669811	0	0.080660128	0.990329939	38.57	0	1.185703875
PC13	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Scooter Refuelling	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];	No specific RMMs developed beyong those OCs stated	Based upon daily use	0.909669811	0	0.053235684	0.962905496	38.57	0	0.782564557
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Garden Equipment - Use	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];	No specific RMMs developed beyong those OCs stated	Based upon daily use	0	0	0.495185507	0.495185507	0	0	7.27922696
	Consumer-SU21	PC13:Fuels	Liquid (subcategories added): Garden Equipment - Refueling	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 typcial ventilation [ConsOC10]; covers use in room size of 34m3[ConsOC11]; for each use event, covers exposure up to 0.03hr/event[ConsOC14];	No specific RMMs developed beyong those OCs stated	Based upon daily use	0.95754717	0	0.027512579	0.985059749	40.6	0	0.40443491
	Consumer-SU21	PC13:Fuels	Liquid - subcategories added: Lamp oil	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];	No specific RMMs developed beyong those OCs stated	Based upon daily use	0.95754717	0	0.009176184	0.966723354	40.6	0	0.134889912

Appendix A.8 ES 8 Use in functional fluids of Fuel Oil Streams (industrial)

Table A.8.1 ES8 General information

Substance specific information				
Substance	Fuel Oil Streams	**Reference Values**		
CAS RN		DNEL worker - inhalation (long term)	1	ppm
Substance volatility:	10 kPa (benzene)	DNEL worker - inhalation (short term)		ppm
TRA volatility range	medium	DNEL worker - dermal (long term)	23.4	mg/kg/day
physical property	liquid			
ES#				
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			
Life Cycle Stage / Sector of Use	Industrial (SU3)			
Applicable Use Descriptors (PROC or PC)	PROC1, PROC2, PROC3, PROC4, PROC 8a, PROC 8b, PROC9			
Applicable Use Descriptors (ERC or SpERC)	ERC 7			
Default Operational Conditions				
concentration of substance in product	Covers percentage substance in the product up to 100 % (unless stated differently) [G13].			
physical form of product	Liquid, vapour pressure 0.5 - 10 kPa [OC4].			
frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently) [G2]			
other Operational Conditions of use	Assumes use at not > 20oC above ambient [G15]; Assumes a good basic standard of occupational hygiene is implemented [G1]. Unless otherwise stated			

Table A.8.2 ES8 Use in functional fluids (industrial) Table 1: Mapping Uses in the Supply Chain

Table 1: Mapping Uses in the Supply Chain									
Generic Exposure Scenario			Contributing Scenarios			Typical Mapped Operating Conditions	Typical Mapped RMMs		Use Descriptor
ES #	Short Title	Life Cycle Stage / Area of Application	Title	supporting phrase [optional]	CS further specification [free text]	[free text]	[free text]	LEV (Yes/No]	Process Category [scroll list]
ES#1	Use in functional fluids of Benzene for Category G	Industrial -SU3	Bulk transfers [CS14].		Bulk transfers to/from storage	Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	No	1 - Use in closed process, no likelihood of exposure
		Industrial -SU3	Bulk transfers [CS14].	With occasional controlled exposure [CS137]	Bulk transfers to/from storage	Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	No	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial -SU3	Bulk transfers [CS14].	Batch process [CS55].	Bulk transfers to/from storage	Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	Yes	3 - Use in closed batch process (synthesis or formulation)
		Industrial -SU3	Bulk transfers [CS14].		Bulk transfers to/from storage	Daily; 15 min - 1 hour; ambient temp	Enclosed transfers, clear lines prior to decoupling	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial -SU3	Drum/batch transfers [CS8].	Dedicated facility [CS81].	Transfers from drums to filling machinery	Daily; 15 min - 1 hour; ambient temp	Pumped transfer from drum to holding tanks.	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities
		Industrial -SU3	Pelletizing [CS53]. ; (closed systems) [CS107]	Dedicated facility [CS81].	filling articles from predominantly enclosed machines	Daily; >4 hours, ambient	enclosed operations, size of openings minimised	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)
		Industrial -SU3	Filling / preparation of equipment from drums or containers. [CS45].	Manual [CS34].	manual filling of machines	Daily; 1-4 hours, ambient	careful pouring, worker instructions	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial -SU3	General exposures (closed systems) [CS15].		operation of closed equipment containing functional fluids	Daily; >4 hours, ambient	None.	Yes	2 - Use in closed, continuous process with occasional controlled exposure
		Industrial -SU3	General exposures (open systems) [CS16].		operation of open equipment containing functional fluids	Daily; >4 hours, ambient	Well ventilated area.	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial -SU3	General exposures (open systems) [CS16].		operation of open equipment containing functional fluids at elevated temperatures	Daily; >4 hours, ambient (product at 80oC)	None.	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises
		Industrial -SU3	Remanufacture of reject articles [CS19].		Re-work on off specification articles	Daily; >4 hours, ambient	work methods, drain prior to work, retain spills	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)
		Industrial -SU3	Equipment maintenance [CS5].		maintenance of equipment	Daily; 1-4 hours, ambient	work methods, drain prior to work, retain spills, gloves	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities
		Industrial -SU3	Storage [CS67]			Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	1 - Use in closed process, no likelihood of exposure
		Industrial -SU3	Storage [CS67]	With occasional controlled exposure [CS137]		Daily; 8 hrs; ambient temp;	samples collected at dedicated sample point	No	2 - Use in closed, continuous process with occasional controlled exposure

