CHEMICAL SAFETY REPORT

Part B

Heavy Fuel Oil Components

Prepared by: CONCAWE

9. EXPOSURE ASSESSMENT

 Table 9.1. Identified Use Description and Exposure Scenario Number Key

IU	Category	Identified Use Name	Sector	ES Number	Sector of Use (SU)	Product Category (PC)	Process Category (PROC)	Article Category (AC)	Environmental Release Category (ERC)	Specific Environmental Release Category (SpERC)
1	Heavy Fuel Oil Components	01 – Manufacture of Substance	Industrial	ES 9.1.1	3, 8, 9	NA	1, 2, 3, 8a, 8b, 15	NA	1, 4	ESVOC SpERC 1.1.v1
2	Heavy Fuel Oil Components	01b – Use of Substance as Intermediate	Industrial	ES 9.2.1	3, 8, 9	NA	1, 2, 3, 8a, 8b, 15	NA	6a	ESVOC SpERC 6.1a.v1
3	Heavy Fuel Oil Components	01a – Distribution of Substance	Industrial	ES 9.3.1	3	NA	1, 2, 3, 8a, 8b, 15	NA	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7	ESVOC SpERC 1.1b.v1
4	Heavy Fuel Oil Components	02 – Formulation & (Re)packing of Substances and Mixtures	Industrial	ES 9.4.1	3, 10	NA	1, 2, 3, 8a, 8b, 15	NA	2	ESVOC SpERC 2.2.v1
5	Heavy Fuel Oil Components	03a – Uses in Coatings: Industrial	Industrial	ES 9.5.1	3	NA	1, 2, 3, 8a, 8b, 15	NA	4	ESVOC SpERC 4.3a.v1
6	Heavy Fuel Oil Components	03b – Uses in Coatings: Professional	Professional	ES 9.6.1	22	NA	1, 2, 3, 8a, 8b, 15	NA	8a, 8d	ESVOC SpERC 8.3b.v1
7	Heavy Fuel Oil Components	12a – Use as a Fuel: Industrial	Industrial	ES 9.7.1	3	NA	1, 2, 3, 8a, 8b, 16	NA	7	ESVOC SpERC 7.12a.v1
8	Heavy Fuel Oil Components	12b – Use as a Fuel: Professional	Professional	ES 9.8.1	22	NA	1, 2, 3, 8a, 8b, 16	NA	9a, 9b	ESVOC SpERC 9.12b.v1

9	Heavy Fuel	15 – Use in	Professional	ES	22	NA	8a, 8b	NA	8d, 8f	ESVOC
	Oil	Road and		9.9.1						SpERC 8.15.v1
	Components	Construction								
	-	Applications:								
		Professional								

The process of mapping uses and characterising risks has often identified a series of supporting measures that may further contribute to the management of exposure. The measures are identified in *blue* text in the Appendices contained in section 10. These measures are not contained within the Exposure Scenarios (ES) as they do not need to be implemented in order to achieve satisfactory exposure control. However, they are identified within the CSA in order that stakeholders are able to benefit from access to other exposure control information that has been obtained during the process of CSA/ES development.

9.1. Manufacture of Heavy Fuel Oil – Industrial

9.1.1. Exposure Scenario

Section 1 Exposure Scena	ario Title Heavy Fu	iel Oil					
Title							
Manufacture of Substance	Manufacture of Substance						
Use Descriptor							
Sector(s) of Use		3, 8, 9					
Process Categories		1, 2, 3, 8a, 8b, 15 Further information on the mapping and allocation of PROC codes is contained in Table 9.1					
Environmental Release Cate	gories	1, 4					
Specific Environmental Rele	ase Category	ESVOC SpERC 1.1.v1					
Processes, tasks, activitie	s covered						
Manufacture of the substanc contained systems. Includes storage, sampling, associate vessel/barge, road/rail car a	e or use as a proce incidental exposur d laboratory activiti nd bulk container).	ess chemical or extraction agent within closed or ess during recycling/ recovery, material transfers, ies, maintenance and loading (including marine					
Assessment Method							
See Section 3.	little second state of						
Section 2 Operational con	ditions and risk m	nanagement measures					
Section 2.1. Control of war	ther expective						
Droduct characteristics	Kerexposure						
Product characteristics	Liquid vanour pres	cours $< 0.5 \text{ kDa at QTD } OC3$					
Concentration of substance	Covers percentage	ssule SUB Kra at STF. UUS.					
in product	differently) G13						
Amount used	Not applicable						
Frequency and duration of use/exposure	Covers daily expos	sures up to 8 hours (unless stated differently) G2					
Human factors not influenced by risk management	Not applicable						
Other Operational Conditions affecting exposure	Operation is carried temperature). OC7 hygiene is impleme	d out at elevated temperature (> 20°C above ambient 7. Assumes a good basic standard of occupational ented G1.					
Contributing Scenarios	Contributing Scenarios Specific Risk Management Measures and Operating Conditions						
General measures (carcinogens) G18	Consider technical automation) for the measures such as general / local exha lines prior to break possible, prior to m Where there is pot persons; provide s exposures; wear s contamination; wear certain contributing wastes safely. Ens are in place to mar control measures. G20	advances and process upgrades (including e elimination of releases. Minimise exposure using closed systems, dedicated facilities and suitable aust ventilation. Drain down systems and clear transfer ting containment. Clean / flush equipment, where naintenance. tential for exposure: Restrict access to authorised pecific activity training to operators to minimise uitable gloves and coveralls to prevent skin ar respiratory protection when its use is identified for g scenarios; clear up spills immediately and dispose of sure safe systems of work or equivalent arrangements nage risks. Regularly inspect, test and maintain all Consider the need for risk based health surveillance.					
CS15 General exposures (closed systems)	Handle substance	within a closed system $E47$. Wear chemically resistant $N374$ in combination with 'basic' employee training					

	PPE16.					
S2 Process sampling. OC9 Outdoor Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26 Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.						
CS85 Bulk product storage.	CS85 Bulk product storage. Store substance within a closed system E84. Avoid carrying out activiti involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.					
CS36 Laboratory activities	Handle within a fume cupboard or implement to minimise exposure E12. Wear suitable global end of the second	nt suitable equivalent methods oves tested to EN374 PPE15.				
CS510 Marine vessel/barge (un)loading	Avoid carrying out activities involving expose OC28. Transfer via enclosed lines E52. Clea coupling E39. Retain drain downs in sealed for subsequent recycle ENVT4. Wear chemi to EN374) in combination with 'basic' emplo	ure for more than 4 hours ar transfer lines prior to de- storage pending disposal or ically resistant gloves (tested yee training PPE16.				
CS511 Road tanker/Railcar loading	Ensure material transfers are under containe <u>E66</u> . Wear chemically resistant gloves (tester with 'basic' employee training <u>PPE16</u> .	ment or extract ventilation ed to EN374) in combination				
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipn E55. Wear chemically resistant gloves (tester with specific activity training PPE17. Retain pending disposal or for subsequent recycle	nent break-in or maintenance ed to EN374) in combination drain downs in sealed storage ENVT4.				
Additional information on contained in Appendices 2	the basis for the allocation of the identifie	ed OCs and RMMs is				
Section 2.2 Control of env	ironmental exposure					
Product characteristics						
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4a	1.				
Amounts used						
Fraction of EU tonnage used	l in region	0.1				
Regional use tonnage (tonne	es/vear)	1.1e7				
Fraction of Regional tonnage	e used locally	5.2e-2				
Annual site tonnage (tonnes	/vear)	6.0e5				
Maximum daily site tonnage	(kg/day)	2.0e6				
Frequency and duration of	use					
Continuous release [FD2].						
Emission days (days/year)		300				
Environmental factors not	influenced by risk management					
Local freshwater dilution fact	10					
Local marine water dilution factor 100						
Other given operational co	nditions affecting environmental exposu	re				
Release fraction to air from process (initial release prior to RMM) 1.0e-4						
Release fraction to wastewater from process (initial release prior to 3.0e-6						
Release fraction to soil from process (initial release prior to RMM) 0.0001						
Technical conditions and measures at process level (source) to prevent release						
Common practices vary acro	oss sites thus conservative process release e	estimates used ITCS11				
Technical onsite condition	s and measures to reduce or limit discha	rges, air emissions and				
releases to soil						
Risk from environmental exposure is driven by humans via indirect exposure [TCR1j]. Onsite wastewater treatment required [TCR13]. Prevent discharge of undissolved substance to or recover from onsite wastewater [TRC14].						
Treat air emission to provide	ecover from onsite wastewater [TRU14].					
Treat onsite wastewater (price	Freat onsite wastewater (prior to receiving water discharge) to provide 85.9					

the required removal efficiency \geq (%)					
If discharging to domestic sewage treatment plant, provide the required	0.0				
onsite wastewater removal efficiency of \geq (%)					
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 pla	int				
Estimated substance removal from wastewater via domestic sewage	88.8				
treatment (%)					
Total efficiency of removal from wastewater after onsite and offsite	88.8				
(domestic treatment plant) RMMs (%)					
Maximum allowable site tonnage (M _{Safe}) based on release following total	2.3e6				
wastewater treatment removal (kg/d)					
Assumed domestic sewage treatment plant flow (m [°] /d)	10000				
Conditions and measures related to external treatment of waste for	disposal				
During manufacturing no waste of the substance is generated to treat [ET	W4].				
Conditions and measures related to external recovery of waste					
During manufacturing no waste of the substance is generated to recover	[ERW2].				
Additional information on the basis for the allocation of the indentifi	ied OCs and RMMs is				
contained in PETRORISK file in IUCLID Section 13.					
Section 3 Exposure Estimation					
3.1. Health					
The ECETOC TRA tool has been used to estimate workplace exposures	unless otherwise indicated.				
G21.					
3.2. Environment					
The Hydrocarbon Block Method has been used to calculate environmenta	al exposure with the Petrorisk				
model [EE2].					
Section 4 Guidance to check compliance with the Exposure Scenar	io				
4.1. Health					
Predicted exposures are not expected to exceed the DN(M)EL when the	Risk Management				
Measures/Operational Conditions outlined in Section 2 are implemented.	G22.				
Where other Dick Management Massures/Operational Conditions are ad-	anted then users should				
onsure that risks are managed to at least equivalent levels. C23	opted, then users should				
ensure that risks are managed to at least equivalent levels. G25.					
Available bazard data do not enable the derivation of a DNFL for carcinor	nenic effects G33 Available				
hazard data do not support the need for a DNFL to be established for oth	er health effects G36 Risk				
Management Measures are based on gualitative risk characterisation. G	37.				
4.2. Environment					
Guidance is based on assumed operating conditions which may not be a	oplicable 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 SpERC factsheet (<u>http://cefic.org/en/reach-for-industries-libraries.html</u>)					
[DSU4]. Scaled assessments for EU refineries have been performed using site-specific data and are					
attached in PETRORISK file in IUCLID Section 13 – "Site-Specific Production" worksheet [DSU6]. For					
refinery sites where scaling revealed a condition of unsafe use (i.e., RCRs > 1), a site-specific					
in an attempt to refine concentrative exposure accumptions and improve r	assessment was performed				
an allempt to refine conservative exposure assumptions and improve r analysis demonstrates that no refineries have RCRs>1 (see Appendix 4 a	and PETRORISK file in				
IIICLID section 13 – "Tier 2 Site Specific Production worksheet")					

9.1.2. Exposure Estimation

9.1.2.1. Human Health

See Appendix 2.a and 2.b.

