

WASTE STREAM	2D96.4	Ion Exchange Material in Skips (AW500)
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SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	= 279.7			
Total future arisings:	0.0			
Total waste volume:	279.7			

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: Ion exchange resins are no longer used to treat the pond water, however two skips of Ion exchange resin are still in place as part of the emergency pumping arrangements. 237 opening stock, with 18 skips having been exported to ISF by 1.4.25.

Additional information on quantities: There are 219 skips remaining. Any future arisings will be generated from skip changes on the emergency pumping system.

Uncertainty factors on volumes: Stock (upper): x 1.30 Arisings (upper): x -
Stock (lower): x 0.70 Arisings (lower): x -

WASTE SOURCE Ion exchange material in Magnox skips from historical pond water treatment.

PHYSICAL CHARACTERISTICS

General description: The waste arises as zeolite type AW500 from the treatment of pond water. It is in the form of elliptical pellets approximately 5mm in length. The zeolite is held in a mild steel mesh within a modified Magnox fuel skip. No items require special handling.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.3

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Zeolite (AW500) (65%), aluminium (as Al₂O₃), silicon (as SiO₂), caesium, mild steel (35%).

Chemical state: Neutral

Sheet metal proportion / thickness: The internal steel cage of the skip is 6 mm thick mild steel. There is also mild steel wire mesh within the skips.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 35.0	-	
Iron.....		-	
Aluminium.....	= 0	-	
Beryllium.....		-	
Cobalt.....	= 0	-	
Copper.....		-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 0	-	
Paper, cotton.....	-	-	
Wood.....	-	-	
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.....	-	-	
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.....	= 57.0	-	
Inorganic sludges and flocs.....	TR	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	TR	-	
Glass/Ceramics.....	-	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	~ 8.0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	-	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%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.....	= 0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....	= 0	-
Total complexing agents.....	= 0	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	= 100.0

Comments on planned treatments:

Zeolite skips are initially exported to the Interim Storage Facility in Self-Shielded Boxes for buffer storage until the Box Encapsulation Plant becomes available.

Conditioning method:

The baseline route from the ISF is for the SSBs to be transferred to BEP, the Zeolite skip removed and placed into a 3m3 box for grout encapsulation.

Conditioning plants:

Plant Name	Location
Box Encapsulation Plant (BEP)	Sellafield

Likely conditioning matrix:

-

Further information on the conditioning matrix:

LoC not yet obtained.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	Sellafield 3 m³ box	100.0	1.3	2.7	219	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m³): NE
Conditioned density comment: -**Management Routes:**

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

Opportunities for alternative disposal routing: Not yet determined

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: The main source of the activity is from the fuel contamination of pond water giving mixed fission product and uranium contamination of AW500 resins. Caesium is the dominant radioactive element present.

Uncertainty: -

Measurement of radioactivities: -

Chemical form of radionuclides:
H-3: -
C-14: -
Cl-36: -
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: -
Np: -
Pu: -

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54					Pb 205				
Fe 55					Pb 210	2.51E-14			
Co 60	1.27E-04	B B 2			Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210	1.53E-14			
Zn 65					Ra 223	4.75E-12			
Se 79					Ra 225	1.03E-17			
Kr 81					Ra 226	8.39E-13			
Kr 85					Ra 228	7.11E-21			
Rb 87					Ac 227	5.13E-12			
Sr 90	5.64E-01	B B 2			Th 227	4.82E-12			
Zr 93					Th 228	1.49E-21			
Nb 91					Th 229	1.12E-17			
Nb 92					Th 230	1.29E-09			
Nb 93m					Th 232	7.22E-20			
Nb 94					Th 234	5.76E-05			
Mo 93					Pa 231	1.11E-10			
Tc 97					Pa 233	1.94E-08			
Tc 99					U 232				
Ru 106	2.84E-12	B B 2			U 233	1.23E-13			
Pd 107					U 234	4.69E-05	B B 2		
Ag 108m					U 235	1.74E-06	B B 2		
Ag 110m					U 236	9.75E-10			
Cd 109					U 238	5.76E-05	B B 2		
Cd 113m					Np 237	2.02E-08			
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.82E-03	B B 2		
Sn 123					Pu 239	1.56E-02	B B 2		
Sn 126					Pu 240	1.10E-02	B B 2		
Sb 125					Pu 241	3.05E-02	B B 2		
Sb 126					Pu 242	2.42E-06	B B 2		
Te 125m					Am 241	2.08E-02	B B 2		
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.30E-05	B B 2			Cm 242				
Cs 135					Cm 243				
Cs 137	1.54E+02	B B 2			Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	1.98E-15	B B 2			Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154	2.16E-02	B B 2			Total a	5.13E-02	*	0	*
Eu 155	2.22E-03	B B 2			Total b/g	1.54E+02	*	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 the 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
* Total calculated from the 114 declared radionuclides