Table A.8.3 ES8 Use in functional fluids (industrial) Table 2: Characterising the Risk – Chemical Safety Assessment- Evaluation of Safe Use

	Table 1: Mapping Uses in the Supply Chain					Table 2: Characterising the Risk - Chemical Safety Assessment - Evaluation of Safe Use																
	Generic Exposure Scenario		Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Inhalatory exposure								Dermal exposure							Risk Characterization		
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	TRA Predicted Exposure - (ppm) - no modifiers	TRA LEV : efficiency (%)	Dilution ventilation effectiveness (%)	TRA concentration factor	TRA duration factor	TRA RPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (inhalation)	Predicted Exposure - (ppm) - modified	TRA Predicted Dermal exposure (mg/kg/d) - no modifiers	TRA Dermal exposure LEV reduction factor	TRA concentration factor	PPE factor	Extra exposure modifier: [optional]	Free text - comment to clarify additional modifier (dermal)	Predicted Dermal Exposure (mg/kg/d) - modified	RCR (inhalation)	RCR (dermal)	RCR (all routes)
ES#1	Use in functional fluids of Benzene for Category G	Industrial -SU3	Bulk transfers [CS14].	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.03					0.03	0.01	0.00	0.01
		Industrial -SU3	Bulk transfers [CS14].	No	2 - Use in closed, continuous process with occasional controlled exposure	10	90			1-4 hours				0.60	1.37					1.37	0.60	0.06	0.66
		Industrial -SU3	Bulk transfers [CS14].	Yes	3 - Use in closed batch process (synthesis or formulation)	25	90			15 min-1 hour				0.50	0.34	0.1				0.03	0.50	0.00	0.50
		Industrial -SU3	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90			15 min-1 hour				0.40	6.86	0.1				0.69	0.40	0.03	0.43
		Industrial -SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	50	97			1-4 hours				0.90	6.86	0.1				0.69	0.90	0.03	0.93
		Industrial -SU3	Pelletizing [CS53]. : (closed systems) [CS107]	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	50	90	30		15 min-1 hour				0.70	6.86	0.1				0.69	0.70	0.03	0.73
		Industrial -SU3	Filling / preparation of equipment from drums or containers. [CS45].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50	90	30		15 min-1 hour				0.70	13.71	0.1				1.37	0.70	0.06	0.76
		Industrial -SU3	General exposures (closed systems) [CS15].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	10	90	30						0.70	1.37	0.1				0.14	0.70	0.01	0.71
		Industrial -SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	70						0.60	6.86	0.1				0.69	0.60	0.03	0.63
		Industrial -SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	20	90	70						0.60	6.86	0.1				0.69	0.60	0.03	0.63
		Industrial -SU3	Remanufacture of reject articles [CS19].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	50	90	30				0.2	Draining of system	0.70	6.86	0.1				0.69	0.70	0.03	0.73
		Industrial -SU3	Equipment maintenance [CS5].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	50					half mask	0.1	SoP Equivavent to 90% LEV Efficiency	0.50	13.71	0.1				1.37	0.50	0.06	0.56
		Industrial -SU3	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	0.01								0.01	0.34					0.34	0.01	0.01	0.02
		Industrial -SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	10	95							0.50	1.37					1.37	0.50	0.06	0.56

