

WASTE STREAM	7A115	Decommissioning LLW - Plutonium
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SITE AWE Aldermaston

SITE OWNER Ministry of Defence (MOD)

WASTE CUSTODIAN AWE plc

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 473.5		
Future arisings:	1.4.2025 - 31.3.2027	722.9		
	1.4.2028 - 31.3.2030	627.1		
	1.4.2031 - 31.3.2033	511.0		
	1.4.2034 - 31.3.2036	365.0		
	1.4.2037 - 31.3.2039	176.4		
	1.4.2040 - 31.3.2042	705.4		
	1.4.2043 - 31.3.2045	628.0		
	1.4.2046 - 31.3.2048	1035.1		
	1.4.2049 - 31.3.2051	260.8		
	1.4.2052 - 31.3.2054	260.8		
	1.4.2055 - 31.3.2057	173.9		
	1.4.2058 - 31.3.2060	0		
	1.4.2061 - 31.3.2063	83.8		
	1.4.2064 - 31.3.2066	83.8		
	1.4.2067 - 31.3.2080	0		
Total future arisings:		5634.0		
Total waste volume:		6107.5		

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

Comment on arising rates: Future arisings are estimated based on the latest decommissioning waste estimation plans for facilities on site, correct as of February 2025.

Additional information on quantities: The stock volumes are considered to be accurate. The total volume of waste from this waste stream is dependent on the longevity of the AWE site, with estimates based upon existing buildings and a site closure date of potentially 2080 or beyond.

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x 5.00
Stock (lower): x 1.00 Arisings (lower): x 0.20

WASTE SOURCE The waste arises from plutonium decommissioning operations.

PHYSICAL CHARACTERISTICS

General description: Metal (60.55%), Organics (28.30%), Other (11.15%)

Changes since waste generated: -

Bulk density (t/m³): ~ 0.40

Comment on density: This figure has been derived using stock data from 2025 (total stream mass divided by the total stream volume).

CHEMICAL COMPOSITION

General description and components (%wt): Metal (60.55%), Organics (28.30%), Other (11.15%)

Chemical state: Neutral

Sheet metal proportion / thickness: The majority of decommissioning metal is sheets and pipes typically 4mm in thickness.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 5.6	-	
Other ferrous metals.....	~ 50.8	-	
Iron.....	= 0	-	
Aluminium.....	~ 1.6	-	
Beryllium.....	TR	-	
Cobalt.....	= 0	-	
Copper.....	~ 0.70	Includes cables	
Lead.....	~ 1.0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	~ 0.88	Brass 0.02%, Galvanised steel 0.55%, Mercury 0.11%, Tin 0.2% by weight in waste stream.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 5.6	-	
Paper, cotton.....	~ 2.8	Includes hoover bags and contents, HEPA filter media.	
Wood.....	2.8	-	
Halogenated plastics.....	~ 4.6	PVC	
Total non-halogenated plastics.....	~ 4.2	Not segregated on waste records into constituent types.	
Condensation polymers.....	-	-	
Others.....	-	-	
Organic ion exchange materials.....	-	-	
Total rubber.....	~ 0.55	Not segregated on waste records into constituent types.	
Halogenated rubber.....	-	-	
Non-halogenated rubber.....	-	-	
Hydrocarbons.....	~ 13.3	-	
Oil or grease.....	~ 0.66	-	
Fuel.....	= 0	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	~ 12.7	-	
Others.....	~ 0.07	ALARA contamination control chemical	
Other organics.....	= 0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 10.2	-	
Cementitious material.....	= 0	-	
Sand.....	~ 0.61	-	
Glass/Ceramics.....	~ 0.15	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	< 0.23	Form of asbestos is likely to be moderately / highly friable.	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
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.....	= 0	-
Chloride.....	= 0	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	= 0	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	= 0	-
Sulphide.....	= 0	-

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.....	P	-
Putrescible wastes.....	P	Potential for dead animals, but likely to have dried out.
Non-putrescible wastes.....	P	Paper and wood,
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	= 0	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

-

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

Complexing agents (%wt):

Yes

	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....	= 0	-
NTA.....	= 0	-
Polycarboxylic acids.....	TR	-
Other organic complexants.....	TR	There are likely to be traces of complexing agents in this waste stream
Total complexing agents.....	TR	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)	-	-
EEE Type 1.....	NE	EEE unable to be segregated into constituent types. Number of items not able to be estimated. Approx. 0.05%wt of stream.
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)	Off-site	~ 5.0
Incineration	Off-site	~ 40.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 50.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None	Off-site	~ 5.0

Comments on planned treatments:

Planned treatment percentages have been estimated.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	5.0	17.0	18.3	18	-

Range in container waste loading:

Other information on packaging and conditioning:

Drums would be supercompacted prior to transfer to the repository at LLWR.

