

WASTE STREAM	5H11	UKAEA ILW Non-Incinerable
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SITE Culham
SITE OWNER United Kingdom Atomic Energy Authority
WASTE CUSTODIAN United Kingdom Atomic Energy Authority

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0 m ³
Future arisings -	1.4.2022 - 31.3.2040.....	~~1.6 m ³
Total future arisings:		1.6 m ³
Total waste volume:		1.6 m ³

Comment on volumes: New stream for the UKAEA Materials Research Facility (MRF) running from 2022 to 2039, the facility arisings will depend on research requirements of the UK and European nuclear industry and therefore are uncertain at this time. The MRF (Materials Research Facility) and other related UKAEA (non JET) facilities are forecast to run for 20 years with active operations beginning in 2019, volumes are expected to be ~~200l per year but will depend on the operational activities in the facility.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.5
 Stock (lower): x Arisings (lower) x 0.1

WASTE SOURCE Neutron activated and tritium contaminated nuclear components used for research, original source includes nuclear facilities in the UK and Europe.

PHYSICAL CHARACTERISTICS

General description: Majority of activity will be contained within metal samples and related dust following cutting, polishing and sub-sampling during research activities. The majority of volume/mass will consist of polishing pads, cutting / grinding consumables and filters or other consumables not suitable for incineration. Waste is cleaned, segregated, sorted, sampled and size reduced where possible to enable packaging in to disposal packages and to confirm disposal route.

Physical components (%wt): -

Sealed sources: Not yet determined.

Bulk density (t/m³): ~~0.55

Comment on density: Bulk density is an estimate based on expected arisings.

CHEMICAL COMPOSITION

General description and components (%wt): Sample consumables incl gloves and wipes (~40%), filters (~35%), gators (~6%), mounting blocks (~6%), polishing pads (~2%), cutting wheels (~1%) , samples and sample debris (<10%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Mainly outgassed tritium present in the form of tritiated water vapour, and some absorbed into material surfaces.

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~~1.0		
Other ferrous metals.....	~~4.0		
Iron.....	~~1.0		
Aluminium.....	~~7.0		
Beryllium.....	~~0.50		
Cobalt.....	TR		

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Copper.....	~~0.50
Lead.....	TR
Magnox/Magnesium.....	NE
Nickel.....	~~1.0
Titanium.....	~~0.50
Uranium.....	NE
Zinc.....	TR
Zircaloy/Zirconium.....	~~0.50
Other metals.....	TR

Organics (%wt): Consumables including wipes and filters unsuitable for incineration (total ~~70%).

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~~35.0		
Paper, cotton.....	~~35.0		
Wood.....	P		
Halogenated plastics	P		
Total non-halogenated plastics.....	~~37.0		
Condensation polymers.....	~~37.0		
Others.....	P		
Organic ion exchange materials....	0		
Total rubber.....	TR		
Halogenated rubber	TR		
Non-halogenated rubber.....	TR		
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.....	P		

Other materials (%wt): Mounting blocks and cutting wheels (~~7% total)

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	~~3.5		
Cementitious material.....	P		
Sand.....	~~5.0	Including silicon carbide.	
Glass/Ceramics.....	~~3.5		
Graphite.....	TR		
Desiccants/Catalysts.....	0		

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Asbestos.....	0
Non/low friable.....	0
Moderately friable.....	0
Highly friable.....	0
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): No inorganic anions are expected in this waste stream.

	(%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.....	NE	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	NE	
Biological etc. materials.....	0	
Biodegradable materials.....	NE	
Putrescible wastes.....	NE	
Non-putrescible wastes.....	NE	
Corrosive materials.....	P	Sodium hydroxide (NaOH) potentially present in trace amounts.
Pyrophoric materials.....	NE	
Generating toxic gases.....	0	
Reacting with water.....	NE	
Higher activity particles.....	P	Beta/gamma active particles present.
Soluble solids as bulk chemical compounds.....	0	

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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.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	NE	
Cadmium.....	NE	
Caesium.....	0	
Selenium.....	0	
Chromium.....	NE	
Molybdenum.....	NE	
Thallium.....	0	
Tin.....	NE	
Vanadium.....	NE	
Mercury compounds.....	0	
Others.....	P	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	0	
EEE Type 2.....	0	
EEE Type 3.....	0	
EEE Type 4.....	0	
EEE Type 5.....	0	

Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....	0	
DPTA.....	0	
NTA.....	0	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	
Total complexing agents.....	NE	

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Potential for the waste to contain discrete items: Yes.

PACKAGING AND CONDITIONING

Conditioning method: Waste conditioned for transport into a Type A/B 1648C (Chapel Cross Flask).

Plant Name: Mixed Beta Gamma Waste Store.

Location: Sellafield.

Plant startup date: Not known.

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

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

Other information: MRF waste will be added to Mixed Beta Gamma Waste Store for interim storage .

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: Not yet determined

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: Activity is expected to originate from activated metal dust contamination of tools, equipment and consumables.

Uncertainty: Currently there are large uncertainties in the specific activity of the waste as this will depend on the nature of samples submitted for analysis and the operational programme of the facility.

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'.

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Measurement of radioactivities:

Activities are estimates only. Once operations commence specific and total activities for the waste stream will be determined by gamma spectroscopy and other relevant techniques based on the radiochemical nature of samples (e.g. acid dissolution followed by liquid scintillation counting).

Other information:

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3				6	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					Tl 204				
Mn 54				6	Pb 205				
Fe 55				6	Pb 210				
Co 60				6	Bi 208				
Ni 59				6	Bi 210m				
Ni 63				6	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
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					Other a				5
Eu 152					Other b/g		~8E-03	AA	2
Eu 154					Total a	0	0		5
Eu 155					Total b/g	0	~8E-03	AA	2

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