9.1.2.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

9.2. Use of Heavy Fuel Oil as Intermediate – Industrial

9.2.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil				
Title				
Use as Substance as Interm	ediate			
Use Descriptor				
Sector(s) of Use		3, 8, 9		
Process Categories		1, 2, 3, 8a, 8b, 15		
		Further information on the mapping and allocation of		
		PROC codes is contained in Table 9.1		
Environmental Release Cate	egories	6a		
Specific Environmental Rele	ase Category	ESVOC SpERC 6.1a.v1		
Processes, tasks, activitie	s covered	· ·		
Use of substance as an inter	mediate within clos	sed or contained systems. Includes incidental		
exposures during recycling/	recovery, material t	ransfers, storage, sampling, associated laboratory		
activities, maintenance and l	oading (including n	narine vessel/barge, road/rail car and bulk container).		
Assessment Method	U (1)			
See Section 3.				
Section 2 Operational con	ditions and risk m	nanagement measures		
Section 2.1 Control of wor	rker exposure			
Product characteristics				
Physical form of product	Liquid, vapour pres	ssure <0.5 kPa at STP. <mark>OC3</mark> .		
Concentration of substance	Covers percentage	e substance in the product up to 100 % (unless stated		
in product	differently) G13			
Amount used	Not applicable			
Frequency and duration of	Covers daily expos	sures up to 8 hours (unless stated differently) G2		
use/exposure				
Human factors not	Not applicable			
influenced by risk				
management				
Other Operational	Operation is carrie	d out at elevated temperature (> 20°C above ambient		
Conditions affecting	temperature). OC7	Assumes a good basic standard of occupational		
exposure	hygiene is impleme	ented G1.		
Contributing Scenarios	Specific Risk Mar	nagement Measures and Operating Conditions		
Conoral moasures	Consider technical	advances and process upgrades (including		
(carcinogens) G18	automation) for the	alimination of releases. Minimise exposure using		
(carcinogens) GTO	measures such as	closed systems, dedicated facilities and suitable		
	deneral / local exh	aust ventilation. Drain down systems and clear transfer		
	lines prior to break	ing containment Clean / flush equipment where		
	nossible, prior to maintenance			
Where there is notential for exposure: Restrict access to authorised				
persons: provide specific activity training to operators to minimise				
exposures; wear suitable cloves and coveralls to prevent skin				
	ar respiratory protection when its use is identified for			
	certain contributing	scenarios; clear up spills immediately and dispose of		
	wastes safely. Ens	ure safe systems of work or equivalent arrangements		
are in place to ma		nage risks. Regularly inspect, test and maintain all		
	control measures.	Consider the need for risk based health surveillance.		
	G20			
CS15 General exposures	Handle substance	within a closed system E47. Wear chemically resistant		
(closed systems).	gloves (tested to E	N374) in combination with 'basic' employee training		
PPE16.				

S15 General exposures Handle substance within a closed system E47. Sample via a closed loop						
losed systems). + CS2 or other system to avoid exposure E8. Avoid carrying out activities						
Process sampling. +OC9	ocess sampling. +OC9 involving exposure for more than 15 minutes OC26. Wear chemically					
Outdoor	resistant gloves (tested to EN374) in combination with 'basic' employee					
	training PPE16.					
CS85 Bulk product storage.	Store substance within a closed system E84	. Avoid carrying out activities				
	involving exposure for more than 4 hours OC	C28. Wear chemically				
	resistant gloves (tested to EN374) in combin	nation with 'basic' employee				
	training PPE16.					
CS36 Laboratory activities	Handle within a fume cupboard or implemen	it suitable equivalent methods				
	to minimise exposure E12. Wear suitable glo	oves tested to EN374 PPE15.				
CS510 Marine vessel/barge	Avoid carrying out activities involving exposi	ure for more than 4 hours				
(un)loading	OC28. Transfer via enclosed lines E52. Clea	ar transfer lines prior to de-				
	coupling E39. Retain drain downs in sealed	storage pending disposal or				
	tor subsequent recycle ENV14. Wear chemi	cally resistant gloves (tested				
CS511 Road tankar/Railaar	to EN374) In combination with basic emplo	yee training PPE 10.				
	Avoid carrying out activities involving exposit	under containment or extract				
loading	ventilation E66 Wear chemically resistant of	loves (tested to EN374) in				
	combination with 'hasic' employee training P	PE16				
CS39 Equipment cleaning	Drain down and flush system prior to equipm	nent break-in or maintenance				
and maintenance	E55 Wear chemically resistant gloves (teste	ed to FN374) in combination				
	with specific activity training PPE17. Retain	drain downs in sealed storage				
	pending disposal or for subsequent recycle I	ENVT4.				
Additional information on	the basis for the allocation of the identifie	d OCs and RMMs is				
contained in Appendices 2	2 to 3					
Section 2.2 Control of env	rironmental exposure					
Product characteristics						
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4a].				
Amounts used		-				
Fraction of EU tonnage used	t in region	0.1				
Regional use tonnage (tonne	es/vear)	1.3e5				
Fraction of Regional tonnage		1.200				
Annual site tonnage (tonnes	/vear)	1.50/				
Maximum daily site toppage	(ka/day)	5.004				
Frequency and duration of		5.064				
Frequency and duration of	use					
Continuous release [FD2].		200				
Emission days (days/year)	influenced by rick management	300				
Environmental factors not	Innuenced by risk management					
Local freshwater dilution fac	tor	10				
Local marine water dilution factor 100						
Other given operational conditions affecting environmental exposure						
Pologog fraction to air from r	process (initial release prior to PMM)	1.00.5				
Release traction to wastewater from process (initial release prior to						
Release fraction to soil from process (initial release prior to RMM)						
Technical conditions and measures at process level (source) to prevent release						
Common practices yory across sites thus conservative process release estimates used [TCS4]						
Common practices vary across sites thus conservative process release estimates used [ICS1].						
releases to soil		ges, an emissions and				
Risk from environmental exposure is driven by freshwater sediment [TCR1b]. If discharging to						
domestic sewage treatment plant, no onsite wastewater treatment required [TCR9]. Prevent discharge						
domestic sewage treatment	plant, no onsite wastewater treatment require	ed [TCR9]. Prevent discharge				
of undissolved substance to	plant, no onsite wastewater treatment require or recover from onsite wastewater [TRC14].	ed [TCR9]. Prevent discharge				
of undissolved substance to Treat air emission to provide	plant, no onsite wastewater treatment require or recover from onsite wastewater [TRC14]. a typical removal efficiency of (%)	ed [TCR9]. Prevent discharge				

the required removal efficiency \geq (%)						
If discharging to domestic sewage treatment plant, provide the required	0					
onsite wastewater removal efficiency of \geq (%)						
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 pla	ant					
	-					
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8					
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8					
Maximum allowable site tonnage (M _{Safe}) based on release following total wastewater treatment removal (kg/d)	1.9e5					
Assumed domestic sewage treatment plant flow (m ³ /d)	2000					
Conditions and moscures related to external treatment of waste for	disposal					
This substance is consumed during use and no waste of the substance is	apporated to treat [ET/M/5]					
	s generated to treat [E1 W5].					
Conditions and measures related to external recovery of waste						
This substance is consumed during use and no waste of the substance is [ERW3].	s generated to recover					
Additional information on the basis for the allocation of the indentif	ied OCs and RMMs is					
contained in PETRORISK file in IUCLID Section 13						
Section 3 Exposure Estimation						
3.1. Health						
The ECETOC TRA tool has been used to estimate workplace exposures G21.	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.					
3.2. Environment						
The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk						
model [FF2]						
Section 4 Guidance to check compliance with the Exposure Scenario						
4.1. Health						
Predicted exposures are not expected to exceed the DN(M)EL when the	Risk Management					
Measures/Operational Conditions outlined in Section 2 are implemented.	G22.					
Where other Risk Management Measures/Operational Conditions are ad	opted, then users should					
ensure that risks are managed to at least equivalent levels. G23.						
Available hazard data do not enable the derivation of a DNEL for carcino	genic effects. G33. Available					
hazard data do not support the need for a DNEL to be established for oth	er health effects. G36. Risk					
Management Measures are based on qualitative risk characterisation. G37.						
4.2. Environment						
Guidance is based on assumed operating conditions which may not be a	policable to all sites: thus.					
scaling may be necessary to define appropriate site-specific risk management measures IDSU11						
Required removal efficiency for wastewater can be achieved using onsite	e/offsite technologies, either					
alone or in combination [DSU2]. Required removal efficiency for air can be achieved using onsite						
technologies, either alone or in combination IDSU31. Further details on scaling and control						
technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html)						
	/					

9.2.2. Exposure Estimation

9.2.2.1. Human Health See Appendix 2.a and 2.b.

9.2.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.3. Distribution of Heavy Fuel Oil – Industrial

9.3.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil				
Title				
Distribution of Substance				
Use Descriptor				
Sector(s) of Use		3		
Process Categories		1, 2, 3, 8a, 8b, 15 Further information on the mapping and allocation of PROC codes is contained in Table 9.1		
Environmental Release Cate	egories	1, 2, 3, 4, 5, 6a, 6b, 6c, 6d, 7		
Specific Environmental Rele	ase Category	ESVOC SpERC 1.1b.v1		
Processes, tasks, activitie	s covered			
Bulk loading (including marin or contained systems, includ maintenance and associated	ne vessel/barge, rai ling incidental expo l laboratory activitie	I/road car and IBC loading) of substance within closed sures during its sampling, storage, unloading, es.		
Assessment Method				
See Section 3.				
Section 2 Operational con	ditions and risk m	nanagement measures		
Section 2.1 Control of wor	rker exposure			
Product characteristics				
Physical form of product	Liquid			
Vapour pressure (kPa)	Liquid, vapour pres	ssure <0.5 kPa at STP. OC3.		
Concentration of substance in product	Covers percentage differently) G13	e substance in the product up to 100 % (unless stated		
Frequency and duration of use/exposure	Covers daily expos	sures up to 8 hours (unless stated differently) G2		
Other Operational Conditions affecting exposure	Assumes use at no stated differently. O hygiene is impleme	ot more than 20°C above ambient temperatures, unless G15. Assumes a good basic standard of occupational ented G1		
Contributing Scenarios	Specific Risk Mar	nagement Measures and Operating Conditions		
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			
OC9 Outdoor	 Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with thasic' employee training PPE16. 			
CS15 General exposures	Handle substance	within a closed system F47 Avoid carrying out		
(closed systems).	activities involving	exposure for more than 4 hours OC28. Sample via a		

