

WASTE STREAM	2D12/C	Conditioned MBGW in PFSP
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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		4.7	5.7
Future arisings:	1.4.2025 - 31.3.2026		10.8	13.1
	1.4.2026 - 31.3.2027		18.8	22.8
	1.4.2027 - 31.3.2028		18.8	22.8
Total future arisings:			48.4	58.8
Total waste volume:			53.1	64.5

Number of waste packages in stock: At 1.4.2025..... 10 packages

Comment on arising rates: -

Additional information on quantities: Stock volume is based upon drums conditioned and put to store.
Arisings uncertainty due to waste exported from PFSP, but not conditioned by WEP yet.
There are 23 drums in WEP cave which have not been set to store yet.

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x 1.20
Stock (lower): x 1.00 Arisings (lower): x 1.00

WASTE SOURCE Isotope and spent fuel handling operations, general production waste (including scrap equipment), some items from clean up/initial decommissioning of Windscale Piles. This stream now includes all the pond and bay furniture such as trolleys, bogies, tables, tanks and decanner equipment.

PHYSICAL CHARACTERISTICS

General description: This stream is solid waste which includes isotope cartridges, reactor holding down weights and reactivity control cartridges, mops, buckets, clothing, scaffolding, wire, assorted scrap metal, boxes and baskets. These wastes arise from early site operations and the clean up of the Windscale Piles. Some items will need to be reduced in size before packaging, particularly in-pond storage boxes and redundant equipment. Also includes pond and bay furniture.

Changes since waste generated: Waste has been retrieved from the pond, placed into baskets, drip dried and sent to WEP for processing by entombment in cementitious grout.

Bulk density (t/m³): ~ 1.9

Comment on density: Weights and volumes for each component of this stream have been estimated from skip contents and tele/video surveys, and using drawings/data sheets of the individual items. Density quoted is gross weight divided by gross volume of the whole stream. Bulk density will vary substantially between different components.

CHEMICAL COMPOSITION

General description and components (%wt): Mild steel, stainless steel, aluminium, Magnox, nickel/chrome and nickel/aluminium (wire), cobalt, graphite, bismuth oxide, lead, lithium/magnesium alloy, aluminium nitride. Cellulosic material may be present.

Chemical state: Neutral

Sheet metal proportion / thickness: None as only the debris part of the waste stream.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 23.8	-	Antimony, beryllium, lithium/magnesium alloy, nickel/chrome and nickel/aluminium. Weights not available, but all present individually in small quantities. Volumes of materials are difficult to quantify.
Other ferrous metals.....	= 6.3	-	
Iron.....	-	-	
Aluminium.....	= 0.30	-	
Beryllium.....	P	-	
Cobalt.....	= 0	-	
Copper.....	NE	-	
Lead.....	-	-	
Magnox/Magnesium.....	= 4.0	-	
Nickel.....	= 2.0	-	
Titanium.....	0	-	
Uranium.....	= 1.4	-	
Zinc.....	P	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	P	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE	-	
Paper, cotton.....	NE	-	
Wood.....	NE	-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	NE	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	NE	-	
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):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	Magnesium oxide and sludge carryover
Inorganic sludges and flocs.....	= 1.3	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 57.1	-	
Sand.....	-	-	
Glass/Ceramics.....	-	-	
Graphite.....	= 3.8	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	NE	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	NE	-
Chloride.....	TR	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	TR	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
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.....	-	-
Reacting with water.....	-	-
Higher activity particles.....	= 0	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	= 0	-
Benzene.....	= 0	-
Chlorinated solvents.....	= 0	-
Formaldehyde.....	= 0	-
Organometallics.....	= 0	-
Phenol.....	= 0	-
Styrene.....	= 0	-
Tri-butyl phosphate.....	= 0	-
Other organophosphates.....	= 0	-
Vinyl chloride.....	= 0	Trace in inventory.
Arsenic.....	= 0	-
Barium.....	-	-
Boron.....	-	-
Boron (in Boral).....	= 0	-
Boron (non-Boral).....	= 0	-
Cadmium.....	-	-
Caesium.....	-	-
Selenium.....	-	-
Chromium.....	-	-
Molybdenum.....	-	-
Thallium.....	-	-
Tin.....	-	-
Vanadium.....	-	-
Mercury compounds.....	-	-
Others.....	-	-

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)	-	-
EEE Type 1.....	= 0	-
EEE Type 2.....	= 0	-
EEE Type 3.....	= 0	-
EEE Type 4.....	= 0	-
EEE Type 5.....	= 0	-

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:

Entombment in cementitious grout

Conditioning method:

Entombment in grout at Wastes Encapsulation Plant

Conditioning plants:

Plant Name	Location
Wastes Encapsulation Plant (WEP)	Sellafield

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

4.5:1 (0.35% water solids)

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
500 l drum (basket for waste)	100.0	0.47	0.47	113	2025

Range in container waste loading:

Waste container loading will be variable due to variable nature of waste. Have only weighed 10 drums so far which confirms variable nature of the waste.

