

<b>WASTE STREAM</b>	<b>2D100</b>	<b>Pile Chimney Decommissioning Waste</b>
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**SITE** Sellafield  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Sellafield Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	39.4 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2120.....	0 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		39.4 m <sup>3</sup>

Comment on volumes: Waste stock represents 197 x 200 litre stainless steel high integrity drums with an inner polypropylene lid. The inventory of these drums was generated during the removal of insulation from the upper shaft of Pile 1 chimney down to the 35m level, Pile 1 diffuser and an amount of floor scabblings from Pile 1 "Ballroom". This material is deemed to be ILW.

Uncertainty factors on volumes: Stock (upper): x 1.0 Arisings (upper) x  
 Stock (lower): x 1.0 Arisings (lower) x

**WASTE SOURCE** Contamination of Pile 1 Chimneys during operations followed by some demolition.

**PHYSICAL CHARACTERISTICS**

General description: Insulation material and scabbled concrete from Pile Chimney decommissioning currently held in stainless steel 200 l Interim storage drums.

Physical components (%vol): Glassfiber insulation, galvanised wire mesh, concrete scabblings.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1.2

Comment on density: Based on a sample of drum weights. Densities in sample range from 0.5 to 1.6.

**CHEMICAL COMPOSITION**

General description and components (%wt): Unknown.

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....		Interim containers are 304L stainless steel.	
Other ferrous metals.....	P	Galvanised wire mesh.	
Iron.....			
Aluminium.....			
Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....			
Magnox/Magnesium.....			
Nickel.....			
Titanium.....			

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Uranium.....			
Zinc.....	TR	Galvanised wire mesh.	
Zircaloy/Zirconium.....			
Other metals.....			
Organics (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....			
Paper, cotton.....			
Wood.....			
Halogenated plastics .....			
Total non-halogenated plastics.....			
Condensation polymers.....			
Others.....			
Organic ion exchange materials....			
Total rubber.....			
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..			
Inorganic sludges and flocs.....			
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....	P	Floor scabblings.	
Sand.....			
Glass/Ceramics.....	P	Glass fibre insulation.	
Graphite.....			
Desiccants/Catalysts.....			
Asbestos.....	P	Asbestos cement insulation boards.	
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....			

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Free non-aqueous liquids.....

Powder/Ash.....

Inorganic anions (%wt): -

(%wt) Type(s) and comment

Fluoride.....

Chloride.....

Iodide.....

Cyanide.....

Carbonate.....

Nitrate.....

Nitrite.....

Phosphate.....

Sulphate.....

Sulphide.....

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..... NE

Biodegradable materials..... NE

Putrescible wastes..... NE

Non-putrescible wastes..... NE

Corrosive materials..... NE

Pyrophoric materials..... NE

Generating toxic gases..... NE

Reacting with water..... NE

Higher activity particles..... NE

Soluble solids as bulk chemical compounds..... NE

Hazardous substances / non hazardous pollutants: -

(%wt) Type(s) and comment

Acrylamide.....

Benzene..... NE

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

Phenol..... NE

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

Complexing agents (%wt):      No

(%wt)      Type(s) and comment

EDTA.....	
DPTA.....	
NTA.....	
Polycarboxylic acids.....	
Other organic complexants.....	
Total complexing agents.....	

Potential for the waste to contain discrete items:      Yes. Waste is packaged in sealed 200 l Stainless steel drums.

**PACKAGING AND CONDITIONING**

Conditioning method:      Not yet determined.  
Plant Name:      Not yet determined.  
Location:      Not yet determined.  
Plant startup date:      Not yet determined.  
Total capacity (m³/y incoming waste):      -

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Target start date for packaging this stream: 2042

Throughput for this stream (m<sup>3</sup>/y incoming waste): -

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	Sellafield 3m <sup>3</sup> box	100.0	1.2	2.1	33

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Not Specified

Other information: -

Conditioned density (t/m<sup>3</sup>): NE

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
Disposal at a Geological Disposal Facility	Disposal at LLWR	NE	-	Medium	Some of this waste may be suitable for LLWR but quantities cannot yet be specified.

**RADIOACTIVITY**

Source: Historical contamination from aerial discharges.

Uncertainty: -

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: Document Reference B6/B16/724 DO25 (May 2004) states that the total inventory of the drums is 1.0E+10 Bq alpha and 1.05E+13 Bq beta. This waste is in Pile 2 Chimney catacomb. Cs137 and Pu239 are used in the Safety Case as the dominant isotopes for calculation purposes.

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			Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36		6			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54		6			Pb 205				
Fe 55		6			Pb 210				
Co 60		6			Bi 208				
Ni 59					Bi 210m				
Ni 63		6			Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94		6			Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239		6		
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137		6			Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					<b>Total a</b>	<b>2.54E-04</b>	<b>CC 2</b>	<b>0</b>	
Eu 155					<b>Total b/g</b>	<b>2.66E-01</b>	<b>CC 2</b>	<b>0</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