closed loop or other system to avoid exposure E8. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.						
CS85 Bulk product storage.	Store substance within a closed system E84	Avoid carrying out activities				
involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to FN374) in combination with 'basic' employee						
	Itraining PPE16.	lation with baolo employee				
CS137 Product sampling	CS137 Product sampling Sample via a closed loop or other system to avoid exposure F8 Avoid					
	carrying out activities involving exposure for	more than 15 minutes OC26.				
	Wear chemically resistant gloves (tested to	EN374) in combination with				
	'basic' employee training PPE16.					
CS36 Laboratory activities	Handle within a fume cupboard or implement to minimise exposure E12. Wear suitable gl	nt suitable equivalent methods oves tested to EN374 PPE15.				
CS510_Marine	Avoid carrying out activities involving expos	ure for more than 4 hours				
vessel/barge (un)loading	OC28. Transfer via enclosed lines E52. Cle	ar transfer lines prior to de-				
	coupling E39. Retain drain downs in sealed	storage pending disposal or				
	for subsequent recycle ENV14. Wear chem	ically resistant gloves (tested				
CSE11 Road tankar/Railaar	Ensure meterial transfers are under contain	yee training PPE 16.				
	Ensure material transfers are under contain E66. Wear chemically resistant doves (test	ed to EN374) in combination				
loading	with 'basic' employee training PPF16					
CS39 Equipment cleaning	Drain down and flush system prior to equipr	nent break-in or maintenance				
and maintenance	E55. Wear chemically resistant gloves (test	ed to EN374) in combination				
	with specific activity training PPE17. Retain	drain downs in sealed storage				
	pending disposal or for subsequent recycle	ENVT4.				
Additional information on contained in Appendices 2	the basis for the allocation of the identifie ? to 3	ed OCs and RMMs is				
Section 2.2 Control of env	vironmental exposure					
Product characteristics						
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4a	ı].				
Amounts used						
Fraction of EU tonnage used	t in region	0.1				
Regional use tonnage (tonne	es/vear)	1 1e7				
Fraction of Regional tonnage	e used locally	2 0e-3				
Annual site tonnage (tonnes	(vear)	2 3e4				
Maximum daily site tonnage	(ka/dav)	7 704				
Frequency and duration of	(Ng/Ody)	1.104				
Continuous release [ED2]	436					
Emission days (days/year)		300				
Environmental factors not	influenced by risk management	500				
Local freshwater dilution fac	tor	10				
Local marine water dilution f	actor	100				
Other given operational co	unditions affecting environmental exposu	re				
other given operational conditions anecting environmental exposure						
Release fraction to air from process (initial release prior to RMM) 1.0e-4						
RMM) 1.0e-7						
Release fraction to soil from process (initial release prior to RMM) 0.00001						
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 condition releases to soil	is and measures to reduce or limit discha	rges, air emissions and				
Risk from environmental exp	posure is driven by humans via indirect expo	sure [TCR1j].				
No wastewater treatment rec	No wastewater treatment required [TCR6].					
Treat air emission to provide	a typical removal efficiency of (%)	90				
Treat onsite wastewater (prie	or to receiving water discharge) to provide	0				

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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 SpERC factsheet (<u>http://cefic.org/en/reach-for-industries-libraries.html</u>) [DSU4].						

9.3.2. Exposure Estimation

9.3.2.1. Human Health See Appendix 2.a and 2.b.

9.3.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.4. Formulation & (Re)packing of Heavy Fuel Oil – Industrial

9.4.1. Exposure Scenario

Section 1 Exposure Scena	ario Title Heavy Fu	iel Oil				
Title	Fitle					
Formulation & (Re)packing of Substances and Mixtures						
Use Descriptor						
Sector(s) of Use		3, 10				
Process Categories		1, 2, 3, 8a, 8b, 15				
-		Further information on the mapping and allocation of				
		PROC codes is contained in Table 9.1				
Environmental Release Cate	gories	2				
Specific Environmental Rele	ase Category	ESVOC SpERC 2.2.v1				
Processes, tasks, activities	s covered					
Formulation of the substance	e and its mixtures in	n batch or continuous operations within closed or				
contained systems, including	incidental exposur	res during storage, materials transfers, mixing,				
maintenance, sampling and	associated laborato	pry activities.				
Assessment Method						
See Section 3.						
Section 2 Operational con	ditions and risk m	anagement measures				
Section 2.1 Control of wor	ker exposure					
Product characteristics						
Physical form of product	Liquia					
Vapour pressure (KPa)	Liquid, vapour pres	SSURE < U.5 KPA at 51P. UUS.				
	Covers percentage	substance in the product up to 100 % (unless stated				
Frequency and duration of	Covers daily expos	surce up to 8 hours (uplace stated differently) G2				
	COvers daily expos					
Other Operational	Assumes use at no	ot more than 20°C above ambient temperatures, unless				
Conditions affecting	stated differently.	315 Assumes a good basic standard of occupational				
exposure	hvaiene is impleme	ented G1				
Contributing Scenarios	Specific Risk Mar	nagement Measures and Operating Conditions				
General measures	Consider technical	advances and process upgrades (including				
(carcinogens) G18	automation) for the	elimination of releases. Minimise exposure using				
	measures such as	closed systems, dedicated facilities and suitable				
	general / local exha	aust ventilation. Drain down systems and clear transfer				
	lines prior to break	ing containment. Clean / flush equipment, where				
	possible, prior to m	naintenance.				
	vvnere there is pote	ential for exposure: Restrict access to authorised				
	persons, provide si	pecific activity training to operators to minimise				
	exposures, wear a	ar respiratory protection when its use is identified for				
	certain contributing	a respiratory protection when its use is identified for				
	wastes safely. Ens	sure safe systems of work or equivalent arrangements				
	are in place to mar	nage risks. Regularly inspect, test and maintain all				
control measures. Consider the need for risk based health surveillance						
	G20					
CS15 General exposures	Handle substance	within a closed system E47. Sample via a closed loop				
(closed systems). + CS2	or other system to	avoid exposure E8. Avoid carrying out activities				
Process sampling.	involving exposure	for more than 15 minutes OC26. Wear chemically				
	resistant gloves (te	ested to EN374) in combination with 'basic' employee				
	training PPE16.					
CS15 General exposures	Handle substance	within a closed system E47. Sample via a closed loop				

(closed systems).	or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.		
CS85 Bulk product storage.	Store substance within a closed system E84. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.		
CS137 Product sampling	Sample via a closed loop or other system to carrying out activities involving exposure for Wear chemically resistant gloves (tested to 'basic' employee training PPE16.	Sample via a closed loop or other system to avoid exposure E8. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.	
CS36 Laboratory activities	Handle within a fume cupboard or impleme to minimise exposure E12. Wear suitable g	ent suitable equivalent methods ploves tested to EN374 PPE15.	
CS510 Marine vessel/barge (un)loading	Transfer via enclosed lines E52 Avoid carrying out activities involving exposure for more than 4 hours OC28Clear transfer lines prior to de- coupling E39. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16		
CS511 Road tanker/Railcar loading	Ensure material transfers are under contair E66. Wear chemically resistant gloves (tes with 'basic' employee training PPE16.	ted to EN374) in combination	
CS8 Drum/batch transfers	Ensure material transfers are under containment or extract ventilation E66. Provide a 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 chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16.		
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55. Wear chemically resistant gloves (tested to EN374) in combination with specific activity training PPE17. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.		
Additional information on contained in Appendices 2	the basis for the allocation of the identifi 2 to 3	ed OCs and RMMs is	
Section 2.2 Control of env	ironmental exposure		
Product characteristics			
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4	a].	
Amounts used			
Fraction of EU tonnage used	l in region	0.1	
Regional use tonnage (tonne	es/year)	1.1e7	
Fraction of Regional tonnage	e used locally	2.6e-3	
Annual site tonnage (tonnes	/year)	3.0e4	
Maximum daily site tonnage	(kg/day)	1.0e5	
Frequency and duration of	iuse		
Continuous release [FD2].		1	
Emission days (days/year)		300	
Environmental factors not influenced by risk management			
Local freshwater dilution factor 10		10	
Local marine water dilution is	actor	100	
Other given operational co	nditions affecting environmental exposu	Ire	
Release fraction to air from p consistent with EU Solvent E	process (after typical onsite RMMs, Emissions Directive requirements)	2.2e-3	
Release fraction to wastewa	ter from process (initial release prior to	5.0e-6	
Release fraction to soil from	Release fraction to soil from process (initial release prior to RMM) 0.0001		
Technical conditions and r	measures at process level (source) to pro	event release	

Common practices vary across sites thus conservative process release e	stimates used [TCS1].	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and		
releases to soil	gee, an enneerone and	
Risk from environmental exposure is driven by humans via indirect expos	ure [TCR1i]	
If discharging to domestic sewage treatment plant, no onsite wastewater	treatment required [TCR9].	
Prevent discharge of undissolved substance to or recover from onsite wa	stewater [TRC14]	
Treat air emission to provide a typical removal efficiency of (%)	0	
Treat onsite wastewater (prior to receiving water discharge) to provide	54.0	
the required removal efficiency \geq (%)		
If discharging to domestic sewage treatment plant, provide the required	0	
onsite wastewater removal efficiency of \geq (%)		
Organisation measures to prevent/limit release from site		
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be reclaimed [OMS3].	incinerated, contained or	
Conditions and measures related to municipal sewage treatment pla	int	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8	
Total efficiency of removal from wastewater after onsite and offsite	88.8	
(domestic treatment plant) RMMs (%)		
Maximum allowable site tonnage (M _{Safe}) based on release following total	1.1e5	
Wastewater treatment removal (Kg/d)	2000	
	2000	
Conditions and measures related to external treatment of waste for (
External treatment and disposal of waste should comply with applicable re	egulations [E I W3].	
Conditions and measures related to external recovery of waste		
External recovery and recycling of waste should comply with applicable re	egulations [ERW1].	
Additional information on the basis for the allocation of the indentifi	ed OCs and RMMs is	
contained in PETRORISK file in IUCLID Section 13		
Section 3 Exposure Estimation		
3.1. Health		
The ECETOC TRA tool has been used to estimate workplace exposures G21.	unless otherwise indicated.	
3.2. Environment		
The Hydrocarbon Block Method has been used to calculate environmenta	al exposure with the	
PETRORISK model [EE2].		
Section 4 Guidance to check compliance with the Exposure Scenar	io	
4.1. Health		
Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented.	Risk Management <mark>G22</mark> .	
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23.		
Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk		
A 2 Environment	<i>n</i> .	
I - I II danca le nacad on accilimad oparating conditione which may pat no a	onlicable to all sites: thus	
Guidance is based on assumed operating conditions which may not be a	oplicable to all sites; thus,	
scaling may be necessary to define appropriate site-specific risk manager	oplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either	
scaling may be necessary to define appropriate site-specific risk manager Required removal efficiency for wastewater can be achieved using onsite alone or in combination IDSU21. Required removal efficiency for air can	oplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either pe achieved using opsite	
scaling may be necessary to define appropriate site-specific risk manager Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be technologies, either alone or in combination [DSU3]. Further details on si	oplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either be achieved using onsite caling and control	
scaling may be necessary to define appropriate site-specific risk manager Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be technologies, either alone or in combination [DSU3]. Further details on so technologies are provided in SpERC factsheet (http://cefic.org/en/reach-fit	oplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either be achieved using onsite caling and control	
Scaling may be necessary to define appropriate site-specific risk manager Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be technologies, either alone or in combination [DSU3]. Further details on set technologies are provided in SpERC factsheet (<u>http://cefic.org/en/reach-for</u> IDSU4].	oplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either be achieved using onsite caling and control pr-industries-libraries.html)	

9.4.2. Exposure Estimation

9.4.2.1. Human Health

See Appendix 2.a and 2.b.

