

WASTE STREAM**9H26/C****DSC4 Uranic Corrosion Debris**

SITE Wylfa
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	0.3 m ³	3.9 m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		0.3 m ³	3.9 m ³
Number of waste packages in stock:	At 1.4.2022.....	3 package(s)	
Comment on volumes:	-		
Uncertainty factors on volumes:	Stock (upper):	x 1.1	Arisings (upper) x
	Stock (lower):	x 0.9	Arisings (lower) x

WASTE SOURCE •37 skip tubes containing various quantities of corrosion debris including one containing corroded uranic debris from half of a single fuel element (skip 131 tube D11) •Magnox alloy corrosion debris •One Thermocouple wire, constructed of stainless steel •One lifting 'button' constructed of Magnox alloy MN80 and zirconium alloy. The waste also includes the tooling used to retrieve the skip-tubes.

PHYSICAL CHARACTERISTICS

General description: Severely corroded uranium rod consisting of a mixture of corroded fuel element cladding, corroded fuel product (UO₂) and surface corroded fuel pieces.

Physical components (%vol): -

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.4

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): -

Chemical state: Neutral

Chemical form of radionuclides:

H-3: The chemical form of tritium has not been determined.
 C-14: The chemical form of carbon-14 has not been determined.
 Cl-36: Chemical form of chlorine 36 has not been determined.
 Se-79: The chemical form of selenium-79 has not been determined.
 Tc-99: The chemical form of technetium-99 has not been determined.
 Ra: The chemical form of radium isotopes have not been determined.
 Th: The chemical form of thorium isotopes have not been determined.
 U: The chemical form of uranium isotopes have not been determined.
 Np: The chemical form of neptunium isotopes have not been determined.
 Pu: The chemical form of plutonium isotopes have not been determined.

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	NE		
Iron.....			
Aluminium.....	NE		
Beryllium.....	NE		

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Cobalt.....
 Copper..... NE
 Lead..... NE
 Magnox/Magnesium..... NE
 Nickel.....
 Titanium.....
 Uranium..... NE
 Zinc..... NE
 Zircaloy/Zirconium..... NE
 Other metals..... NE

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....			
Wood.....			
Halogenated plastics			
Total non-halogenated plastics.....	0		
Condensation polymers.....			
Others.....			
Organic ion exchange materials....	NE		
Total rubber.....	0		
Halogenated rubber			
Non-halogenated rubber.....			
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....			

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	NE		
Inorganic sludges and flocs.....	NE		
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....			
Sand.....			
Glass/Ceramics.....			
Graphite.....			

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Desiccants/Catalysts.....
 Asbestos.....
 Non/low friable.....
 Moderately friable.....
 Highly friable.....
 Free aqueous liquids.....
 Free non-aqueous liquids.....
 Powder/Ash.....

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	NE	
Carbonate.....	NE	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	NE	
Sulphide.....	NE	

Materials of interest for
 waste acceptance criteria: -

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

Hazardous substances /
non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....		
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....		
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

Complexing agents (%wt):

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	NE	

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Potential for the waste to contain discrete items:

No. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

PACKAGING AND CONDITIONING

Container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l RS drum (20mm Pb)	100.0	0.107	0.107	3

Container type comment:

-

Range in container waste volume:

-

Other information on containers:

-

Conditioned density (t/m³):

-

Conditioned density comment:

-

Other information on conditioning:

Due to the very dry (less than 30% relative humidity) long term storage conditions in DSC4, there was no need to condition the waste during the packaging process.

RADIOACTIVITY

Source:

-

Uncertainty:

Activities calculated are considered to be upper bound estimates.

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 WD/EAN/0066/21 – see Table 1 for inventory at 2022 and WD/CALC/5554 – supporting calculations for the EAN.