Table A.8.4 ES8 Use in functional fluids (industrial) Risk Management Measures

Table 1: Mapping Uses in the Supply Chain						DNEL =
Generic Exposure Scenario			Contributing Scenarios	Typical Mapped RMMs	Use Descriptor	Risk Management Measures (RMMs)
ES #	Short Title	Life Cycle Stage / Area of Application	Title	LEV (Yes/No)	Process Category [scroll list]	RMMs for communication - Consolidate into GES or e-SDS REACH ADVISED: phrase [RMM code] Recommended: {phrase [RMM code].}
ES#1	Use in functional fluids of Benzene for Category G	Industrial -SU3	Bulk transfers [CS14].	No	1 - Use in closed process, no likelihood of exposure	Handle substance within a closed system [E47].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Bulk transfers [CS14].	No	2 - Use in closed, continuous process with occasional controlled exposure	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Bulk transfers [CS14].	Yes	3 - Use in closed batch process (synthesis or formulation)	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Bulk transfers [CS14].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 1 hour [OC27].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Drum/batch transfers [CS8].	Yes	8b -Transfer of chemicals from/to vessels/ large containers at dedicated facilities	Ensure material transfers are under containment or extract ventilation [E66]. Avoid carrying out activities involving exposure for more than 4 hours [OC28]{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Pelletizing [CS53]. ; (closed systems) [CS107]	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Filling / preparation of equipment from drums or containers. [CS45].	Yes	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (closed systems) [CS15].	Yes	2 - Use in closed, continuous process with occasional controlled exposure	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	General exposures (open systems) [CS16].	Yes	4 - Use in batch and other process (synthesis) where opportunity for exposure arises	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].{Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Remanufacture of reject articles [CS19].	Yes	9 -Transfer of chemicals into small containers (dedicated filling line)	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].Retain drain downs in sealed storage pending disposal or for subsequent recycle [ENVT4]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Equipment maintenance [CS5].	No	8a -Transfer of chemicals from/to vessels/ large containers at non dedicated facilities	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]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Storage [CS67]	No	1 - Use in closed process, no likelihood of exposure	[Sample via a closed loop or other system to avoid exposure] E8Store substance within a closed system [E84].; Provide a good standard of general ventilation. Natural ventilation is from windows and doors etc. Controlled ventilation means air is supplied or removed by a powered fan. [E1]. {Wear suitable gloves tested to EN374 [PPE15]}.
		Industrial -SU3	Storage [CS67]	No	2 - Use in closed, continuous process with occasional controlled exposure	[Sample via a closed loop or other system to avoid exposure] E8Store substance within a closed system [E84].{Wear suitable gloves tested to EN374 [PPE15]}.