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	~ 5.0	~ 0.40	
Expected to be consigned to a Landfill Facility	~ 5.0	~ 0.40	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	~ 40.0	< 0.40	
Expected to be consigned to a Metal Treatment Facility	~ 50.0	~ 0.40	
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:

17 06 01*, 17 06 03*, 17 04 09*, 17 02 04*, 17 02 01, 17 02 02, 17 02 03, 17 01 06*, 17 01 07

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source:	Principal contamination is from plutonium, with low level uranium contamination present too.
Uncertainty:	The gross alpha and gross beta activity of the in-stock waste is calculated from a variety of specific facility fingerprints.
Measurement of radioactivities:	Isotopic declarations (fingerprints) are generated from the assay undertaken to pertinent buildings prior to decommissioning commencing. Assay methods include in-situ NDA analysis and sampling/destructive to ascertain relevant fingerprints. The associated fingerprint is used in addition to health physics probe or instrument (high resolution gamma-ray spectroscopy) measurements to derive individual nuclide activities.
Chemical form of radionuclides:	H-3: Not present in Waste Stream C-14: Not present in Waste Stream Cl-36: Not present in Waste Stream Se-79: Not present in Waste Stream Tc-99: Not present in Waste Stream I-129: Not present in Waste Stream Ra: Only daughter products present from uranium in this waste stream. Oxide form. Th: Only daughter products present from uranium in this waste stream. Oxide form. U: Present in Waste Stream as oxide form Np: Np-237 likely to be present in waste stream in oxide form as daughter product of Am-241 alpha decay. Pu: Present in Waste Stream as oxide form

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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		5	= 5.68E-15	C C 2
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210		5	= 5.35E-15	C C 2
Zn 65					Ra 223		5	= 1.38E-13	C C 2
Se 79					Ra 225		5	= 1.36E-17	C C 2
Kr 81					Ra 226		5	= 2.66E-14	C C 2
Kr 85					Ra 228		5	= 1.60E-19	C C 2
Rb 87					Ac 227		5	= 1.39E-13	C C 2
Sr 90					Th 227		5	= 1.36E-13	C C 2
Zr 93					Th 228		5	= 1.36E-19	C C 2
Nb 91					Th 229		5	= 1.37E-17	C C 2
Nb 92					Th 230		5	= 4.94E-12	C C 2
Nb 93m					Th 232		5	= 2.36E-19	C C 2
Nb 94					Th 234		5	= 4.38E-09	C C 2
Mo 93					Pa 231		5	= 4.48E-13	C C 2
Tc 97					Pa 233		5	= 3.32E-10	C C 2
Tc 99					U 232				
Ru 106					U 233		5	= 1.77E-14	C C 2
Pd 107					U 234	~ 1.94E-09	B B 2	= 2.16E-08	C C 2
Ag 108m					U 235	~ 7.26E-11	B B 2	= 8.46E-10	C C 2
Ag 110m					U 236	~ 2.17E-11	B B 2	= 2.01E-10	C C 2
Cd 109					U 238	~ 9.07E-10	B B 2	= 4.38E-09	C C 2
Cd 113m					Np 237		5	= 3.34E-10	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238	~ 1.10E-07	B B 2	= 3.29E-06	C C 2
Sn 123					Pu 239	~ 1.41E-05	B B 2	= 9.86E-05	C C 2
Sn 126					Pu 240	~ 2.33E-06	B B 2	= 2.54E-05	C C 2
Sb 125					Pu 241	~ 8.89E-06	B B 2	= 8.19E-05	C C 2
Sb 126					Pu 242	~ 1.50E-10	B B 2	= 5.14E-09	C C 2
Te 125m					Am 241	~ 3.29E-06	B B 2	= 4.30E-05	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					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					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	1.98E-05	*	1.70E-04	*
Eu 155					Total b/g	8.89E-06	*	8.19E-05	*

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