9.4.2.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

9.5. Uses of Heavy Fuel Oil in Coatings – Industrial

9.5.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil			
Title			
Uses in Coatings			
Use Descriptor			
Sector(s) of Use		3	
Process Categories		1, 2, 3, 8a, 8b, 15 Further information on the mapping and allocation of PROC codes is contained in Table 9.1	
Environmental Release Cate	egories	4	
Specific Environmental Rele	ase Category	ESVOC SpERC 4.3a.v1	
Processes, tasks, activitie	s covered		
Covers the use in coatings (incidental exposures during bulk and semi-bulk, applicati and associated laboratory ac	Covers the use in coatings (paints, inks, adhesives, etc) within closed or contained systems including incidental exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application activities and film formation) and equipment cleaning, maintenance and associated laboratory activities.		
Assessment Method			
See Section 3.			
Section 2 Operational con	ditions and risk m	nanagement measures	
Section 2.4. Control of way			
Section 2.1 Control of Wol	rker exposure		
Product characteristics	Liquid		
	Liquid vapour prov		
Concentration of substance	Covers percentage	ssule <0.5 kFd dl 5 FF. 005.	
in product	differently) G13		
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2		
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational bygiene is implemented G1		
Contributing Scenarios	Specific Risk Mar	nagement Measures and Operating Conditions	
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		
CS99 Film formation - force drying, stoving and other	Provide extract ver chemically resistar	ntilation to points where emissions occur E54. Wear at gloves (tested to EN374) in combination with 'basic'	
CO15 Concerct and a second	lemployee training	PPE 10.	
(closed systems).	to points where en	nissions occur E54. Provide a good standard of	

	controlled ventilation (10 to 15 air changes chemically resistant gloves (tested to EN37 employee training PPE16.	per hour) E40. Wear 4) in combination with 'basic'	
CS3 Material transfers	Provide a good standard of controlled ventilation (10 to 15 air changes per hour) E40. Wear chemically resistant gloves (tested to EN374) in		
	combination with 'basic' employee training transfers are under containment or extract	PPE16. Ensure material ventilation E66.	
CS36 Laboratory activities.	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure E12. Wear suitable gloves tested to EN374 PPE15.		
CS39 Equipment cleaning	Drain down and flush system prior to equip	ment break-in or maintenance	
and maintenance	E55. Wear chemically resistant gloves (test with specific activity training PPE17. Retain pending disposal or for subsequent recycle	ed to EN374) in combination drain downs in sealed storage ENVT4.	
CS67 Storage.	Store substance within a closed system E8 gloves (tested to EN374) in combination with PPE16.	4. Wear chemically resistant th 'basic' employee training	
Additional information on contained in Appendices 2	the basis for the allocation of the identifient of the identifient of the identifient of the identifient of the	ed OCs and RMMs is	
Section 2.2 Control of env	vironmental exposure		
Product characteristics			
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4	al.	
Amounts used		-	
Fraction of EU tonnage used	t in region	0.1	
Regional use tonnage (tonne	es/vear)	1.0e2	
Fraction of Regional tonnage	e used locally	1	
Annual site tonnage (tonnes	/vear)	1.0e2	
Maximum daily site tonnage	(kg/dav)	5.0e3	
Frequency and duration of	fuse	0.000	
Continuous release [FD2].			
Emission davs (davs/vear)		20	
Environmental factors not	influenced by risk management		
Local freshwater dilution fac	tor	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)	0.98	
Release fraction to wastewater from process (initial release prior to 2.0e-5 RMM) 2.0e-5		2.0e-5	
Release fraction to soil from	process (initial release prior to RMM)	0	
Technical conditions and	measures at process level (source) to pre	event release	
Common practices vary acro	oss sites thus conservative process release	estimates used [TCS1].	
Technical onsite condition releases to soil	is and measures to reduce or limit discha	arges, air emissions and	
Risk from environmental exp No wastewater treatment rea from onsite wastewater [TR0	oosure is driven by humans via indirect expo quired [TCR6]. Prevent discharge of undissc C14].	sure [TCR1j]. Ived substance to or recover	
Treat air emission to provide a typical removal efficiency of (%) 90			
Treat onsite wastewater (prior to receiving water discharge) to provide 0			
f discharging to domestic sewage treatment plant, provide the required 0 onsite wastewater removal efficiency of $> (\%)$			
Organisation measures to	prevent/limit release from site	•	
Do not apply industrial sludg reclaimed [OMS3].	e to natural soils [OMS2]. Sludge should be	e incinerated, contained or	
Conditions and measures	related to municipal sewage treatment pl	ant	

Estimated substance removal from wastewater via domestic sewage	88.8		
treatment (%)			
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8		
Maximum allowable site tonnage $(M_{2,2})$ based on release following total	1 105		
wastewater treatment removal (kg/d)	1.100		
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 r	egulations [ETW3].		
Conditions and measures related to external recovery of waste			
External recovery and recycling of waste should comply with applicable re	egulations [ERW1].		
Additional information on the basis for the allocation of the indentif	ied OCs and RMMs is		
contained in PETRORISK file in IUCLID Section 13			
Section 3 Exposure Estimation			
3.1. Health			
The ECETOC TRA tool has been used to estimate workplace exposures	unless otherwise indicated.		
G21.			
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 Scenar	io		
4.1. Health			
Predicted exposures are not expected to exceed the DN(M)EL when the	Risk Management		
Measures/Operational Conditions outlined in Section 2 are implemented.	G22.		
Where other Risk Management Measures/Operational Conditions are adopted, then users should			
ensure that risks are managed to at least equivalent levels. G23.			
Available hazard data do not enable the derivation of a DNEL for carcino	genic effects. G33. Available		
hazard data do not support the need for a DNEL to be established for oth	er health effects. G36. Risk		
Management Measures are based on qualitative risk characterisation. G37.			

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 SpERC factsheet (<u>http://cefic.org/en/reach-for-industries-libraries.html</u>) [DSU4].

9.5.2. Exposure Estimation

9.5.2.1. Human Health

See Appendix 2.a and 2.b.

9.5.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.6. Uses of Heavy Fuel Oil in Coatings – Professional

9.6.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil		
Title		
Uses in Coatings		
Use Descriptor		
Sector(s) of Use		22
Process Categories		1, 2, 3, 8a, 8b, 15 Further information on the mapping and allocation of PROC codes is contained in Table 9.1
Environmental Release Cate	egories	8a, 8d
Specific Environmental Rele	ase Category	ESVOC SpERC 8.3b.v1
Processes, tasks, activitie	s covered	
Covers the use in coatings (paints, inks, adhesives, etc) within closed or contained systems including incidental exposures during use (including materials receipt, storage, preparation and transfer from bulk and semi-bulk, application activities and film formation) and equipment cleaning, maintenance and associated laboratory activities.		
Assessment Method		
See Section 3.		
Section 2 Operational con	iditions and risk m	nanagement measures
Section 2.1 Control of way	rkar avpacura	
Product characteristics	iker exposure	
Physical form of product	Liquid	
Vapour pressure (kPa)	Liquid vanour pres	ssure <0.5 kPa at STP_OC3
Concentration of substance	Covers percentage	e substance in the product up to 100 % (upless stated
in product	differently) G13	
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2	
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1	
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions	
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	
Film formation - force	Handle substance	within closed systems E47 Limit the substance content
arying, stoving and other technologies CS99.	emissions occur.	% OC17. Provide extract ventilation to points where 54.
CS15 General exposures	Handle substance	within closed systems E47 Limit the substance content
(closed systems).	in the product to 5	% OC17. Provide extract ventilation to points where

	emissions occur E54.	
CS3 Material transfers	Ensure material transfers are under contain E66 Avoid carrying out activities involving ex- minutes OC26. Limit the substance content Wear chemically resistant gloves (tested to intensive management supervision controls	ment or extract ventilation xposure for more than 15 in the product to 1 % OC16. EN374) in combination with PPE18.
CS36 Laboratory activities.	Handle within a fume cupboard or implemer to minimise exposure. E12.	nt suitable equivalent methods
CS39 Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance E55 Retain drain down in sealed storage pending disposal or for subsequent recycle ENVT4. Deal with spills immediately. C&H13. Avoid carrying out activities involving exposure for more than 15 minutes OC26. Limit the substance content in the product to 1 % OC16. Wear chemically resistant gloves (tested to EN374) in combination with intensive management supervision controls PPE18. Retain drain downs in sealed storage pending disposal or for subsequent recycle ENVT4.	
CS67 Storage.	Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPE16. Store substance within a closed system. E84	
Additional information on contained in Appendices 2	the basis for the allocation of the identifie 2 to 3	ed OCs and RMMs is
Section 2.2 Control of env	vironmental exposure	
Product characteristics		
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4a].
Amounts used		-
Fraction of EU tonnage used	t in region	0.1
Regional use tonnage (tonne	es/vear)	1.0e2
Fraction of Regional tonnage	e used locally	5 0e-4
Annual site tonnage (tonnes/vear)		5 0e-2
Maximum daily site tonnage (kg/day)		1 4e-1
Frequency and duration of	fuse	
Continuous release [FD2]		
Emission days (days/year)		365
Environmental factors not	influenced by risk management	
Local frashwater dilution factor		
Local marine water dilution f	actor	100
Other given operational co	onditions affecting environmental exposu	re
·····		
Release fraction to air from wide dispersive use (regional only)		0.98
Release fraction to wastewater from wide dispersive use		0.01
Release fraction to soil from	wide dispersive use (regional only)	0.01
Technical conditions and	measures at process level (source) to pre-	vent release
Common practices vary acre	as sites thus conservative process release a	estimates used [TCS1]
Technical onsite condition	and measures to reduce or limit discha	rges air emissions and
releases to soil		
Risk from environmental exp No wastewater treatment red	posure is driven by humans via indirect exposi guired [TCR6].	sure [TCR1j].
Treat air emission to provide a typical removal efficiency of (%) N/A		N/A
Treat onsite wastewater (pri	or to receiving water discharge) to provide	0
the required removal efficier	ncy ≥ (%)	
If discharging to domestic se	ewage treatment plant, provide the required	0
onsite wastewater removal efficiency of \geq (%)		
Organisation measures to	prevent/limit release from site	incincrated contained or
not apply industrial sludg	ie to natural solis [OIVIS2]. Sludge should be	incinerated, contained or

reclaimed [OMS3].	
Conditions and measures related to municipal sewage treatment pla	ant
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8
Total efficiency of removal from wastewater after onsite and offsite (domestic treatment plant) RMMs (%)	88.8
Maximum allowable site tonnage (M _{Safe}) based on release following total wastewater treatment removal (kg/d)	7.0e-1
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 regulations [ETW3].