APPENDIX B: ENVIRONMENTAL EXPOSURE

Table B.1. Local CSR Worksheet

Table of Local Exposure and Risk Characterisation Results from PETRORISK	local output- Manufacture	local output- Distribution	local output- Use as Inter	local output- Formulation	local output- Use as a fuel	local output- Use as a fuel	local output- Use as a f fuel	local output- Functional fuel
Section 9 - Exposure Assessment	9.1	9.3	9.2	9.4	9.6	9.7	9.8	9.5
Regional Tonnage (T/yr)	2.0E+05	1.0E+05	2.0E+04	8.0E+04	1.1E+05	1.6E+04	8.0E+03	1.0E+02
Fraction of regional tonnage used locally	8.0E-01	2.0E-03	7.5E-01	3.8E-01	1.4E+00	5.0E-04	5.0E-04	1.0E-01
Local Site Tonnage (T/y)	1.6E+05	2.0E+02	1.5E+04	3.0E+04	1.6E+05	8.0E+00	4.0E+00	1.0E+01
Site Tonnage (kg/d)	5.3E+05	1.0E+04	5.0E+04	1.0E+05	5.3E+05	2.2E+01	1.1E+01	5.0E+02
Emission days (d/yr)	300	20	300	300	300	365	365	20
Release fraction (prior to RMM) - wastewater	1.0E-04	1.0E-05	3.0E-04	2.0E-04	1.0E-05	1.0E-05	1.0E-05	3.0E-05
Release fraction (prior to RMM) - air	1.0E-02	1.0E-03	1.0E-03	1.0E-03	5.0E-03	1.0E-03	1.0E-03	5.0E-03
Dilution Factor - Freshwater	40	10	10	10	10	10	10	10
Dilution Factor - Marine	100	100	100	100	100	100	100	100
On-site removal efficiency - Air (%)	90.0	90.0	80.0	0.0	95.0	0.0	0.0	0.0
Risk-driving Comparment	Human Inhalation	Human Ingestion	Human Ingestion	Human Ingestion	Human Inhalation	Human Ingestion	Human Ingestion	Human Inhalation
Wastewater Treatment Required (Yes/No)	Yes	No	Yes	Yes	Yes	No	No	No
Required Removal Efficiency - wastewater (%)	43.6	0.0	99.7	82.8	35.5	0.0	0.0	0.0
Onsite Removal Efficiency - wastewater (%)	0.0	0.0	94.9	0.0	0.0	0.0	0.0	0.0
Offsite Removal Efficiency - wastewater (%)	94.9	94.9	94.9	94.9	94.9	94.9	94.9	94.9
Total Removal Efficiency - wastewater (%)	94.9	94.9	99.7	94.9	94.9	94.9	94.9	94.9
Msafe (kg/d)	5.3E+05	2.2E+05	5.0E+04	1.0E+05	5.3E+05	8.0E+02	4.1E+02	1.2E+04
Aquatic without Treatment (kg/d)	5.5E+01	2.7E+00	1.6E+01	4.4E+01	3.1E+00	4.4E-01	2.2E-01	8.2E-03
Aquatic (with onsite and offsite treatment) (kg/d)	5.2E+01	2.6E+00	1.6E+01	4.2E+01	2.9E+00	4.2E-01	2.1E-01	7.8E-03
Air (direct after on-site treatment) (kg/d)	5.7E+02	2.8E+01	1.7E+01	2.3E+02	7.8E+01	4.4E+01	2.2E+01	1.4E+00
Environmental Exposure								

