

WASTE STREAM	5C310	Solid Waste Complex Decommissioning ILW
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SITE Harwell
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m ³
Future arisings -	1.4.2020 - 31.3.2025.....	25.0 m ³
Total future arisings:		25.0 m ³
Total waste volume:		25.0 m ³

Comment on volumes: Arisings as a result of decommissioning. Contact-handled ILW from decommissioning of the Solid Waste Complex. Volumes estimated based on historic information and project review.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.2
 Stock (lower): x Arisings (lower) x 0.8

WASTE SOURCE Contact-handled ILW from decommissioning of the Solid Waste Complex.

PHYSICAL CHARACTERISTICS

General description: Waste from the PoCo/decommissioning of facilities, cells, ventilation systems and pipework.
 Physical components (%vol): Ferrous metals, other metals, plastics, cellulose, glassware, and concrete.
 Sealed sources: -
 Bulk density (t/m³): ~2.9
 Comment on density: Based on densities of streams 5C30 and 5C304 (similar waste types).

CHEMICAL COMPOSITION

General description and components (%wt): Metal, concrete , cellulose , plastic, rubber etc.
 Chemical state: Neutral
 Chemical form of radionuclides: H-3: Metal activation product.
 C-14: In labelled organic compounds and activation of metals.
 Ra: Found as an oxide, a nitrate, and as a sulphate.
 Th: Found as an oxide, a metal, and in irradiated fuel.
 U: Found as an oxide, a metal, and as a fuel.
 Pu: Found as an oxide, a metal, and as a fuel.
 Metals and alloys (%wt): Metal is present in a large range of thicknesses
 Stainless steel..... ~~20.0
 Other ferrous metals..... ~~60.0
 Iron.....
 Aluminium..... ~-0.50
 Beryllium..... P
 Cobalt.....
 Copper..... P
 Lead..... P
 Magnox/Magnesium..... TR
 Nickel.....
 Titanium.....
 Uranium.....
 Zinc.....

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	Zircaloy/Zirconium.....	P	
	Other metals.....	TR	Uranium, europium, cobalt, magnesium, tin, and nickel.
Organics (%wt):	The waste contains cellulose in the form of paper, wood, wax and bitumen. The halogenated plastics which are present in the waste are PVC and PTFE, and the rubbers are neoprene and hypalon.		
	Total cellulose.....	~~6.0	
	Paper, cotton.....	~~3.0	
	Wood.....	~~3.0	
	Halogenated plastics	~~2.0	PVC and PTFE
	Total non-halogenated plastics.....	P	
	Condensation polymers.....	~~1.0	
	Others.....	NE	
	Organic ion exchange materials....	P	
	Total rubber.....	P	
	Halogenated rubber	~~0.50	Neoprene and hypalon.
	Non-halogenated rubber.....	~~0.50	
	Hydrocarbons.....		
	Oil or grease		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	P	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	P	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	~~5.0	
	Sand.....		
	Glass/Ceramics.....	P	
	Graphite.....	P	
	Desiccants/Catalysts.....		
	Asbestos.....	TR	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	TR	
	Free non-aqueous liquids.....	TR	
	Powder/Ash.....	P	
Inorganic anions (%wt):	-		

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

Materials of interest for waste acceptance criteria:

Combustible metals comprise mainly uranium and other finely divided metals. Free liquids will be immobilised in cement or evaporated to dryness before conditioning. Powder may be present as a result of decommissioning operations.

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

Hazardous substances / non hazardous pollutants:

Lead and beryllium are present as metal. Trace levels of antimony may be present in the waste.

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

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Cadmium.....

Caesium.....

Selenium.....

Chromium.....

Molybdenum.....

Thallium.....

Tin.....

Vanadium.....

Mercury compounds.....

Others.....

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt):

Yes

EDTA..... TR

Present at trace levels (includes EDTA, Citrate, TBP, etc).

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... TR

PACKAGING AND CONDITIONINGConditioning method: The waste will be packaged into 6m³ boxes and placed in long-term storage in the Harwell ILW Store.

Plant Name: -

Location: Harwell

Plant startup date: 2020

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: 2020

Throughput for this stream (m³/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
6m ³ concrete box (SD)	100.0	1.75	5.8	15

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Pulverised Fly Ash / Ordinary Portland Cement

Other information: -

Conditioned density (t/m³): ~2.6

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: Activity is principally contamination associated with historic operations.

Uncertainty: The above radionuclides are expected to be present but predominantly dominated by Co60 and Cs137. Full characterisation will be undertaken near to the start of decommissioning.

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: -

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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				6	Gd 153				8
Be 10				8	Ho 163				8
C 14				6	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55				6	Pb 210				8
Co 60				6	Bi 208				8
Ni 59				6	Bi 210m				8
Ni 63				6	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				6
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90				6	Th 227				8
Zr 93				8	Th 228				6
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232				8
Nb 94				8	Th 234				8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				6
Ru 106				8	U 233				8
Pd 107				8	U 234				6
Ag 108m				8	U 235				6
Ag 110m				8	U 236				6
Cd 109				8	U 238				6
Cd 113m				6	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238				6
Sn 123				8	Pu 239				6
Sn 126				8	Pu 240				6
Sb 125				8	Pu 241				6
Sb 126				8	Pu 242				8
Te 125m				8	Am 241				6
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				6	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137				6	Cm 244				6
Ba 133				8	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Other a				
Eu 152				8	Other b/g				
Eu 154				6	Total a	0			NE
Eu 155				6	Total b/g	0			NE

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