

<b>WASTE STREAM</b>	<b>5C321</b>	<b>Active Handling Facility Decommissioning ILW</b>
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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 <sup>3</sup>
Future arisings -	1.4.2021 - 31.3.2022.....	1.9 m <sup>3</sup>
Total future arisings:		1.9 m <sup>3</sup>
Total waste volume:		1.9 m <sup>3</sup>
Comment on volumes:	Arisings as a result of decommissioning Active Handling Facility Volume mainly expected to arise from areas surrounding the high active cell lines.	
Uncertainty factors on volumes:	Stock (upper): x	Arisings (upper) x 1.2
	Stock (lower): x	Arisings (lower) x 0.8

**WASTE SOURCE** Decommissioning of the active handling facility

**PHYSICAL CHARACTERISTICS**

General description: ILW from miscellaneous items from the decommissioning of cells, ventilation systems and pipework.  
 Physical components (%vol): Ferrous metals, other metals, plastics, cellulose, glassware, and concrete.  
 Sealed sources: -  
 Bulk density (t/m<sup>3</sup>): ~2.9  
 Comment on density: The density of the waste varies with the nature of the waste items.

**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): -

Stainless steel.....	~80.0
Other ferrous metals.....	P
Iron.....	
Aluminium.....	P
Beryllium.....	
Cobalt.....	
Copper.....	P
Lead.....	P
Magnox/Magnesium.....	TR
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	TR

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	Zircaloy/Zirconium.....	P	
	Other metals.....	TR	Uranium, europium, cobalt, magnesium, tin, and nickel.
Organics (%wt):	-		
	Total cellulose.....	P	
	Paper, cotton.....	~2.0	
	Wood.....	P	
	Halogenated plastics .....	P	
	Total non-halogenated plastics.....	P	
	Condensation polymers.....	P	
	Others.....	NE	
	Organic ion exchange materials....	P	
	Total rubber.....	P	
	Halogenated rubber .....	P	
	Non-halogenated rubber.....	P	
	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.....	~18.0	
	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:

-	
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 CONDITIONING**Conditioning method: Waste will be treated by packaging and encapsulation into 6m<sup>3</sup> box for transfer to the Harwell ILW Store

Plant Name: Active Handling Facility

Location: Harwell

Plant startup date: 2021

Total capacity  
(m<sup>3</sup>/y incoming waste): -Target start date for  
packaging this stream: 2021Throughput for this stream  
(m<sup>3</sup>/y incoming waste): -

Other information: -

Likely container  
type:

Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
6m <sup>3</sup> concrete box (SD)	100.0	1.46	5.8	2

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless steel and concrete box

Likely conditioning matrix: Pulverised Fly Ash / Ordinary Portland Cement

Other information: -

Conditioned density (t/m<sup>3</sup>): >2.0

Conditioned density comment: Estimated range 2 - 3 t/m<sup>3</sup>.

Other information on conditioning: -

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: Activity is principally contamination associated with historic operations.

Uncertainty: Fingerprint will vary from facility location and reflect historical processes performed. At this stage an assumed radioactivity is unable to be stated but characterisation work will take place nearer the time 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 <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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				8	Gd 153				8
Be 10				8	Ho 163				8
C 14				8	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				8	Pb 210				6
Co 60				6	Bi 208				6
Ni 59				8	Bi 210m				8
Ni 63				8	Po 210				8
Zn 65				8	Ra 223				6
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				6
Rb 87				8	Ac 227				6
Sr 90				6	Th 227				6
Zr 93				6	Th 228				6
Nb 91				8	Th 229				6
Nb 92				8	Th 230				6
Nb 93m				6	Th 232				6
Nb 94				8	Th 234				6
Mo 93				8	Pa 231				6
Tc 97				8	Pa 233				6
Tc 99				6	U 232				6
Ru 106				8	U 233				6
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				6
Sn 119m				8	Pu 236				6
Sn 121m				8	Pu 238				6
Sn 123				8	Pu 239				6
Sn 126				6	Pu 240				6
Sb 125				6	Pu 241				6
Sb 126				8	Pu 242				6
Te 125m				6	Am 241				6
Te 127m				8	Am 242m				6
I 129				8	Am 243				6
Cs 134				6	Cm 242				6
Cs 135				6	Cm 243				6
Cs 137				6	Cm 244				6
Ba 133				8	Cm 245				6
La 137				8	Cm 246				6
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				6	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				6	Other a				
Eu 152				6	Other b/g				
Eu 154				6	<b>Total a</b>	<b>0</b>			<b>NE</b>
Eu 155				6	<b>Total b/g</b>	<b>0</b>			<b>NE</b>

**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