PEC effluent (mg/L)	2.8E-01	2.6E-03	3.9E-01	5.2E-01	1.4E-01	5.7E-06	2.8E-06	3.9E-04
PEC sludge (mg/kg dw)	6.8E+02	6.4E+00	9.6E+02	1.3E+03	3.4E+02	1.4E-02	7.0E-03	9.6E-01
PEC air (mg/m^3)	1.2E-01	3.3E-05	3.8E-03	2.5E-02	3.1E-02	1.7E-05	1.7E-05	3.8E-05
C air (mg/m^3)	1.2E-01	1.6E-05	3.8E-03	2.5E-02	3.1E-02	2.6E-08	1.3E-08	2.1E-05
PEC freshwater (mg/L)	6.9E-03	2.6E-04	3.9E-02	5.2E-02	1.4E-02	1.5E-05	1.5E-05	3.9E-05
C freshwater (mg/L)	6.9E-03	2.5E-04	3.9E-02	5.2E-02	1.4E-02	5.7E-07	2.8E-07	2.4E-05
PEC marine (mg/L)	2.8E-03	2.6E-05	3.9E-03	5.2E-03	1.4E-03	1.3E-07	1.0E-07	3.9E-06
C marine (mg/L)	2.8E-03	2.6E-05	3.9E-03	5.2E-03	1.4E-03	5.7E-08	2.8E-08	3.8E-06
PEC freshwater sediment (mg/kg ww)	1.2E-01	4.4E-03	6.6E-01	8.8E-01	2.3E-01	9.5E-05	9.0E-05	6.6E-04
C freshwater sediment (mg/kg ww)	1.2E-01	4.3E-03	6.6E-01	8.8E-01	2.3E-01	9.6E-06	4.8E-06	5.7E-04
PEC marine sediment (mg/kg ww)	4.7E-02	4.4E-04	6.6E-02	8.8E-02	2.3E-02	9.6E-07	4.8E-07	6.6E-05
C marine sediment (mg/kg ww)	4.7E-02	4.4E-04	6.6E-02	8.8E-02	2.3E-02	4.9E-07	6.2E-09	6.5E-05
PEC agricultural soil (mg/kg ww)	1.8E-03	3.0E-06	5.8E-05	3.6E-04	4.4E-04	4.0E-06	4.7E-06	3.3E-06
C agricultural soil (mg/kg ww)	1.8E-03	2.3E-07	5.5E-05	3.6E-04	4.4E-04	1.3E-06	2.0E-06	5.5E-07
PEC groundwater (mg/L)	2.1E-04	2.8E-08	7.3E-06	4.4E-05	5.3E-05	5.3E-08	2.7E-08	6.5E-08
C groundwater (mg/L)	3.3E-07	2.5E-08	3.4E-07	3.3E-07	3.3E-07	3.7E-08	1.5E-08	5.5E-08
PEC oral freshwater fish (mg/kg ww)	2.2E-01	5.9E-04	1.3E+00	1.7E+00	4.5E-01	5.9E-04	5.8E-04	1.3E-04
PEC oral marine top predator (mg/kg ww)	4.9E-02	1.2E-04	2.7E-01	3.6E-01	9.7E-02	6.0E-05	5.8E-05	1.4E-05
PEC oral worm (mg/kg ww)	2.1E-03	3.5E-06	7.6E-05	4.4E-04	5.3E-04	3.4E-06	1.2E-06	3.9E-06
Indirect Human Exposure								
PEC fish (mg/kg ww)	4.4E-01	2.3E-03	2.5E+00	3.3E+00	8.8E-01	1.2E-03	1.2E-03	1.3E-03
C fish (mg/kg ww)	4.4E-01	1.1E-03	2.5E+00	3.3E+00	8.8E-01	4.4E-05	2.2E-05	1.7E-04
PEC drinking water (mg/L)	3.2E-03	7.5E-06	1.7E-02	2.2E-02	6.0E-03	7.7E-06	7.6E-06	8.6E-06
C drinking water (mg/L)	3.2E-03	4.2E-08	1.7E-02	2.2E-02	6.0E-03	3.0E-07	1.5E-07	1.2E-06
PEC meat (mg/kg ww)	5.5E-03	6.8E-06	1.9E-04	1.1E-03	1.4E-03	6.0E-06	6.0E-06	7.7E-06
C meat (mg/kg ww)	5.5E-03	7.2E-07	1.8E-04	1.1E-03	1.4E-03	1.6E-09	8.1E-10	1.7E-06
PEC milk (mg/kg ww)	1.7E-03	2.1E-06	6.1E-05	3.6E-04	4.4E-04	1.9E-06	1.9E-06	2.5E-06
C milk (mg/kg ww)	1.7E-03	2.3E-07	5.9E-05	3.6E-04	4.4E-04	5.4E-10	2.7E-10	5.4E-07
PEC leaf (mg/kg ww)	1.0E-02	4.0E-06	3.6E-04	2.1E-03	2.5E-03	2.7E-06	2.7E-06	3.1E-06
C leaf (mg/kg ww)	1.0E-02	1.3E-06	3.5E-04	2.1E-03	2.5E-03	3.1E-09	1.5E-09	3.7E-07
PEC root (mg/kg ww)	3.6E-03	6.8E-06	1.2E-04	7.3E-04	9.0E-04	8.1E-06	7.2E-06	7.5E-06
C root (mg/kg ww)	3.6E-03	4.6E-07	1.1E-04	7.2E-04	8.9E-04	1.7E-06	8.5E-07	1.1E-06

