

WASTE STREAM	2D201	ILW Concrete Lined Drums from Harwell
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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:	= 917.9			
Total future arisings:	0.0			
Total waste volume:	917.9			

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

Comment on arising rates: Arisings are not published in this return to avoid double counting, CLDs yet to be transferred to the Sellafield site are included in waste streams 5C08 and 5G10. It is anticipated that 2,328 CLDs will eventually be consigned to Sellafield from Harwell.

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.05 Arisings (upper): x -
Stock (lower): x 0.95 Arisings (lower): x -

WASTE SOURCE Wastes from various sites which were packaged for the abandoned 1982 sea disposal campaigns.

PHYSICAL CHARACTERISTICS

General description: Miscellaneous radioactive wastes held in mild steel drums within a concrete carcass. Internal packages contain absorbed liquid, precipitated sludge, incinerator ash, and laboratory trash. Type 1801 sea disposal drums contain an internal cardboard drum of 100 litres in an external drum of 200 litres and weigh up to 352 kg; these drums will be overpacked in a mild steel overdrum prior to consignment to Sellafield. Type 1802 sea disposal drums contain an internal drum of 200 litres in an external drum of 450 litres and weigh up to 1060 kg. Type 1803 sea disposal drums contain various inner drums from 10 litres to 200 litres in an external drum of 630 litres and weigh up to 2290 kg.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.5

Comment on density: Total mass divided by total volume.

CHEMICAL COMPOSITION

General description and components (%wt): The waste consists of metals, glass, plastics, paper, sludges, ash etc. in mild steel drums within a concrete carcass. Concrete/ cemented wastes (37%), ferrous metals (24%), Al (7%), other metals including sources (9%), plastics (4%), cellulose (2%), others (17%).

Chemical state: Neutral

Sheet metal proportion / thickness: The form of metals within the wastes varies. Uranium can be present as single items up to 50kg.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 8.0	Ferrous metals consist principally of mild steel; small amounts of cast iron are also present. Grades of stainless are generally unknown, and in many cases only "metal" is declared; taken to be mild steel. Other alloys may also be present, but none specifically declared. A proportion of the waste (~4%) consists of sources. The mass of these is assumed to be dominated by stainless.	
Other ferrous metals.....	~ 20.0		
Iron.....	P		
Aluminium.....	~ 7.0		
Beryllium.....	TR		
Cobalt.....	= 0		
Copper.....	< 0.20		
Lead.....	< 4.0		
Magnox/Magnesium.....	TR		
Nickel.....	= 0		
Titanium.....			
Uranium.....	~ 0.70		
Zinc.....	TR		
Zircaloy/Zirconium.....	TR		
Other metals.....	~ 0.73	Other metals principally U & Th. Also small amounts of cobalt, cadmium, titanium, tungsten, and beryllium; traces of scandium, tantalum, iridioplatinum, palladium.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 2.1	-	
Paper, cotton.....	~ 2.0	-	
Wood.....	< 0.10	-	
Halogenated plastics.....	~ 2.0	-	
Total non-halogenated plastics.....	~ 2.0	-	
Condensation polymers.....	TR	-	
Others.....	~ 2.0	-	
Organic ion exchange materials.....	TR	-	
Total rubber.....	~ 0.10	-	
Halogenated rubber.....	~ 0.10	-	
Non-halogenated rubber.....	TR	-	
Hydrocarbons.....	= 0	-	
Oil or grease.....	= 0	-	
Fuel.....	= 0	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	= 0	-	
Others.....	= 0	-	
Other organics.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	~ 0.10	-	
Inorganic sludges and flocs.....	< 7.0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	TR	-	
Cementitious material.....	= 44.8	-	
Sand.....	= 0	-	
Glass/Ceramics.....	~ 1.2	-	
Graphite.....	< 0.10	-	
Desiccants/Catalysts.....		-	
Asbestos.....	TR	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	TR	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	P	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	TR	-
Chloride.....	TR	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	P	-
Nitrate.....	TR	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	P	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

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

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	TR	Trace oxalic acid in one drum.
Total complexing agents.....	TR	-

Physical components:

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

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:

-

Conditioning method:

At present there is no treatment route available for CLDs; the high level assumption is that the CLD's will be treated through a thermal process (previously it was to be loaded into 3m3 boxes and grouted).