Conditions and measures related to external recovery of waste

External recovery and recycling of waste should comply with applicable regulations [ERW1]. Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in PETRORISK file in IUCLID Section 13

Section 3 Exposure Estimation

3.1. Health

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.

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

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23.

Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.

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 SpERC factsheet (<u>http://cefic.org/en/reach-for-industries-libraries.html</u>) [DSU4].

9.6.2. Exposure Estimation

9.6.2.1. Human Health

See Appendix 2.a and 2.b.

9.6.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.7. Use of Heavy Fuel Oil as a Fuel – Industrial

9.7.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil			
Title			
Use as a Fuel			
Use Descriptor	Use Descriptor		
Sector(s) of Use		3	
Process Categories		1, 2, 3, 8a, 8b, 16 Further information on the mapping and allocation of PROC codes is contained in Table 9.1	
Environmental Release Cate	egories	7	
Specific Environmental Rele	ase Category	ESVOC SpERC 7.12a.v1	
Processes, tasks, activitie	s covered		
Covers the use as a fuel (or systems, including incidental maintenance and handling c	fuel additives and a l exposures during of waste.	additive components) within closed or contained activities associated with its transfer, use, equipment	
Assessment Method			
See Section 3.			
Section 2 Operational con	ditions and risk m	nanagement measures	
Section 2.1 Control of wor	ker exposure		
Product characteristics			
Physical form of product			
Vapour pressure (KPa)	Liquid, vapour pres	SSURE <0.5 KPa at STP. 003.	
in product	differently) G13	Substance in the product up to 100 % (unless stated	
Frequency and duration of use/exposure	Covers daily exposures up to 8 hours (unless stated differently) G2		
Other Operational Conditions affecting exposure	Assumes use at not more than 20°C above ambient temperatures, unless stated differently. G15. Assumes a good basic standard of occupational hygiene is implemented G1		
Contributing Scenarios	Scenarios Specific Risk Management Measures and Operating Conditions		
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		
CS15 General exposures (closed systems).	Handle substance or other system to involving exposure resistant gloves (te training PPE16	within a closed system E47. Sample via a closed loop avoid exposure E8. Avoid carrying out activities of more than 4 hours OC28. Wear chemically ested to EN374) in combination with 'basic' employee	
CS15 General exposures	Handle substance	within a closed system E47. Sample via a closed loop	

(closed systems). + CS137 Product sampling	or other system to avoid exposure E8. Avoid carrying out activities	
r roudot ourriphing.	of controlled ventilation (10 to 15 air changes per hour) E40. Wear	
	chemically resistant gloves (tested to EN3	74) in combination with 'basic'
	employee training PPE16.	-
CS502 Bulk closed unloading + OC9 Outdoor	Transfer via enclosed lines E52. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves	
CS8 Drum/batch transfore	(lested to EN374) In combination with bas	ic employee training PPE 16.
	Ensure material transfers are under contain E66. , or (G9): Provide a good standard of the 2 to E sin changes per hour) E11	general ventilation (not less
	Avoid carrying out activities involving expo	sure for more than 1 hour
	OC27. Wear chemically resistant gloves (t with 'basic' employee training PPE16.	ested to EN374) in combination
CS 117 Operation of solids	Provide a good standard of general ventila	tion (not less than 3 to 5 air
filtering equipment	changes per hour) E11. Avoid carrying out activities involving exposure for more than 4 hours OC28. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training PPF16.	
CS85 Bulk product storage.	Store substance within a closed system E8	34. Provide a good standard of
	general ventilation (not less than 3 to 5 air	changes per hour) E11. Avoid
	Wear chemically resistant gloves (tested to 'basic' employee training PPE16.	or more than 4 hours OC28. (c) EN374) in combination with
GEST_12I Use as a fuel.	Wear chemically resistant gloves (tested to	EN374) in combination with
CS 107 (closed system)	'basic' employee training PPE16.	
CS39 Equipment cleaning	Drain down and flush system prior to equip	ment break-in or maintenance
and maintenance	E55. Wear chemically resistant gloves (tes	ted to EN374) in combination
	nepding disposal or for subsequent recycle	
Additional information on	the basis for the allocation of the identif	ied OCs and RMMs is
contained in Appendices 2	2 to 3	
Section 2.2 Control of env	vironmental exposure	
Product characteristics		
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4	a].
Amounts used		-
Fraction of EU tonnage used	t in region	0.1
Regional use tonnage (tonne	es/vear)	1 1e7
Fraction of Regional tonnage	e used locally	1 4e-1
Annual site tonnage (tonnes	/vear)	1.5e6
Maximum daily site tonnage	(kg/day)	5.0e6
Frequency and duration of	fuse	
Continuous release [FD2].		
Emission days (days/year)		300
Environmental factors not	influenced by risk management	-
Local freshwater dilution fac	tor	10
Local marine water dilution factor		100
Other given operational co	onditions affecting environmental expositions	ure
Release fraction to air from process (initial release prior to RMM) 7.0e-4		7.0e-4
Release fraction to wastewa RMM)	Release fraction to wastewater from process (initial release prior to 4.4e-7	
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 acro	oss sites thus conservative process release	estimates used [TCS1].
Technical onsite condition	is and measures to reduce or limit disch	arges, air emissions and
releases to soil		

Risk from environmental exposure is driven by freshwater sediment [TCF	R1b].	
Additional onsite wastewater treatment required [TCR13]. Prevent dischato or recover from onsite wastewater [TRC14].	rge of undissolved substance	
Treat air emission to provide a typical removal efficiency of (%)	95	
Treat onsite wastewater (prior to receiving water discharge) to provide	87.7	
the required removal efficiency \geq (%)		
If discharging to domestic sewage treatment plant, provide the required	0	
onsite wastewater removal efficiency of \geq (%)		
Organisation measures to prevent/limit release from site		
Do not apply industrial sludge to natural soils [OMS2]. Sludge should be reclaimed [OMS3].	incinerated, contained or	
Conditions and measures related to municipal sewage treatment pla	int	
Estimated substance removal from wastewater via domestic sewage treatment (%)	88.8	
Total efficiency of removal from wastewater after onsite and offsite	88.8	
(domestic treatment plant) RMMs (%)		
Maximum allowable site tonnage (M _{Safe}) based on release following total wastewater treatment removal (kg/d)	5.2e6	
Assumed domestic sewage treatment plant flow (m ³ /d)	2000	
Conditions and moscures related to external treatment of waste for	disposal	
Conditions and measures related to external treatment of wasterior	W11 Compution opications	
considered in regional exposure assessment [ETW2]	W IJ. Compustion emissions	
Conditions and measures related to external recovery of waste		
This substance is consumed during use and no waste of the substance is	apperated to recover	
[ERW3].	generated to recover	
Additional information on the basis for the allocation of the indentif	ied OCs and RMMs is	
Contained in PETRORISK file in IUCLID Section 13		
Section 3 Exposure Estimation		
3.1. Health		
2.2. Environment		
3.2. Environment The Undreasthen Disck Method has been used to coloulate environment	al avecause with the	
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		
Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented.	Risk Management	
	622.	
Where other Risk Management Measures/Operational Conditions are ad- ensure that risks are managed to at least equivalent levels. G23.	opted, then users should	
Where other Risk Management Measures/Operational Conditions are ad- ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcino- hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3	opted, then users should genic effects. G33. Available ler health effects. G36. Risk	
Where other Risk Management Measures/Operational Conditions are ade ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinon hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment	genic effects. G33. Available er health effects. G36. Risk	
Where other Risk Management Measures/Operational Conditions are ade ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinon hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be technologies, either alone or in combination [DSU3]. Further details on s technologies are provided in SpERC factsheet (<u>http://cefic.org/en/reach-f</u> [DSU4].	genic effects. G33. Available genic effects. G33. Available er health effects. G36. Risk 87. pplicable to all sites; thus, ment measures [DSU1]. coffsite technologies, either be achieved using onsite caling and control or-industries-libraries.html)	

9.7.2. Exposure Estimation

9.7.2.1. Human Health

See Appendix 2.a and 2.b.

9.7.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.8. Use of Heavy Fuel Oil as a Fuel – Professional

9.8.1. Exposure Scenario

Section 1 Exposure Scenario Title Heavy Fuel Oil		
Title		
Use as a Fuel		
Use Descriptor		
Sector(s) of Use		22
Process Categories		1, 2, 3, 8a, 8b, 16 Further information on the mapping and allocation of PROC codes is contained in Table 9.1
Environmental Release Cate	egories	9a, 9b
Specific Environmental Rele	ase Category	ESVOC SpERC 9.12b.v1
Processes, tasks, activities	s covered	
Covers the use as a fuel (or systems, including incidental maintenance and handling o	fuel additives and a l exposures during of waste.	additive components) within closed or contained activities associated with its transfer, use, equipment
Assessment Method		
See Section 3.		
Section 2 Operational con	ditions and risk m	nanagement measures
Section 2.1 Control of wor	ker exposure	
Product characteristics		
Physical form of product	Liquia	
Vapour pressure (KPa)	Liquid, vapour pres	ssure <0.5 kPa at STP. 003.
in product	Covers percentage	e substance in the product up to 100 % (unless stated
Frequency and duration of	Covers daily expos	sures up to 8 hours (unless stated differently) G2
use/exposure	00.0.0	
Other Operational	Assumes use at not more than 20°C above ambient temperatures, unless	
Conditions affecting	stated differently. G15. Assumes a good basic standard of occupational	
exposure	hygiene is implemented G1	
Contributing Scenarios	Specific Risk Management Measures and Operating Conditions	
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	
CS15 General exposures (closed systems). + CS137 Product sampling.	Handle substance or other system to involving exposure of controlled ventile chemically resistar activity training PP	within a closed system E47. Sample via a closed loop avoid exposure E8. Avoid carrying out activities for more than 1 hour OC27. Provide a good standard ation (10 to 15 air changes per hour) E40. Wear at gloves (tested to EN374) in combination with specific PE17.