Other information on packaging and conditioning:

33 baskets have been received, of which 20 have been conditioned in 500L drums, 10 of which have gone to store. 13 are ungrouted in cave.

Conditioned density (t/m³):

2.6

Conditioned density comment:

1200 kg / 0.47 m³

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		2077

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: Activity originates from Cobalt and other isotope cartridges irradiated in Piles 1 and 2 and Calder reactors, activated fuel stringer and reactor control components. Also components such as bay pond furniture contaminated by fuel and pond water activity. Magnox swarf is now included in this stream.

Uncertainty: The data given is that for the whole MBGW in PFSP stream. The specific activity data has been updated to align with LoC submission for processing in WEP

Measurement of radioactivities: By theoretical calculation.

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: Present as metal.
- Th: No characterisation data available
- U: Present as metal.
- Np: -
- Pu: Present as metal.

WASTE STREAM			2D12/C		Conditioned MBGW in PFSP				
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	2.64E-02	E C 2	2.64E-02	E C 2	Gd 153	5.81E-33	B B 8	5.81E-33	B B 8
Be 10	5.74E-08	B B 2	5.74E-08	B B 2	Ho 163	1.03E-12	B B 8	1.03E-12	B B 8
C 14	1.47E-02	E B 2	1.47E-02	E B 2	Ho 166m	2.00E-09	B B 2	2.00E-09	B B 2
Na 22					Tm 170	2.66E-66	B B 8	2.66E-66	B B 8
Al 26					Tm 171	1.50E-08	B B 2	1.50E-08	B B 2
Cl 36	1.36E-06	C B 2	1.36E-06	C B 2	Lu 174	7.71E-26	B B 8	7.71E-26	B B 8
Ar 39	1.65E-04	C B 2	1.65E-04	C B 2	Lu 176	8.92E-16	B B 8	8.92E-16	B B 8
Ar 42	5.26E-12	C B 8	5.26E-12	C B 8	Hf 178n	2.65E-15	B B 8	2.65E-15	B B 8
K 40	1.91E-09	C B 2	1.91E-09	C B 2	Hf 182	1.14E-15	B B 8	1.14E-15	B B 8
Ca 41	1.09E-05	B B 2	1.09E-05	B B 2	Pt 193	4.92E-08	B B 2	4.92E-08	B B 2
Mn 53	1.79E-13	C B 8	1.79E-13	C B 8	Ti 204	5.28E-07	B B 2	5.28E-07	B B 2
Mn 54	1.63E-29	C B 8	1.63E-29	C B 8	Pb 205	3.61E-07	B B 2	3.61E-07	B B 2
Fe 55	3.76E-04	C B 2	3.76E-04	C B 2	Pb 210	5.60E-08	B B 2	5.60E-08	B B 2
Co 60	2.53E-01	B B 2	2.53E-01	B B 2	Bi 208	2.03E-13	B B 8	2.03E-13	B B 8
Ni 59	6.48E-01	C B 2	6.48E-01	C B 2	Bi 210m	3.06E-15	B B 8	3.06E-15	B B 8
Ni 63	5.43E+01	C B 2	5.43E+01	C B 2	Po 210	5.67E-08	B A 2	5.67E-08	B A 2
Zn 65					Ra 223	1.26E-08	B A 2	1.26E-08	B A 2
Se 79	1.72E-06	C B 2	1.72E-06	C B 2	Ra 225	1.28E-11	B A 2	1.28E-11	B A 2
Kr 81	1.57E-10	C B 8	1.57E-10	C B 8	Ra 226	3.18E-09	B A 2	3.18E-09	B A 2
Kr 85	6.10E-03	B B 2	6.10E-03	B B 2	Ra 228	1.35E-10	B A 8	1.35E-10	B A 8
Rb 87	2.02E-07	B B 2	2.02E-07	B B 2	Ac 227	1.26E-08	B A 2	1.26E-08	B A 2
Sr 90	5.97E-01	B B 2	5.97E-01	B B 2	Th 227	1.24E-08	B A 2	1.24E-08	B A 2