Other information:

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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	2.57E+02	BC 2			Gd 153		8		
Be 10	2.21E-01	BC 2			Ho 163	1.66E-02	BC 2		
C 14	1.38E+02	BC 2			Ho 166m	1.70E+01	BC 2		
Na 22		8			Tm 170		8		
Al 26	3.36E+01	BC 2			Tm 171	7.03E-05	BC 2		
Cl 36	2.09E+01	BC 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	1.77E-01	BC 2			Pt 193		8		
Mn 53		8			Tl 204	1.25E+00	BC 2		
Mn 54		8			Pb 205	2.35E-04	BC 2		
Fe 55	7.08E-01	BC 2			Pb 210	2.35E-07	BC 2		
Co 60	5.72E+01	BC 2			Bi 208		8		
Ni 59	1.45E+01	BC 2			Bi 210m		8		
Ni 63	1.43E+03	BC 2			Po 210	2.28E-07	BC 2		
Zn 65		8			Ra 223	2.98E-06	BC 2		
Se 79	3.88E-02	BC 2			Ra 225	1.27E-08	8		
Kr 81	1.36E-08	BC 2			Ra 226	6.70E-07	8		
Kr 85	7.06E+01	BC 2			Ra 228		8		
Rb 87	2.35E-06	BC 2			Ac 227	2.99E-06	BC 2		
Sr 90	3.01E+03	BC 2			Th 227	2.94E-06	BC 2		
Zr 93	2.08E-01	BC 2			Th 228	3.94E-04	BC 2		
Nb 91		8			Th 229	1.27E-08	BC 2		
Nb 92	5.72E-08	BC 2			Th 230	6.64E-05	BC 2		
Nb 93m	4.12E+00	BC 2			Th 232		8		
Nb 94	6.82E-02	BC 2			Th 234	1.83E-01	BC 2		
Mo 93	3.40E-03	BC 2			Pa 231	5.15E-06	BC 2		
Tc 97		8			Pa 233	1.60E-02	BC 2		
Tc 99	1.70E+00	BC 2			U 232	3.83E-04	BC 2		
Ru 106	2.02E-08	8			U 233	3.22E-06	BC 2		
Pd 107	1.32E-02	BC 2			U 234	1.58E-01	BC 2		
Ag 108m	1.67E+00	BC 2		8	U 235	3.20E-03	BC 2		
Ag 110m		8		8	U 236	2.47E-02	BC 2		
Cd 109	6.47E-09	BC 2		8	U 238	1.83E-01	BC 2		
Cd 113m	3.00E+01	BC 2			Np 237	1.60E-02	BC 2		
Sn 119m		8			Pu 236	2.53E-07	BC 2		
Sn 121m	1.77E+01	BC 2			Pu 238	7.57E+01	BC 2		
Sn 123		8			Pu 239	7.89E+01	BC 2		
Sn 126	9.52E-02	BC 2			Pu 240	1.33E+02	BC 2		
Sb 125	4.97E-02	BC 2			Pu 241	1.80E+03	BC 2		
Sb 126	1.33E-02	BC 2			Pu 242	1.30E-01	BC 2		
Te 125m	9.82E-03	BC 2			Am 241	3.90E+02	BC 2		
Te 127m		8			Am 242m	7.76E-01	BC 2		
I 129	3.79E-03	BC 2			Am 243	4.42E-01	BC 2		
Cs 134	5.60E-03	BC 2			Cm 242	6.40E-01	BC 2		
Cs 135	8.54E-02	BC 2			Cm 243	1.80E-01	BC 2		
Cs 137	4.59E+03	BC 2			Cm 244	3.71E+00	BC 2		
Ba 133	1.37E+00	BC 2			Cm 245	5.68E-04	BC 2		
La 137	1.89E-03	BC 2			Cm 246	6.21E-05	BC 2		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	2.72E-01	BC 2			Cf 250		8		
Pm 147	4.15E-01	BC 2			Cf 251		8		
Sm 147	1.04E-06	BC 2			Cf 252		8		
Sm 151	3.06E+01	BC 2			Other a				
Eu 152	2.79E-01	BC 2			Other b/g				
Eu 154	2.86E+01	BC 2			Total a	6.83E+02	BC 2	0	
Eu 155	6.94E-01	BC 2			Total b/g	1.16E+04	BC 2	0	

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