CS15 General exposures	Handle substance within a closed system	E47. Sample via a closed loop		
(closed systems).	or other system to avoid exposure E8. Av	oid carrying out activities		
()-	involving exposure for more than 1 hour C	C27. Provide a good standard		
	of controlled ventilation (10 to 15 air chan	ges per hour) <mark>E40</mark> . Wear		
	chemically resistant gloves (tested to EN3	74) in combination with 'basic'		
	employee training PPE16.	,		
CS502 Bulk closed	Provide a good standard of controlled ventilation (10 to 15 air changes			
unloading	per hour) E40. Wear chemically resistant	gloves (tested to EN374) in		
-	combination with 'basic' employee training	PPE16. Avoid carrying out		
	activities involving exposure for more than	1 hour OC27. , or G9: Ensure		
	material transfers are under containment	or extract ventilation E66.		
CS8 Drum/batch transfers	h transfers Provide a good standard of controlled ventilation (10 to 15 air cha			
	per hour) E40. Wear chemically resistant	gloves (tested to EN374) in		
	combination with 'basic' employee training) PPE16.		
	Avoid carrying out activities involving expo	osure for more than 1 hour		
	UC27., or G9: Ensure material transfers a	are under containment or extract		
CSE07 Defuelling	Finaliation E00.	inment or extract ventilation		
CS507 Reideling	Ensure material transfers are under conta	sted to EN374) in combination		
	with 'hasic' employee training PPE16 Ave	and carrying out activities		
	involving exposure for more than 1 hour (C_{27}		
GEST 12LUse as a fuel.	Wear chemically resistant gloves (tested t	o EN374) in combination with		
CS 107 (closed system)	'basic' employee training PPE16.			
CS39 Equipment cleaning	Provide a good standard of general ventila	ation (not less than 3 to 5 air		
and maintenance	changes per hour) E11. Wear chemically	resistant gloves (tested to		
	EN374) in combination with specific activi	ty training PPE17. Drain down		
	system prior to equipment break-in or mai	ntenance E65. Retain drain		
	downs in sealed storage pending disposa	or for subsequent recycle		
	ENVT4. Clear spills immediately C&H13.			
Additional information on	the basis for the allocation of the identi	fied OCs and RMMs is		
contained in Appendices 2	2 to 3 vironmontal experiure			
Broduct characteristics				
Substance is complex UVC	P. [Pro2] Prodominantly hydrophobia [Pro	4.01		
		чај.		
Amounts used				
Fraction of EU tonnage used	d in region	0.1		
Regional use tonnage (tonn	es/year)	3.3e5		
Fraction of Regional tonnag	e used locally	5.0e-4		
Annual site tonnage (tonnes	/year)	1.7e2		
Maximum daily site tonnage	(kg/day)	4.6e2		
Frequency and duration o	fuse			
Continuous release [FD2].				
Emission days (days/year)		365		
Environmental factors not	influenced by risk management	·		
Local freshwater dilution fac	tor	10		
Local marine water dilution	actor	100		
Other given operational co	onditions affecting environmental expos	ure		
Release fraction to air from	wide dispersive use (regional only)	1.0e-4		
Release fraction to wastewa	0.00001			
Release fraction to soil from	wide dispersive use (regional only)	0.00001		
Technical conditions and	measures at process level (source) to p	revent release		
Common practices years com		estimates used ITCS1		
Tochnical onsite condition	and mossures to reduce or limit discl	coundes used [1031].		
releases to soil	is and measures to reduce or minit discr	iaiyes, ali elilissiolis aliu		
	osuro is drivon by humans via indiract ovn			

No wastewater treatment required [TCR6]	
Treat air emission to provide a typical removal efficiency of (%)	N/A
Treat onsite wastewater (prior to receiving water discharge) to provide	0
the required removal efficiency $> (\%)$	0
If discharging to domestic sewage treatment plant, provide the required	0
onsite wastewater removal efficiency of $> (\%)$	0
Organisation measures to prevent/limit release from site	
Do not apply industrial sludge to patural soils [OMS2]. Sludge should be	incinerated contained or
reclaimed IOMS31	incinerated, contained of
Conditions and measures related to municipal sewage treatment pla	unt
Estimated substance removal from wastewater via domestic sewage	88.8
treatment (%)	00.0
Total efficiency of removal from wastewater after onsite and offsite	88.8
(domestic treatment plant) RMMs (%)	00.0
Maximum allowable site tonnage (M_{rest}) based on release following total	2 3e3
wastewater treatment removal (kg/d)	2.000
Assumed domestic sewage treatment plant flow (m^3/d)	2000
Conditions and measures related to outernal theatment of wests for	
Conditions and measures related to external treatment of waste for	
	wij. Compustion emissions
Considered in regional exposure assessment [E1W2].	
This substance is consumed during use and no wests of the substance is	apparated to receiver
[ERW3].	s generated to recover
Additional information on the basis for the allocation of the indentifi	ied OCs and RMMs is
contained in PETRORISK file in IUCLID Section 13	
Section 3 Exposure Estimation	
Section 3 Exposure Estimation 3.1. Health	
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures	unless otherwise indicated.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21.	unless otherwise indicated.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment	unless otherwise indicated.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environment	unless otherwise indicated. al exposure with the Petrorisk
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2].	unless otherwise indicated. al exposure with the Petrorisk
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar	unless otherwise indicated. al exposure with the Petrorisk
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health	unless otherwise indicated. al exposure with the Petrorisk
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the	unless otherwise indicated. al exposure with the Petrorisk io Risk Management
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented.	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22.
 Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. 	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are additional conditional conditions are additional conditions are additional conditional conditions are additional conditional conditions are additional conditional conditions are additional conditional conditiconal conditional conditional conditional cond	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are add ensure that risks are managed to at least equivalent levels. G23.	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addrensure that risks are managed to at least equivalent levels. G23.	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addrensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinop	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentation model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addrensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinophazard data do not support the need for a DNEL to be established for other	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk
 Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinophazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available ier health effects. G36. Risk 87.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are add ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinop hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk 87.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are address ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinop hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk 37.
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentate model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addrensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinop hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available the health effects. G36. Risk 87.
 Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentate model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are addrensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinophazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage Required removal efficiency for wastewater can be achieved using onsite	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk 87. pplicable to all sites; thus, ment measures [DSU1].
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentate model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are address ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinon hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be have based on as eachieved in second s	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available ter health effects. G36. Risk 87. pplicable to all sites; thus, ment measures [DSU1]. /offsite technologies, either be achieved using onsite pairing and central
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmentate model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are address ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinon hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can be technologies, either alone or in combination [DSU3]. Further details on s	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk 87. oplicable to all sites; thus, ment measures [DSU1]. Joffsite technologies, either be achieved using onsite caling and control
Section 3 Exposure Estimation 3.1. Health The ECETOC TRA tool has been used to estimate workplace exposures G21. 3.2. Environment The Hydrocarbon Block Method has been used to calculate environmenta model [EE2]. Section 4 Guidance to check compliance with the Exposure Scenar 4.1. Health Predicted exposures are not expected to exceed the DN(M)EL when the Measures/Operational Conditions outlined in Section 2 are implemented. Where other Risk Management Measures/Operational Conditions are add ensure that risks are managed to at least equivalent levels. G23. Available hazard data do not enable the derivation of a DNEL for carcinop hazard data do not support the need for a DNEL to be established for oth Management Measures are based on qualitative risk characterisation. G3 4.2. Environment Guidance is based on assumed operating conditions which may not be a scaling may be necessary to define appropriate site-specific risk manage Required removal efficiency for wastewater can be achieved using onsite alone or in combination [DSU2]. Required removal efficiency for air can b technologies, either alone or in combination [DSU3]. Further details on s technologies are provided in SpERC factsheet (<u>http://cefic.org/en/reach-f</u>	unless otherwise indicated. al exposure with the Petrorisk io Risk Management G22. opted, then users should genic effects. G33. Available er health effects. G36. Risk 37. pplicable to all sites; thus, ment measures [DSU1]. //offsite technologies, either be achieved using onsite caling and control or-industries-libraries.html)

9.8.2. Exposure Estimation

9.8.2.1. Human Health

See Appendix 2.a and 2.b.

9.8.2.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

9.9. Use of Heavy Fuel Oil in Road and Construction Applications – Professional

9.9.1. Exposure Scenario

Section 1 Exposure Scena	ario Title Heavy Fu	iel Oils	
Title			
Use in Road and Construction	on Applications		
Use Descriptor			
Sector(s) of Use		22	
Process Categories		8a, 8b Further information on the mapping and allocation of PROC codes is contained in Table 9.1	
Environmental Release Cate	egories	8d, 8f	
Specific Environmental Rele	ase Category	ESVOC SpERC 8.15.v1	
Processes, tasks, activitie	s covered		
Covers the use of surface co incidental exposures during	batings and binders material transfers a	within closed or contained systems, including nd filling operations.	
See Section 3			
Section 2 Operational con	ditions and risk m	anagement measures	
Section 2.1 Control of wor	rker exposure		
Product characteristics			
Physical form of product	Liguid		
Vapour pressure (kPa)	Liquid, vapour pres	ssure <0.5 kPa at STP. OC3.	
Concentration of substance in product	Covers percentage differently) G13	e substance in the product up to 100 % (unless stated	
Frequency and duration of use/exposure	Covers daily expos	sures up to 8 hours (unless stated differently) G2	
Other Operational Conditions affecting exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature). OC7. Assumes a good basic standard of occupational bygiene is implemented C1		
Contributing Scenarios	Specific Risk Mar	nagement Measures and Operating Conditions	
General measures (carcinogens) G18	Consider technical automation) for the measures such as general / local exh lines prior to break possible, prior to m Where there is pot persons; provide s exposures; wear s contamination; wea certain contributing wastes safely. Ens are in place to mar control measures. G20	advances and process upgrades (including e elimination of releases. Minimise exposure using closed systems, dedicated facilities and suitable aust ventilation. Drain down systems and clear transfer ing containment. Clean / flush equipment, where naintenance. ential for exposure: Restrict access to authorised pecific activity training to operators to minimise uitable gloves and coveralls to prevent skin ar respiratory protection when its use is identified for g scenarios; clear up spills immediately and dispose of sure safe systems of work or equivalent arrangements nage risks. Regularly inspect, test and maintain all Consider the need for risk based health surveillance.	
CS3 Material transfers	Ensure material tra E66 Avoid carrying minutes OC26. Lin Wear chemically re intensive manager	ansfers are under containment or extract ventilation g out activities involving exposure for more than 15 nit the substance content in the product to 1 % OC16. esistant gloves (tested to EN374) in combination with nent supervision controls PPE18.	
		is a system prior to equipment break-in or maintenance	

