

<b>WASTE STREAM</b>	<b>9H21</b>	<b>Contaminated Waste Oil</b>
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**SITE** Wylfa  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Magnox Limited  
**WASTE TYPE** LLW  
 Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	9.6 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2026.....	2.4 m <sup>3</sup>
Total future arisings:		2.4 m <sup>3</sup>
Total waste volume:		12.0 m <sup>3</sup>
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x 1.2
	Stock (lower): x 0.8	Arisings (lower) x 0.8

**WASTE SOURCE**

Waste oil arises from the maintenance and cleaning activities of various site machinery, such as with the gas circulator circuit, reactor gas vacuum pumps, BCD compressors, pile cap transporter, CRMB workshop, RHF workrooms, oil rag compactors, oil contaminated washings and liquid scintillation cocktails.

**PHYSICAL CHARACTERISTICS**

General description: The wastes are lubricating and hydraulic oils and liquid scintillation cocktail from the HP wet lab.  
 Physical components (%vol): Oils (100%).  
 Sealed sources: The waste does not contain sealed sources.  
 Bulk density (t/m<sup>3</sup>): 1  
 Comment on density: The density of the oil is 1.0 t/m.

**CHEMICAL COMPOSITION**

General description and components (%wt): Lubricating and hydraulic oils (100%).  
 Chemical state: Acid  
 Chemical form of radionuclides: -  
 Metals and alloys (%wt): Metal swarf will be present in the waste (<1%).

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....	0.02	Contaminant in waste oil	
Aluminium.....	TR	Contaminant in waste oil	
Beryllium.....	0		
Cobalt.....	TR	Contaminant in waste oil	
Copper.....	TR	Contaminant in waste oil	
Lead.....	TR	Contaminant in waste oil	
Magnox/Magnesium.....	TR	Contaminant in waste oil	
Nickel.....	TR	Contaminant in waste oil	
Titanium.....			

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Uranium.....	0		
Zinc.....	~0.02	Contaminant in waste oil	
Zircaloy/Zirconium.....	0		
Other metals.....			
Organics (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....	0		
Wood.....	0		
Halogenated plastics .....	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	0		
Total rubber.....	0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....			
Oil or grease .....	100.0		
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	0		
Other materials (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		

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Free non-aqueous liquids.....

Powder/Ash..... 0

Inorganic anions (%wt): Chlorides, sulphates, phosphates and sulphides will be present at trace levels. Others may be present in trace amounts.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	TR	
Iodide.....	NE	
Cyanide.....	NE	
Carbonate.....	NE	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	~0.07	Contaminant in waste oil
Sulphate.....	TR	
Sulphide.....	TR	

Materials of interest for waste acceptance criteria: Oils are flammable materials.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances / non hazardous pollutants: Oils (100%). Toxic metals will be present at low concentrations in swarf and as additives.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		

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Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....	TR	Contaminant in waste oil
Molybdenum.....	TR	Contaminant in waste oil
Thallium.....		
Tin.....		
Vanadium.....	TR	Contaminant in waste oil
Mercury compounds.....	TR	Contaminant in waste oil
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

Complexing agents (%wt):      Yes

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....	TR	Trace levels of organic complexing agents will be present as oil additives and stabilisers, or as organic degradation products.
Total complexing agents.....	TR	

Potential for the waste to contain discrete items:      No. In & of itself not a DI

**TREATMENT, PACKAGING AND DISPOSAL**

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Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None	Off-site	100.0

Comment on planned treatments:

It is expected that 100% of the waste stream will be sent for incineration. It should be noted that the tritium and carbon-14 in the oil will be lost during incineration.

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0	1.0

Classification codes for waste expected to be consigned to a landfill facility: -

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

**Opportunities for alternative disposal routing:** -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

**Waste Packaging for Disposal:** (Not applicable to this waste stream)

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Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO			
1/2 Height IP-2 Disposal/Re-usable ISO			
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: -

**Waste Planned for Disposal at the LLW Repository:** (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: -

Uncertainty: Due to lack of information, original activity date was assumed to be 1/4/2012, subsequently decayed to 01/04/2022

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: data taken from WCH 1MXN-3WYL-0-WCH-C-3371 v5 decayed by ten years for RWI 2022

Other information: -

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	6.04E-06	CC 1	6.04E-06	CC 1	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.1E-07	CC 1	2.1E-07	CC 1	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	9.72E-07	CC 2	9.72E-07	CC 2	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	4.91E-07	CC 2	4.91E-07	CC 2	Pb 210		8		8
Co 60	2.31E-07	CC 1	2.31E-07	CC 1	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	8.6E-08	CC 2	8.6E-08	CC 2	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	7E-08	CC 2	7E-08	CC 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94	1.11E-09	CC 2	1.11E-09	CC 2	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m	1.75E-09	CC 2	1.75E-09	CC 2	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	6.09E-09	CC 2	6.09E-09	CC 2
Sn 123		8		8	Pu 239	5.92E-09	CC 2	5.92E-09	CC 2
Sn 126		8		8	Pu 240	7.78E-09	CC 2	7.78E-09	CC 2
Sb 125		8		8	Pu 241	3.66E-07	CC 2	3.66E-07	CC 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	1.93E-08	CC 2	1.93E-08	CC 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	1.95E-09	CC 1	1.95E-09	CC 1	Cm 244		8		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	2.35E-09	CC 2	2.35E-09	CC 2	Other b/g				
Eu 154	2.22E-09	CC 2	2.22E-09	CC 2	<b>Total a</b>	<b>3.91E-08</b>	<b>CC 2</b>	<b>3.91E-08</b>	<b>CC 2</b>
Eu 155		8		8	<b>Total b/g</b>	<b>8.48E-06</b>	<b>CC 2</b>	<b>8.48E-06</b>	<b>CC 2</b>

**Bands (Upper and Lower)**

- A a factor of 1.5
- B a factor of 3
- C a factor of 10
- D a factor of 100
- E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

**Code**

- 1 Measured activity
- 2 Derived activity (best estimate)
- 3 Derived activity (upper limit)
- 4 Not present
- 5 Present but not significant
- 6 Likely to be present but not assessed
- 7 Present in significant quantities but not determined
- 8 Not expected to be present in significant quantity