Dose inhalation (ug/kg/d)	3.5E+01	9.5E-03	1.1E+00	7.1E+00	8.9E+00	4.9E-03	4.9E-03	1.1E-02
Dose oral exposure - excluding inhalation (ug/kg/d)	3.5E+00	5.9E-03	4.6E+00	6.1E+00	1.7E+00	3.9E-03	3.9E-03	4.2E-03
Fraction from water pathways	8.4E-02	3.1E-01	8.1E-01	4.6E-01	1.5E-01	4.8E-01	4.8E-01	2.7E-02
Section 10 - Risk Characterisation	10.1	10.3	10.2	10.4	10.6	10.7	10.8	10.5
PNEC oral (mg/kg ww)	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
DNEL inhalation (ug/kg/d)	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01	4.7E-01
DNEL oral exposure (ug/kg/d)	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01	2.3E-01
Environmental Risk								
RCR effluent	9.1E-02	8.5E-04	1.3E-01	1.7E-01	4.6E-02	1.9E-06	9.4E-07	1.3E-04
RCR freshwater	3.5E-02	1.3E-03	2.0E-01	2.6E-01	7.0E-02	7.9E-05	7.7E-05	2.0E-04
RCR marine	1.4E-02	1.3E-04	2.0E-02	2.6E-02	7.0E-03	8.4E-07	6.9E-07	2.0E-05
RCR freshwater sediment	4.0E-02	1.5E-03	2.2E-01	3.0E-01	8.0E-02	3.1E-05	3.0E-05	2.2E-04
RCR marine sediment	1.6E-02	1.5E-04	2.2E-02	3.0E-02	8.0E-03	3.3E-07	1.6E-07	2.2E-05
RCR oral freshwater fish	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RCR oral marine top predator	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
RCR agricultural soil	1.8E-03	6.0E-07	5.2E-05	3.6E-04	4.5E-04	3.3E-06	2.0E-06	9.2E-07
RCR worm oral	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
Indirect Human Risk								
RCR inhalation	7.5E-01	2.0E-04	2.3E-02	1.5E-01	1.9E-01	1.0E-02	1.0E-02	2.3E-04
RCR ingestion (w/o inhalation)	1.5E-01	2.5E-04	1.9E-01	2.6E-01	7.2E-02	1.7E-02	1.7E-02	1.8E-04
RCR combined HI	9.0E-01	4.5E-04	2.2E-01	4.1E-01	2.6E-01	2.7E-02	2.7E-02	4.1E-04
MaxRCR- Water-related compartments	9.1E-02	1.5E-03	2.2E-01	3.0E-01	8.0E-02	7.9E-05	7.7E-05	2.2E-04
Max RCR - all compartments	9.0E-01	1.5E-03	2.2E-01	4.1E-01	2.6E-01	2.7E-02	2.7E-02	4.1E-04

Indirect exposure of man via the environment has been amended to reflect that these streams only contain a maximum of 1% benzene.

Table B.2: Regional CSR Worksheet

Compartment	Value
Emissions	
Aquatic with STP (kg/d)	1.2E+02
Air (direct + STP) (kg/d)	9.5E+02
Soil (direct only) (kg/d)	1.4E+02
Environmental Exposure	
PEC air (mg/m^3)	1.7E-05
PECregional,FW (mg/L)	1.5E-05
PECregional,Fwsediment (mg/kg ww)	8.6E-05
PECregional,Marine (mg/L)	7.2E-08
PECregional,msd (mg/kg ww)	4.8E-07
PECregional,Agsoil (mg/kg ww)	2.7E-06
PECgrassland (Natural) (mg/kg ww)	4.3E-07
Indirect Human Exposure	
PECfish (mg/kg ww)	1.2E-03
PECdrinking water (mg/kg ww)	7.4E-06
PECroot (mg/kg ww)	6.4E-06
PECleaf (mg/kg ww)	2.7E-06
PECmeat (mg/kg ww)	6.0E-06
PECmilk (mg/kg ww)	1.9E-06
Dose inhalation (ug/kg/d)	4.9E-03
Dose oral exposure - excluding inhalation (ug/kg/d)	3.8E-03
Environmental Risk Characterisation	
RCR freshwater	7.6E-05
RCR freshwater sediment	2.8E-05
RCR marine	5.5E-07
RCR marine sediment	1.6E-07
RCR agricultural soil	3.7E-07
RCR grassland (Natural)	5.7E-08
Indirect Human Risk	
RCR inhalation	1.0E-02
RCR oral exposure - excluding inhalation	1.6E-02
combined RCR	2.7E-02