and maintenance	E55 Retain drain down in sealed storage pe	nding disposal or for				
	subsequent recycle ENVT4. Deal with spills immediately. C&H13. Avoid					
	carrying out activities involving exposure for more than 15 minutes OC26					
	Limit the substance content in the product to 1 % OC16. Wear chemically					
	resistant doves (tested to EN374) in combin	ation with intensive				
	management supervision controls PPF18 Retain drain downs in sealed					
	storage pending disposal or for subsequent recycle FNVT4					
Additional information on	Inditional information on the basis for the allocation of the identified OCs and RMMs is					
contained in Appendices 2	2 to 3					
Section 2.2 Control of env	vironmental exposure					
Product characteristics						
Substance is complex UVCE	3 [PrC3]. Predominantly hydrophobic [PrC4a	1.				
Amounts used						
Fraction of EU tonnage used	t in region	0 1				
Regional use tonnage (tonne	es/vear)	2 204				
Fraction of Pegional tonnage						
		1 1 2 1				
Annual site tornage (tornes						
Maximum daily site tonnage	(kg/day)	3.001				
Frequency and duration of	r use					
Continuous release [FD2].		0.07				
Emission days (days/year)	the fillen and the second s	365				
Environmental factors not	Influenced by risk management					
Local freshwater dilution fac	tor	10				
Local marine water dilution f	actor	100				
Other given operational co	onditions affecting environmental exposur	e				
Pologoo fraction to air from	vide dispersive use (regional only)	0.05				
Release fraction to all from t	wide dispersive use (regional only)	0.95				
Release fraction to wastewa	ter from wide dispersive use	0.01				
Release fraction to soil from wide dispersive use (regional only) 0.04						
Technical conditions and i	measures at process level (source) to prev	vent release				
Common practices vary acro	oss sites thus conservative process release e	stimates used [TCS1].				
Technical onsite condition	is and measures to reduce or limit discha	rges, air emissions and				
releases to soil						
Risk from environmental exp	oosure is driven by numans via indirect expos	sure [ICR1]].				
Il discharging to domestic se	wage treatment plant, no onsite wastewater					
Treat an emission to provide	a typical removal emclency of (%)	IN/A				
the required removal efficien	or to receiving water discharge) to provide $p(x) > (\%)$	30.2				
If discharging to domestic se	wage treatment plant provide the required	0				
onsite wastewater removal e	Efficiency of $>$ (%)	0				
Organisation measures to	prevent/limit release from site					
Do not apply industrial sludg	e to natural soils [OMS2]. Sludge should be	incinerated. contained or				
reclaimed [OMS3].	,					
Conditions and measures	related to municipal sewage treatment pla	ant				
	· · · ·					
Estimated substance remova	al from wastewater via domestic sewage	88.8				
Total efficiency of removal fr	om wastewater after onsite and offsite	88.8				
(domestic treatment plant) R						
Maximum allowable site ton	1.1e2					
wastewater treatment remov	2000					
Assumed domestic sewage						
Containions and measures related to external treatment of waste for disposal						
External treatment and dispo	Liternal treatment and disposal of waste should comply with applicable regulations [⊏1 W3].					
Conditions and measures	Conditions and measures related to external recovery of waste					

External recovery and recycling of waste should comply with applicable regulations [ERW1]. Additional information on the basis for the allocation of the indentified OCs and RMMs is contained in PETRORISK file in IUCLID Section 13

Section 3 Exposure Estimation

3.1. Health

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. G21.

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

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. G22.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels. G23.

Available hazard data do not enable the derivation of a DNEL for carcinogenic effects. G33. Available hazard data do not support the need for a DNEL to be established for other health effects. G36. Risk Management Measures are based on qualitative risk characterisation. G37.

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 SpERC factsheet (<u>http://cefic.org/en/reach-for-industries-libraries.html</u>) [DSU4].

9.9.2. Exposure Estimation

9.9.2.1. Human Health

See Appendix 2.a and 2.b.

9.9.2.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

9.10. Regional Environment Exposure Estimation See *PETRORISK file in IUCLID Section 13 –* "RegionalCSR" worksheet

10. RISK CHARACTERISATION

10.1. Manufacture of Heavy Fuel Oil - Industrial

10.1.1. Human Health

See Appendix 3.a and 3.b.

10.1.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

10.2. Use of Heavy Fuel Oil as Intermediate – Industrial

10.2.1. Human Health

See Appendix 3.a and 3.b.

10.2.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

10.3. Distribution of Heavy Fuel Oil – Industrial

10.3.1. Human Health

See Appendix 3.a and 3.b.

10.3.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

10.4. Formulation & (Re)packing of Heavy Fuel Oil – Industrial

10.4.1. Human Health

See Appendix 3.a and 3.b.

10.4.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

10.5. Uses of Heavy Fuel Oil in Coatings – Industrial

10.5.1. Human Health

See Appendix 3.a and 3.b.

10.5.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

10.6. Uses of Heavy Fuel Oil in Coatings – Professional

10.6.1. Human Health

See Appendix 3.a and 3.b.

10.6.2. Environment

See PETRORISK file in IUCLID Section 13 – "LocalCSR" worksheet

10.7. Uses of Heavy Fuel Oil as a Fuel – Industrial

10.7.1. Human Health

See Appendix 3.a and 3.b.

10.7.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

10.8. Uses of Heavy Fuel Oil as a Fuel – Professional

10.8.1. Human Health

See Appendix 3.a and 3.b.

10.8.2. Environment

See PETRORISK file in IUCLID Section 13 - "LocalCSR" worksheet

10.9. Uses of Heavy Fuel Oil in Road and Construction Applications – Professional

10.9.1. Human Health See Appendix 3.a and 3.b.

10.9.2. Environment See *PETRORISK file in IUCLID Section* 13 – "LocalCSR" worksheet

10.10. Overall exposure (combined for all relevant emission/release sources)

10.10.1. Human health (combined for all exposure routes) See Appendix 3.a & 3.b.

10.10.2. Environment (combined for all exposure routes)

Combined exposures can be calculated with information provided on the individual exposure scenarios presented in section 9. However, it is unclear how to define risk management measures resulting from this analysis.

10.11. Regional Environment

See PETRORISK file in IUCLID Section 13 - "RegionalCSR" worksheet

APPENDIX 2: Exposure Estimations

Appendix 2.a. Exposure Estimation

Appendix 2.b. Qualitative Exposure Estimation

Qualitative Exposure Estimation for R20 substances

There is a difference of at least a factor of 30 between the short-term (when expressed over 15 minutes) and the long term DNELs (when expressed over 8 hours)), i.e. the long-term DNEL is lower by at least 30x. In these circumstances a quantitative assessment of short-term exposure assessment has not be undertaken based on the following rationale:

For any single short term (ST) event to adversely influence the implementation of the long term (LT) reference value (DNEL when available) in the CSA, then the single ST exposure must be ~30x greater than the LT DNEL. Where the ST exposure might be repeated during the course of an activity, then the contribution made by the ST exposures to the LT average would clearly be greater. Hence, provided daily average exposures are controlled to within the LT reference value, then this will also account for any potential risks arising from ST exposure.

Qualitative Exposure Estimation for R45 substances

The R45 risk phrase (may cause cancer) relates to the strength of evidence to indicate that the substance may cause cancer in humans. When a carcinogenic substance is considered a threshold carcinogen and/or if appropriate dose-response data from epidemiological and/or animal studies are available, it may be possible to derive a DMEL which should then be used in quantitative risk characterisation to define the appropriate RMMs... However, when a carcinogenic substance is considered a non-threshold carcinogen and/or if appropriate dose-response data from epidemiological and/or animal studies are and/or animal studies are not available, it is not possible to derive a DMEL, and hence a qualitative approach to the CSA will be required.

This general qualitative CSA approach aims to reduce/avoid exposure or incidents with the substance consistent with the expectations of Directive 2004/37/EC. The general philosophy is twofold:

- 1. that the uses of any R45 substance are limited to suitably equipped industrial or professional settings and will only be supported in circumstances where exposure potential is limited (PROCs *1, 2, 3, 8a (maintenance only), 8b, 9, 15, and 16)* and will not cover those situations where exposure to the substance might be expected to be significant (such as PROCs 7, 11, 17, 18, etc). This limitation on use is consistent with the current expectations of Directive 2004/37/EC.
- 2. That a stringent set of RMMs will be applied. Firstly, exposures should be controlled to at least the levels that represent an acceptable level of risk (i.e. represent a RCR of <1 for the DMEL or the otherwise critical non-carcinogenic adverse effect associated with exposure to the substance (the lowest DNEL is used for a quantitative CSA)). Secondly, that rigorous systems of control are implemented to manage exposures in addition to and independent of the risk measures required to manage non-cancer endpoints (and which are described via the use of standard phrases linked to defined circumstances of use), with the aim that the net outcome is the description of the RMMs that when implemented ensure that the likelihood of cancer occurring is minimised, and the risk is considered to be controlled.</p>

Qualitative Exposure Estimation for R66 substances

For substances and preparations that do not meet the criteria for R38 but which may cause concern as a result of skin dryness, flaking or cracking, the risk phrase R66 (Repeated exposure may cause skin dryness or cracking) shall be used. Decisions for applying this phrase are derived either from practical observation after normal handling and use or from other relevant information used to predict effects on the skin.

The R66 risk phrase is generally applied to petroleum substances and solvents that have the capacity to extract lipids from the skin and that are not classified as skin irritant. R66 does not relate to a classifiable endpoint, and there is no standardized test method to quantify the effect. Thus, a DNEL cannot be derived.

Note that R66 is an "additional" risk phrase which means that it shall be applied only to substances or preparations that are already classified whilst assignment of the risk phrase R66 does not, in itself, have any impact on the formal classification of the substance.

This general qualitative CSA approach aims to reduce/avoid contact or incidents with the substance. However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance. Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.

For skin defatting a qualitative risk characterisation has been conducted. Handling and storage risk management measures that are generally identified for skin defatting risks are outlined in Appendix 3.b. A review of these RMMs indicates that if the user complies with the following generic statement, risks due to skin defatting are considered to be controlled. For any substance, classified as R66, these measures should be communicated via the safety data sheet by use of the following phrase:

• PPE20: If repeated and/or prolonged skin exposure to the substance is likely, then wear suitable gloves tested to EN374 and provide employee skin care programmes

APPENDIX 3: Risk Characterisations

Appendix 3.a. Risk Characterisation

Appendix 3.b. Qualitative Risk Characterisation

Qualitative Risk Characterisation for R20 substances

A quantitative assessment of short term exposure has not been undertaken as there is a difference of at least a factor of 30 between the short term (when expressed over 15 minutes) and the long term DNEL (when expressed over 8 hours) DNELs.

Qualitative Risk Characterisation for R45 substances

In the case of carcinogens (substances classified as R45), comprehensive EU legislation already exists that establishes a framework of expectations that can be used as the basis for applying a qualitative approach for any CSA. Specifically Directive <u>2004/37/EC</u> of the European Parliament and the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work (Sixth individual Directive within the meaning of Article 16(1) of Council Directive <u>89/391/EEC</u>) sets out the minimum requirements for protecting workers who may be exposed to carcinogens and mutagens during work activities Preventive measures must be taken for the protection of the health and safety of workers exposed to carcinogens or mutagens. The implementation of following RMMs, which build from the existing legal provisions, is intended to ensure that the likelihood of cancer occurring is minimised.

For the cancer hazard a qualitative risk characterisation has been conducted consistent with the considerations and risk management measures identified in the Table below.

