

<b>WASTE STREAM</b>	<b>2S312</b>	<b>Other Facilities Decommissioning ILW</b>
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**SITE** Windscale

**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Sellafield Limited

**WASTE TYPE** ILW

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	1.0 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2038.....	0 m <sup>3</sup>
	1.4.2038 - 31.3.2044.....	117.8 m <sup>3</sup>
Total future arisings:		117.8 m <sup>3</sup>
Total waste volume:		118.8 m <sup>3</sup>

Comment on volumes: A quantity of the lead bricks may become LLW but this has yet to be assessed.

Uncertainty factors on volumes:

Stock (upper):	x 1.5	Arisings (upper)	x 1.5
Stock (lower):	x 0.5	Arisings (lower)	x 0.5

**WASTE SOURCE** Decommissioning waste from redundant facilities Windscale Active Handling Facility and Ex-PIE Facility.

**PHYSICAL CHARACTERISTICS**

General description: Gilbert box contents, flask washings sludge, in-cave equipment, misc. contaminated equipment and services, in-cell POCO equipment and decommissioning waste, cell dismantling including lead bricks, sump tank, drains and water duct.

Physical components (%vol): Graphite, concrete, steelwork, sludge, lead. % breakdown not yet assessed.

Sealed sources: -

Bulk density (t/m<sup>3</sup>): ~2

Comment on density: Estimate. Waste is a mixture of lead, steel, sludge and miscellaneous materials.

**CHEMICAL COMPOSITION**

General description and components (%wt): Lead (59%), steel (39%), concrete (1%), PVC, plastic, lead glass (1%). Approximate figures only. A more detailed breakdown will be available once decommissioning work commences.

Chemical state: -

Chemical form of radionuclides: -

Metals and alloys (%wt): -

Stainless steel.....	P
Other ferrous metals.....	39.0
Iron.....	
Aluminium.....	0
Beryllium.....	
Cobalt.....	0
Copper.....	0
Lead.....	59.0
Magnox/Magnesium.....	0
Nickel.....	0
Titanium.....	
Uranium.....	P
Zinc.....	0
Zircaloy/Zirconium.....	0

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	Other metals.....	<1.0	Tungsten is present in the waste.
Organics (%wt):	Small quantities of paper and wood. PVC, perspex, Neoprene and natural rubber are present. Halogenated plastics - PVC. Halogenated rubber - neoprene.		
	Total cellulosics.....	<1.0	
	Paper, cotton.....	NE	
	Wood.....	NE	
	Halogenated plastics .....	<1.0	
	Total non-halogenated plastics.....	<1.0	
	Condensation polymers.....	NE	
	Others.....	NE	
	Organic ion exchange materials....	0	
	Total rubber.....	<1.0	
	Halogenated rubber .....	NE	
	Non-halogenated rubber.....	NE	
	Hydrocarbons.....		
	Oil or grease .....		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	NE	
Other materials (%wt):	Any sludges found, e.g. in pipes, will be immobilised.		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	NE	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	1.0	
	Sand.....		
	Glass/Ceramics.....	<1.0	
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	P	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	NE	
Inorganic anions (%wt):	Anions are only expected to be present as component of concrete.		

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Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	NE
Carbonate.....	P
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for waste acceptance criteria:

Powder may result from decommissioning operations.

Combustible metals.....	0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	0
Biological etc. materials.....	0
Biodegradable materials.....	NE
Putrescible wastes.....	0
Non-putrescible wastes.....	NE
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Active particles.....	NE
Soluble solids as bulk chemical compounds.....	NE

Hazardous substances / non hazardous pollutants:

-	
Acrylamide.....	
Benzene.....	NE
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	NE
Styrene.....	
Tri-butyl phosphate.....	NE
Other organophosphates.....	
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	
Boron.....	NE

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

**PACKAGING AND CONDITIONING**

Conditioning method: Conditioning will take place by direct emplacement and encapsulation in cement.  
 Plant Name: Waste treatment facilities yet to be confirmed.  
 Location: Sellafield.  
 Plant startup date: -  
 Total capacity (m<sup>3</sup>/y incoming waste): -  
 Target start date for packaging this stream: -  
 Throughput for this stream (m<sup>3</sup>/y incoming waste): -  
 Other information: Waste to be processed in available treatment facilities.

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	NE	~2.1	NE

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Cement  
 Other information: Particular encapsulating matrix not yet decided.

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

Other information on conditioning: -

Opportunities for alternative disposal routing: Not yet determined

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: Overall the waste contains contributions from contamination with activation products, e.g Co60, fission products, e.g Cs137 and U and Pu isotopes.

Uncertainty: Clarification will be obtained during characterisation.

Definition of total alpha and total beta/gamma: No specific information is available on the radionuclides activities at present.

Measurement of radioactivities: .

Other information: -

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	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					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60		6		6	Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90		6		6	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233		6		6
Pd 107					U 234		6		6
Ag 108m					U 235		6		6
Ag 110m					U 236		6		6
Cd 109					U 238		6		6
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		6		6
Sn 123					Pu 239		6		6
Sn 126					Pu 240		6		6
Sb 125					Pu 241		6		6
Sb 126					Pu 242		6		6
Te 125m					Am 241		6		6
Te 127m					Am 242m		6		6
I 129					Am 243		6		6
Cs 134		6		6	Cm 242		6		6
Cs 135					Cm 243		6		6
Cs 137		6		6	Cm 244		6		6
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144		6		6	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		6		6	<b>Total a</b>	<b>NE</b>			<b>NE</b>
Eu 155					<b>Total b/g</b>	<b>NE</b>			<b>NE</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