APPENDIX C: QUALITATIVE RISK ASSESSMENTS

Appendix C.1. Carcinogenicity (R45) and mutagenicity (R46) hazard qualitative risk assessment

The purpose of the qualitative risk characterisation is to assess: ".the likelihood that effects are avoided when implementing the exposure scenario…" (REACH Annex 1, Section 6.5). The qualitative risk characterisation has to be completed when there is no basis for setting a DNEL or DMEL for a certain human health endpoint, i.e. when the available data for this effect do not provide quantitative dose-response information, but there exist toxicity data of a qualitative nature. Endpoints for which the available data may trigger a qualitative risk characterisation include carcinogenicity and mutagenicity where no dose threshold is identifiable.
When no DNEL for an endpoint is available the general qualitative risk assessment approach aims to reduce/avoid contact with the substance. This is achieved by implementation of risk management measures (RMMs) and operational conditions (OCs) – these need to be proportional to the degree of concern for the health hazard presented by the substance. For Category 1 and 2 carcinogens and mutagens there is the highest degree of concern. The control strategy must be sufficient to support the conclusion that risk is controlled to a level of no concern.
The general philosophy is twofold – that the use of the substance is limited to suitably equipped settings and that a stringent set of RMMs will be applied.

For the carcinogenic and mutagenic hazard a qualitative risk characterisation has been conducted consistent with the considerations and RMMs identified in the Table below. Implementation of these RMMs will ensure that the likelihood of an event occurring due to the carcinogenic and mutagenic hazard of the substance is negligible and the risk is considered to be controlled to a level of no concern.

Hazard	Material	Risk / Hazard Phrase	Examples of Relevant S Phrases and P Statements	Components of the Qualitative Risk Assessment
Cancer Mutagenicity	Liquid	Cat 2, R45 / Cat 1B, H350 Cat 2, R46/ Cat 1B, H340	<u>S-Phrases:</u> S36/37: Wear suitable protective clothing and gloves. S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). S53: Avoid exposure – obtain special instructions before use. <u>P-Statements:</u> Prevention: P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P281: Use personal protective	**Worker** • Implement good standards of occupational hygiene • Consider technical advances and process upgrades • Minimise exposure using measures such as closed systems • Management/supervision to check that the RMMs in place are being used correctly and OCs followed • Restrict access to authorised persons; • Provide specific activity training • Regularly inspect, test and maintain all control measures • Consider the need for risk based health surveillance **Consumer** - Not supported unless marketed in a manner consistent with Article 56 of REACH

Hazard	Material	Risk / Hazard Phrase	Examples of Relevant S Phrases and P Statements	Components of the Qualitative Risk Assessment
			equipment as required. Response: P308 + P313: If exposed or concerned: Get medical advice/attention. Storage: P405: Store locked up. Disposal: P501 : Dispose of contents/ container to.in accordance with local/regional/ national/international regulations (to be specified)	

These RMMs will be communicated by means of the Exposure Scenario by use of standard phrases.
For every exposure scenario, the following general phrase is be included

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise 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 authorised persons; provide specific activity training to operators to minimise 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].

Appendix C.2. Irritation hazard (R38) qualitative risk assessment

The purpose of the qualitative risk characterisation is to assess: ".the likelihood that effects are avoided when implementing the exposure scenario…" (REACH Annex 1, Section 6.5). The qualitative risk characterisation has to be completed when there is no basis for setting a DNEL or DMEL for a certain human health endpoint, i.e. when the available data for this effect do not provide quantitative dose-response information, but there exist toxicity data of a qualitative nature. One of the endpoints for which the available data may trigger a qualitative risk characterisation includes irritation.

When no DNEL for an endpoint is needed the general approach aims at reducing/avoiding contact with the substance. This is achieved by implementation of risk management measures (RMMs) and operational conditions (OCs) – these need to be proportional to the degree of concern for the health hazard presented by the substance. The control strategy must be sufficient to support the conclusion that risk is controlled to a level of no concern.

Implementation of a selection of these RMMs will ensure that the likelihood of an event occurring due to the irritation hazard of the substance is negligible and the risk is considered to be controlled to a level of no concern.

