

WASTE STREAM	7A37	Contaminated Mercury
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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	= 3.5		
Future arisings:	1.4.2025 - 31.3.2080	= 0		
Total future arisings:		0.0		
Total waste volume:		3.5		

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

Comment on arising rates: AWE does not envisage further mercury contaminated waste arising.

Additional information on quantities: The volume of waste is reasonably well known.

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x -
Stock (lower): x 0.50 Arisings (lower): x -

WASTE SOURCE Elemental mercury used in electrical switches, vacuum pumps, thermometers and general experimental work. The contamination is physically associated with the waste and not chemically bound.

PHYSICAL CHARACTERISTICS

General description: The waste is principally contaminated mercury, although some impurities may be present.

Changes since waste generated: -

Bulk density (t/m³): = 0.39

Comment on density: The density was revised for the 2022 UK RWI and remains unchanged. This is based on the nett weight of Hg in its container (a lot of free space is present).

CHEMICAL COMPOSITION

General description and components (%wt): Mercury (100%).

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 100.0	Mercury	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	= 0	-	
Others.....	= 0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0	-	
Halogenated rubber.....	= 0	-	
Non-halogenated rubber.....	= 0	-	
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.....	= 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.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 0	-	
Non/low friable.....	= 0	-	
Moderately friable.....	= 0	-	
Highly friable.....	= 0	-	
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.....	= 0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	= 0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	P	Mercury
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.....	= 0	-
Chlorinated solvents.....	= 0	-
Formaldehyde.....	= 0	-
Organometallics.....	= 0	-
Phenol.....	= 0	-
Styrene.....	= 0	-
Tri-butyl phosphate.....	= 0	-
Other organophosphates.....	= 0	-
Vinyl chloride.....	= 0	-
Arsenic.....	= 0	-
Barium.....	= 0	-
Boron.....	= 0	-
Boron (in Boral).....	= 0	-
Boron (non-Boral).....	= 0	-
Cadmium.....	= 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	= 0	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	= 0	-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....	= 0	-
NTA.....	= 0	-
Polycarboxylic acids.....	= 0	-
Other organic complexants.....	= 0	There are no complexing agents in this waste stream.
Total complexing agents.....	= 0	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
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	Off-site	NE
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	Off-site	NE
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

AWE aim to investigate further treatments for alpha contaminated mercury, but has not identified a solution at this present time.

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
	Not yet determined	100.0	-	-	-	-

Range in container waste loading:

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	= 0.39	

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

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source: Plutonium, uranium, tritium and other beta/gamma.

Nd-144 - 4.351E-4Bq, Sm148 - 4.755E-25Bq and Gd-152 - 6.108E-10Bq present due to Eu-152 decay but not present in list above. Eu-152 present on waste cards for some containers.

Uncertainty: The stock total alpha and beta/gamma specific activity was taken from the volume and activity of waste in stock.

Measurement of radioactivities: The activity of the contaminated mercury is determined by radiometric assay.

Chemical form of radionuclides:

- H-3: Present as HTO, HT and organically bound solid in the waste stream
- C-14: Not present in the waste stream
- Cl-36: Not present in the waste stream
- Se-79: Not present in the waste stream
- Tc-99: Not present in the waste stream
- I-129: Not present in the 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 in oxide form
- Np: Np-237 present in waste stream as oxide form from daughter product of Am-241 alpha decay.
- Pu: Present in waste stream in oxide form

WASTE STREAM		7A37		Contaminated Mercury			
Nuclide	Mean radioactivity, TBq/m³			Nuclide	Mean radioactivity, TBq/m³		
	Waste at 1.4.2025	Bands and Code	Bands and Future Arisings Code		Waste at 1.4.2025	Bands and Code	Bands and Future Arisings Code
H 3	1.33E-04	C C 2		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	= 3.26E-16	C C 2	
Co 60	= 3.48E-07	C C 2		Bi 208			
Ni 59				Bi 210m			
Ni 63				Po 210	= 3.01E-16	C C 2	
Zn 65				Ra 223	= 7.47E-15	C C 2	
Se 79				Ra 225	= 7.45E-17	C C 2	
Kr 81				Ra 226	= 1.88E-15	C C 2	
Kr 85				Ra 228	= 4.59E-20	C C 2	
Rb 87				Ac 227	= 7.55E-15	C C 2	
Sr 90				Th 227	= 7.39E-15	C C 2	
Zr 93				Th 228	= 3.59E-20	C C 2	
Nb 91				Th 229	= 7.49E-17	C C 2	
Nb 92				Th 230	= 4.72E-13	C C 2	
Nb 93m				Th 232	= 7.62E-20	C C 2	
Nb 94	= 1.34E-07	C C 2		Th 234	= 3.56E-09	C C 2	
Mo 93				Pa 231	= 3.25E-14	C C 2	
Tc 97				Pa 233	= 1.13E-09	C C 2	
Tc 99				U 232			
Ru 106				U 233	= 7.66E-14	C C 2	
Pd 107				U 234	= 3.08E-09	C C 2	
Ag 108m	= 4.15E-08	C C 2		U 235	= 9.13E-11	C C 2	
Ag 110m				U 236	= 9.89E-11	C C 2	
Cd 109				U 238	= 3.56E-09	C C 2	
Cd 113m				Np 237	= 1.14E-09	C C 2	
Sn 119m				Pu 236			
Sn 121m				Pu 238	= 1.11E-05	C C 2	
Sn 123				Pu 239	= 4.33E-04	C C 2	
Sn 126				Pu 240	= 1.01E-04	C C 2	
Sb 125				Pu 241	= 2.49E-05	C C 2	
Sb 126				Pu 242	= 1.17E-08	C C 2	
Te 125m				Am 241	= 1.12E-04	C C 2	
Te 127m				Am 242m			
I 129				Am 243			
Cs 134				Cm 242			
Cs 135				Cm 243			
Cs 137	= 1.27E-06	C C 2		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	= 4.35E-04	C C 2	
Eu 152	= 4.52E-09	C C 2		Unsp b/g			
Eu 154				Total a	1.09E-03	*	0 *
Eu 155				Total b/g	1.60E-04	*	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