Zr 93	6.12E-05	B B 2	6.12E-05	B B 2	Th 228	7.63E-09	B A 2	7.63E-09	B A 2
Nb 91	5.79E-11	B B 8	5.79E-11	B B 8	Th 229	1.28E-11	B A 8	1.28E-11	B A 8
Nb 92	8.65E-13	B B 8	8.65E-13	B B 8	Th 230	2.41E-07	B A 2	2.41E-07	B A 2
Nb 93m	2.18E-04	B B 2	2.18E-04	B B 2	Th 232	1.35E-10	B A 8	1.35E-10	B A 8
Nb 94	1.79E-03	B B 2	1.79E-03	B B 2	Th 234	4.42E-04	B A 2	4.42E-04	B A 2
Mo 93	1.30E-04	B B 2	1.30E-04	B B 2	Pa 231	2.39E-08	B A 2	2.39E-08	B A 2
Tc 97	3.50E-10	B B 2	3.50E-10	B B 2	Pa 233	2.19E-06	B A 2	2.19E-06	B A 2
Tc 99	4.68E-04	B B 2	4.68E-04	B B 2	U 232	9.83E-09	B A 2	9.83E-09	B A 2
Ru 106	3.53E-11	B B 2	3.53E-11	B B 2	U 233	7.07E-10	B A 8	7.07E-10	B A 8
Pd 107	1.87E-06	B B 2	1.87E-06	B B 2	U 234	4.33E-04	B A 2	4.33E-04	B A 2
Ag 108m	2.59E-10	B B 2	2.59E-10	B B 2	U 235	1.83E-05	B A 2	1.83E-05	B A 2
Ag 110m	1.30E-29	B B 8	1.30E-29	B B 8	U 236	9.72E-06	B A 2	9.72E-06	B A 2
Cd 109	4.61E-10	B B 2	4.61E-10	B B 2	U 238	4.42E-04	B A 2	4.42E-04	B A 2
Cd 113m	1.31E-04	B B 2	1.31E-04	B B 2	Np 237	2.19E-06	B A 2	2.19E-06	B A 2
Sn 119m	8.98E-29	B B 8	8.98E-29	B B 8	Pu 236	2.05E-11	B A 8	2.05E-11	B A 8
Sn 121m	4.65E-05	B B 2	4.65E-05	B B 2	Pu 238	9.08E-04	B A 2	9.08E-04	B A 2
Sn 123	1.54E-57	B B 8	1.54E-57	B B 8	Pu 239	6.84E-02	B A 2	6.84E-02	B A 2
Sn 126	1.55E-05	B B 2	1.55E-05	B B 2	Pu 240	2.13E-02	B A 2	2.13E-02	B A 2
Sb 125	8.32E-07	B B 2	8.32E-07	B B 2	Pu 241	5.22E-02	B A 2	5.22E-02	B A 2
Sb 126	2.17E-06	B B 2	2.17E-06	B B 2	Pu 242	1.90E-06	B A 2	1.90E-06	B A 2
Te 125m	2.08E-07	B B 2	2.08E-07	B B 2	Am 241	3.29E-02	B A 2	3.29E-02	B A 2
Te 127m	3.56E-67	B B 8	3.56E-67	B B 8	Am 242m	7.48E-06	B A 2	7.48E-06	B A 2
I 129	8.92E-07	B B 2	8.92E-07	B B 2	Am 243	1.16E-06	B A 2	1.16E-06	B A 2
Cs 134	2.79E-10	B B 8	2.79E-10	B B 8	Cm 242	6.11E-06	B A 8	6.11E-06	B A 8
Cs 135	2.49E-05	B B 2	2.49E-05	B B 2	Cm 243	1.69E-07	B A 2	1.69E-07	B A 2
Cs 137	7.59E-01	B B 2	7.59E-01	B B 2	Cm 244	6.77E-07	B A 2	6.77E-07	B A 2
Ba 133	2.46E-12	B B 8	2.46E-12	B B 8	Cm 245	6.54E-11	B A 8	6.54E-11	B A 8
La 137	4.56E-12	B B 8	4.56E-12	B B 8	Cm 246	1.40E-11	B A 8	1.40E-11	B A 8
La 138	2.88E-13	B B 8	2.88E-13	B B 8	Cm 248	5.69E-27	B A 8	5.69E-27	B A 8
Ce 144	2.64E-12	B B 8	2.64E-12	B B 8	Cf 249	7.47E-17	B A 8	7.47E-17	B A 8
Pm 145	5.26E-07	B B 2	5.26E-07	B B 2	Cf 250	2.06E-21	B A 8	2.06E-21	B A 8
Pm 147	6.72E-07	B B 2	6.72E-07	B B 2	Cf 251	6.22E-23	B A 8	6.22E-23	B A 8
Sm 147	2.07E-10	B B 2	2.07E-10	B B 2	Cf 252	1.43E-28	B A 8	1.43E-28	B A 8
Sm 151	2.37E-02	B B 2	2.37E-02	B B 2	Unsp a		B A 2		B A 2
Eu 152	7.33E-06	B B 2	7.33E-06	B B 2	Unsp b/g		B A 2		B A 2
Eu 154	1.09E-04	B B 2	1.09E-04	B B 2	Total a	1.24E-01	*	1.24E-01	*
Eu 155	1.39E-05	B B 2	1.39E-05	B B 2	Total b/g	5.67E+01	*	5.67E+01	*

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