Conditioning plants:

Plant Name	Location
Waste Treatment Complex 2 (WTC2)	Sellafield

Likely conditioning matrix:

Glass

Further information on the conditioning matrix:

As the treatment process has not yet been developed the details of the conditioning matrix and product properties are not yet known.

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
4 m box (0 mm concrete shielding)	100.0	20.0	15.6	46	2047

Range in container waste loading:

It is assumed that the CLD drums will be subject to thermal treatment, as the process has not yet been developed the variability in waste loading is not currently known.

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

-

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) 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	= 100.0		2050

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

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Predominantly contamination from fuel handling facilities. Also some activated items from MTR operations and sealed sources and bulk uranium from small users' facilities.

Uncertainty: The specific activity uncertainty is based on records of arisings.

Measurement of radioactivities: Specific activity data has been derived using measured activity and dividing by the measured waste volume

Chemical form of radionuclides:

- H-3: Some tritiated D2O is present, remainder from activation of metals
- C-14: Small proportion as labelled organic compounds. Bulk as activation product.
- Cl-36: From activation of impurities in metals.
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: Some Ra and Ra/Be sources, remainder within fuel contamination.
- Th: Metal and oxide.
- U: Principally as bulk metal, with some as irradiated metal/ oxide fuel.
- Np: -
- Pu: Probably as oxide or metal fuel.

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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	1.10E-01	B B 2			Gd 153				
Be 10					Ho 163				
C 14	1.89E-05	B B 2			Ho 166m				
Na 22	4.88E-10	B B 2			Tm 170				
Al 26					Tm 171				
Cl 36	3.65E-05	B B 2			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204	8.00E-08	B B 2		
Mn 54					Pb 205				
Fe 55	5.24E-07	B B 2			Pb 210				
Co 60	1.58E-05	B B 2			Bi 208				
Ni 59	2.82E-06	B B 2			Bi 210m				
Ni 63	2.51E-04	B B 2			Po 210	1.40E-27	B B 2		
Zn 65	5.98E-18	B B 2			Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85	3.45E-05	B B 2			Ra 228	2.09E-08	B B 2		
Rb 87					Ac 227	7.93E-06	B B 2		
Sr 90	8.34E-04	B B 2			Th 227				
Zr 93					Th 228	4.36E-09	B B 2		
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m	3.02E-06	B B 2			Th 232	2.14E-08	B B 2		
Nb 94	3.50E-07	B B 2			Th 234				
Mo 93	1.14E-06	B B 2			Pa 231	1.04E-05	B B 2		
Tc 97					Pa 233				
Tc 99	3.26E-06	B B 2			U 232				
Ru 106	1.90E-14	B B 2			U 233				
Pd 107					U 234	4.88E-05	B B 2		
Ag 108m					U 235	1.28E-07	B B 2		
Ag 110m					U 236	2.51E-07	B B 2		
Cd 109	4.30E-13	B B 2			U 238	5.55E-07	B B 2		
Cd 113m					Np 237	1.40E-05	B B 2		
Sn 119m					Pu 236				
Sn 121m	5.75E-07	B B 2			Pu 238	9.01E-03	B B 2		
Sn 123					Pu 239	3.33E-02	B B 2		
Sn 126					Pu 240	2.26E-02	B B 2		
Sb 125	1.01E-08	B B 2			Pu 241	5.54E-01	B B 2		
Sb 126					Pu 242	1.32E-05	B B 2		
Te 125m	6.65E-63	B B 2			Am 241	6.17E-02	B B 2		
Te 127m					Am 242m	2.24E-06	B B 2		
I 129	1.08E-11	B B 2			Am 243	5.14E-06	B B 2		
Cs 134	7.17E-09	B B 2			Cm 242	2.89E-26	B B 2		
Cs 135					Cm 243	1.00E-06	B B 2		
Cs 137	2.63E-03	B B 2			Cm 244	2.72E-05	B B 2		
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	6.91E-17	B B 2			Cf 249				
Pm 145					Cf 250				
Pm 147	1.53E-07	B B 2			Cf 251				
Sm 147					Cf 252	1.59E-09	B B 2		
Sm 151	6.70E-06	B B 2			Unsp a		B B 2		
Eu 152	4.71E-08	B B 2			Unsp b/g	6.79E-18	B B 2		
Eu 154	4.67E-06	B B 2			Total a	1.27E-01	*	0	*
Eu 155	1.64E-07	B B 2			Total b/g	6.68E-01	*	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