Hazard	Material Risk	Examples of Relevant S	Components of the Qualitative
	Haza	Phrases and P Statements	Risk Assessment
Cancer (R45)	• Liquid R45 H350	 S23: Do not breathe gas/fumes/vapour/spray S24: Avoid contact with skin S51: Use only in well- ventilated areas 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. P201: Obtain special instructions before use. P202: Do not handle until all safety precautions have been read and understood. P260: Do not breathe dust/fume/gas/mist/vapours/spr ay. P281: Use personal protective equipment as required. Response: P308 + P313: If exposed or 	 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
			 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) 	

For any substance, classified as R45, these risk management measures will be communicated via the Exposure Scenario by use of the following phrases:

For <u>every</u> exposure scenario, the following general phrase will 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.

Contributing Scenarios	Risk Management Measures
(examples)	(all included in Exposure Scenarios – for R45 substances)
CS2 Process sampling	Sample via a closed loop or other system to avoid exposure. E8.
CS14 Bulk transfers (incl. CS501) And related phrases such as CS6, CS8.	Ensure material transfers are under containment or extract ventilation. E66.
CS15 General exposures (closed systems) And related phrases	Handle substance within a closed system. E47.
CS507 Refuelling	Ensure material transfers are under containment or extract ventilation. E66.
CS36 Laboratory activities	Handle within a fume cupboard or implement suitable equivalent methods to minimise exposure. E12.
CS5 Equipment maintenance AND CS39 Equipment cleaning and maintenance	Either: Drain down and flush system prior to equipment break-in or maintenance. E55; Or; Drain down system prior to equipment break-in or
	maintenance. E65. And; Retain drain downs in sealed storage pending disposal or

In addition the following specific phrases will also be applied, where the identified contributing scenarios are relevant within any Exposure Scenario

	for subsequent recycle. ENVT4. Clear spills immediately. C&H13.
CS67 Storage	Store substance within a closed system. E84.

Qualitative Risk Characterisation for R66 substances

The implementation of relevant RMMs will ensure that the likelihood of an event occurring due to the substance hazard of skin defatting is negligible and the risk is considered to be controlled to a level of no concern.

For skin defatting a qualitative risk characterisation has been conducted consistent with the considerations and risk management measures identified in the Table below.

Hazard	Material	Risk / Hazard Phrase	Examples of Relevant S Phrases and P Statements	Components of the Qualitative Risk Assessment
Skin defatting (R66)	• Liquid	R66 / EUH066 Repeated exposure may cause skin dryness or cracking	No designated S and P phrases are assigned, though the following phrase may be appropriate: S24 Avoid contact with skin Response: • P280: Wear protective gloves/protect ive clothing/eye protection/fac e protection. • P281: Use personal protective equipment as required.	 Implementation of basic standards of occupational hygiene; Avoid repeated and/or prolonged skin contact with product; Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination promptly; Avoid splashes and spills; Avoidance of contact with contaminated tools and objects; Clean up contamination/spills; Regular cleaning of equipment and work area; Management/supervision 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 effects that may develop; Good standard of personal hygiene.

For any substance, classified as R66, these measures should be communicated via the safety data sheet by use of the following phrase:

• PPE20: If repeated and/or prolonged skin exposure to the substance is likely, then wear suitable gloves tested to EN374 and provide employee skin care programmes

APPENDIX 4: REACH Tier II Environmental Risk Assessment of Heavy Fuel Oil Components Manufactured at European Refineries

Tier II Environmental Risk Assessment of Heavy Fuel Oil Components Manufactured at European Refineries

The Petrorisk model has been applied to assess the risks of Heavy Fuel Oil (HFO) manufacture in the framework of REACH. The model first calculates the risk characterization ratios (RCRs) for a generic refinery scenario and then scales these results to characterize risks for specific refineries using site-specific data.

To develop initial exposure estimates, the Sector Specific Environmental Release Category (SpERC) for the manufacturing generic exposure scenario is used. This SpERC provides a number of key default parameters such as the site tonnage, release fraction to wastewater, wastewater flow and the receiving water dilution factor that are required inputs for generic exposure calculations.

Since HFO is a complex substances (i.e. UVCB), assumptions must also be invoked regarding the composition of the substance and associated emissions. Substance composition is characterized based on analysis of multiple HFO samples using two-dimensional gas chromatography. These analytical results are used to determine a typical HFO composition that is defined in terms of the weight percent of various structural classes and carbon numbers, i.e. hydrocarbon blocks. To simulate the HFO substance composition this distribution is then mapped to a library of 1500 representative hydrocarbon structures that are included in the Petrorisk model. The composition of HFO wastewater emissions is then estimated from the simulated substance composition by applying Raoult's Law. This ensures that the water solubility of the representative hydrocarbons is taken into account in emissions estimation.

Given the SpERC site tonnage and wastewater release fraction coupled with the simulated wastewater composition described above, wastewater emissions of each HFO structure are determined. The corresponding predicted wastewater influent concentrations are then calculated by dividing the structure-specific emission by the generic wastewater treatment flow. These predicted influent concentrations are then reduced by the structure-specific wastewater treatment removal that is obtained using the SimpleTreat model. The resulting predicted effluent concentrations for each HFO structure is then used to calculate surface or marine water concentrations by dividing by the default dilution factor. Sediment concentrations are calculated from predicted water concentrations using equilibrium partitioning theory. Risks associated with concentrations of each structure in effluent, water and sediment are then calculated using an additive toxicity model. The effect concentrations for each structure are calculated using the target lipid model that is incorporated into Petrorisk. Finally, risks associated with specific refineries are determined by scaling the generic refinery scenario results.

The first step in scaling generic results to a specific refinery is to estimate the concentration of HFO associated hydrocarbons in the refinery effluent. This is accomplished by multiplying site measurements of total petroleum hydrocarbons (TPH) in refinery effluent by the ratio of HFO production to crude throughput.

$$PH_{HFO,i} = TPH_{Effluent,i} \times P_{HFO,i} / T_{Crude,i}$$
(1)

where *i* refers to refinery *i*

To calculate a refinery specific RCR for wastewater treatment plant microbes, the following equation is applied:

$$RCR_{WWTP,i} = RCR_{WWTP,generic} \times P_{HFO,i} / P_{HFO,generic}$$
(2)

where $RCR_{WWTP,generic}$ and $P_{HFO,generic}$ are the predicted risk characterization ratio and total effluent concentration of HFO associated hydrocarbons obtained from the generic refinery scenario described above.

To calculate a refinery specific RCR for surface/marine waters or sediments, the site-specific dilution factor must also be incorporated into scaling:

RCR_{Water,i} = RCR_{Water,generic} x P_{HFO,i} / P_{HFO,generic} x DF_{HFO,generic} / DF_{HFO,i} (3)

 $RCR_{Sediment,i} = RCR_{Sediment,generic} \times P_{HFO,i} / P_{HFO,generic} \times DF_{HFO,generic} / DF_{HFO,i}$ (4)

The above procedure has been applied to assess the environmental risk of 117 European refineries that manufacture HFO. Results indicate that only 8 refineries exhibited RCRs for at least one compartment greater than one (Table 1). Consequently a Tier II assessment was performed in an attempt to refine conservative exposure assumptions and improve risk estimates.

Refinery code	Effluent	Fresh Water	Fresh Water Sediment	Marine Water	Marine Sediment
7.02				1.39	1.57
8.00	1.29			0.19	0.21
8.15	1.08			0.16	0.18
11.01				1.90	2.20
11.02				1.12	1.26
15.02	1.71			0.25	0.28
24.02	1.38	0.50	0.57		
27.02		1.13	1.28		

Table 1. Refineries manufacturing HFO with predicted RCRs calculated in Petrorisk based on site-specific scaling with RCRs > 1

A critical assumption in the site specific scaling approach is the estimation of HFO constituents in refinery effluent based on site-specific HFO production and crude throughput volumes and effluent TPH data (Eqn 1). This equation has been applied to all the major marketed petroleum substances in an attempt to develop a general allocation of refinery effluent TPH to each substance. Since other petroleum substances share some of the same hydrocarbon blocks that comprise HFO and are produced in higher volume, manufacture of these substances are also expected to contribute HFO related blocks to refinery effluent (Table 2). If the percentage of HFO blocks that comprise each substance is weighted by the percentage that the substance contributes to the effluent TPH, the percentage of HFO blocks in a generic refinery effluent can be calculated. If the contribution for each substance is summed the total percentage of HFO blocks is predicted to be 51.6% (Table 2). Thus, using the approach incorporated into Petrorisk approximately half of the TPH in effluent is predicted to be attributable to HFO related blocks.

Table 2. Allocation of TPH and HFO Block Composition to Substances and Implications for	r
HFO Refinery Effluent Composition	

	% TPH	% HFO Blocks	% HFO Blocks
Substance	Allocation	in Composition	in Effluent
Naphthas	26.2	1.7	0.5
Kerosines	7.5	39.8	3.2
MK-1	0.5	87.2	0.5
Straight run gas oils	1.1	52.4	0.6
Vacuum gas oils	39.2	66.0	27.6
Cracked gas oils	0.4	82.1	0.4
Other gas oils	2.7	60.8	1.8
Other substances	6.4	0.0	0.0
HFO	16	100.0	17.1
Total			51.6

To determine how predictions compare with actual TPH composition in EU refinery effluents, an

analysis of the Effluent Speciation Project (ESP) that was carried out by CONCAWE in 2008 and 2009 (CONCAWE Report 3/10, in press) has been performed. In this project, 111 effluent samples from 105 refineries were analysed by 2d-GC to obtain an impression of the hydrocarbon speciation across EU refineries. Table 3 provides a statistical summary by receiving water type of the measured TPH concentrations as well as the % contribution from HFO related blocks.

Receiving medium	Parameter	TPH (mg/l)	HFO Blocks %	
	Median	0.14	17	
Fresh water	Average	2.85	12	
	95 %-tile	9.46	16	
	Median	0.16	18	
Marine	Average	1.73	14	
	95 %-tile	6.86	15	
	Median	3.51	14	
External	Average	9.34	4	
	95 %-tile	16.76	10	

Table 3. Statistical Summary of CONCAWE Effluent Speciation Project

This analysis indicates that the actual contribution of HFO blocks to TPH ranges from 4 to 18% in contrast the much higher predictions obtained via the scaling approach presented in Table 2. Consequently, the scaling approach overestimates the amount of HFO blocks in refinery effluent by at least a factor of 2.9 (i.e. 51.6/18). Given the conservatism introduced by the assumptions used to estimate effluent speciation in the Petrorisk model, estimated RCRs obtained for the eight refineries ranging from 1.08 to 2.20 (Table 1) can be refined by dividing by 2.9. The revised RCRs are provided in Table 4. Results indicate all refineries have RCRs below one indicating no unacceptable risks.

Table 4	4. Tier 2 Ris	k Characterization	for Refineries i	n Table 1	Using Recer	nt Measured E	ffluent
TPH Sp	peciation D	ata			-		

Refinery code	Effluent	Fresh Water	Fresh Water Sediment	Marine Water	Marine Sediment
7.02				0.48	0.54
8.00	0.44			0.19	0.21
8.15	0.37			0.16	0.18
11.01				0.66	0.74
11.02				0.39	0.44
15.02	0.59			0.25	0.28
24.02	0.48	0.25	0.57		
27.02		0.39	0.44		