Hazard	Material	Risk / Hazard Phrase	P Phrase	Qualitative Risk Assessment
Skin Irritation	Gas Liquid	R38 / H315	Prevention: P264: Wash ... thoroughly after handling. P280 : Wear protective gloves. Response: P302 + P352 : IF ON SKIN: Wash with plenty of soap and water. P321 : Specific treatment (see ... on this label). P332 + P313 : If skin irritation occurs: Get medical advice/attention. P362 : Take off contaminated clothing and wash before re-use.	• *Implementation of basic standards of occupational hygiene;* • *Avoid all skin contact with product;* • *Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately;* • *Minimisation of splashes and spills;* • *Avoidance of contact with contaminated tools and objects;* • *Clean up contamination/spills as soon as they occur;* • *Regular cleaning of equipment and work area;* • *Management/supervision in place to check that the RMMs in place are being used correctly and OCs followed;* • *Training for staff on good practice to prevent / minimise exposures and to report any skin problems that may develop;* • *Good standard of personal hygiene.* • *Where activities may lead to aerosol release e.g. spraying; additional skin protection measures such as impervious suits and face shields are required.*

Appendix C.4. Qualitative risk assessment of risks from flammable substances

Risks from the physicochemical hazards of substances can be controlled by implementing risk management measures tailored to each specific risk. For flammable substances the following measures need to be implemented to control the risks and to show that safe use can be accomplished.

Physicochemical Hazard Qualitative Risk Assessment
A selection of the following organisational and technical measures should be taken to avoid ignition of flammable substances. These measures are suitable to prevent minor accidents which might occur at the workplace or during consumer use. Larger facilities manufacturing or using substances with flammable properties in significant quantities should follow the ATEX Directive (94/9/EC and 99/92/EC) to control risks arising from flammable substances.

Material	P Phrase	Qualitative Risk Assessment
• Liquid	Prevention: P210: Keep away from heat/sparks/open flames/... /hot surfaces.... No smoking P233 Keep container tightly closed. P240 : Ground/bond container and receiving equipment. P241: Use explosion-proof electrical/ventilating/lighting/.../ equipment. P242: Use only non-sparking tools. P243: Take precautionary measures against static discharge. P280: Wear protective gloves/eye protection/face protection. Response: P303 + P361 + P353 : IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower P370 + P378 : In case of fire: Use ... for extinction. Storage: P403 + P235 : Store in a well-ventilated place. Keep cool. P501 : Dispose of contents/container to	***Substance Handling and Transfer Preventative Measures*** • *Avoid Splash Filling (Industrial) – N/A for Gases.* • *Do NOT use compressed air for filling, discharging or handling operations (Industrial).* • *Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire (Industrial).* • *Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (< 1m.sec^{-1} until fill pipe submerged to twice its diameter, then < 7m.sec^{-1}) (Industrial).* • *Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<10m.sec^{-1}) (Industrial).* • *The vapour is heavier than air, spreads along the ground and distant ignition is possible (Industrial).* • *If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve (Industrial).* • *Use explosion-proof electrical/ventilating/ lighting and other equipment (Industrial).* • *Use appropriate equipment for filling IBCs and other containers. IBCs and other containers must be constructed of appropriate material) (Industrial).* • *Ensure electrical continuity by bonding and grounding (earthing) all equipment. (Industrial / Professional).* • *Keep away from oxidising agents (Industrial/ Professional).* • *Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks (Industrial/ Professional).* • *Handle and open container with care in a well-ventilated area (Industrial/ Professional).* • *Avoid Overfilling (Industrial/ Professional).* • *Do NOT empty into drains (Industrial/ Professional).*

Material	P Phrase	Qualitative Risk Assessment
		• *Use only with adequate ventilation (Consumer).* • *Avoid all possible sources of ignition (spark or flame) (Consumer).* • *Do not puncture or incinerate container (Consumer).* • *Empty pressure vessels should be returned to the supplier (Consumer).* **Storage** • *Must be stored in a dike (bunded) and well-ventilated area, away from sunlight, ignition sources and other sources of heat (Industrial).* • *Storage Temperature: Ambient (Industrial).* • *Keep away from flames, sources of ignition and hot surfaces. No smoking.* • *Take precautionary measures against static discharges.* • *Keep container in a well-ventilated place.* • *Keep container tightly closed.*