

WASTE STREAM	5H310	UKAEA LLW
--------------	-------	-----------

SITE Culham

SITE OWNER UKAEA

WASTE CUSTODIAN United Kingdom Atomic Energy Authority (UKAEA)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025 ~ 25.5			
Future arisings:	1.4.2025 - 31.3.2040 ~~ 3130.6			
Total future arisings:	3130.6			
Total waste volume:	3156.1			

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

Comment on arising rates: Decommissioning secondary waste stream the arisings will be constant and will depend on the JDR programme. Secondary stream made up of housekeeping wastes including coveralls, gloves, PU and mixed plastic sheeting. Combination of 5H06 and 5H16. As the JET facilities have now transitioned to decommissioning as of 2024, the operational wastes will now transition to decommissioning and arise from the decommissioning activities of the JDR programme.

Additional information on quantities: As the JET facilities have now transitioned to decommissioning as of 2024, the operational wastes will now transition to decommissioning and arise from the decommissioning activities of the JDR programme. The increase of arising ~2031 aligns with the commissioning of the H3AT facility (5H16).

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x 1.25
Stock (lower):	x 0.80	Arisings (lower):	x 0.75

WASTE SOURCE JET decommissioning (JDR) operations resulting in neutron activation and/or tritium contamination of waste. Secondary wastes.

PHYSICAL CHARACTERISTICS

General description: Protective clothing, swabs, plastic wrappings, masks, plastic isolation tents.

Changes since waste generated: Waste is segregated, sampled and low force compacted to reduce storage volumes and confirm disposal routes.

Bulk density (t/m³): ~ 0.36

Comment on density: Individual packages vary, figure used is based on historical Net wt averages of all packages generated as part of the waste stream between 01/01/2010 and 31/03/2016.

CHEMICAL COMPOSITION

General description and components (%wt): Plastic (74%), rubber (4%), cellulose including wood (4%), organic liquids (17%), metals (1%) and traces of graphite and beryllium.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 0.20	316	
Other ferrous metals.....	~ 0.80	Mild steel	
Iron.....	TR	-	
Aluminium.....	TR	-	
Beryllium.....	<< 0.10	-	
Cobalt.....	= 0	-	
Copper.....	TR	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	TR	Inconel	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	= 4.0	-	
Paper, cotton.....	~ 3.0	-	
Wood.....	~ 1.0	-	
Halogenated plastics.....	= 9.0	-	
Total non-halogenated plastics.....	= 65.0	-	
Condensation polymers.....	~ 65.0	-	
Others.....	P	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	= 4.0	-	
Halogenated rubber.....	~ 2.0	-	
Non-halogenated rubber.....	~ 2.0	-	
Hydrocarbons.....	~ 17.0	-	
Oil or grease.....	~ 17.0	-	
Fuel.....	TR	-	
Asphalt/Tarmac (cont.coal tar).....	TR	-	
Asphalt/Tarmac (no coal tar).....	TR	-	
Bitumen.....	TR	-	
Others.....	TR	-	
Other organics.....	TR	-	

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.....	TR	-	
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.....	TR	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	TR	-
Chloride.....	TR	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	= 0	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	< 1.0	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 0	-
Low flash point liquids.....	P	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	= 0	-
Biodegradable materials.....	< 1.0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	< 1.0	-
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.....	= 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.....	TR	-
Boron (in Boral).....	= 0	-
Boron (non-Boral).....	TR	As part of boronated concrete contaminated PPE
Cadmium.....	= 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	TR	-
Molybdenum.....	TR	-
Thallium.....	= 0	-
Tin.....	TR	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	= 0	-

Complexing agents (%wt):

	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....	= 0	-
NTA.....	= 0	-
Polycarboxylic acids.....	= 0	-
Other organic complexants.....	= 0	-
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	On-site	= 80.0
Decay storage		
Low force compaction	Off-site	= 100.0
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		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

An estimated 80% of waste is expected to undergo low force compaction but all will go for INCIN

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:

Waste packaged in various containers destroyed during incineration.

Conditioned density (t/m³):

-

Conditioned density comment:

-

Management Routes:

Disposal Route	Stream volume %	Raw density t/m ³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
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			

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

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: The main sources of activity are tritium contamination and neutron activation.

Uncertainty: Nuclide activities are only indicative and relate to operational waste already analysed at UKAEA Culham Campus. Contamination and activation levels will depend on the experimental (H3AT) and decommissioning (JDR) programme therefore a higher level on uncertainty is applied to future arisings.

Measurement of radioactivities: Activity assessments are achieved by documented methods including on and off site pyrolysis followed by liquid scintillation counting. Stock Neutron activation activity levels determined by Gamma Spectroscopy. Historical package averages are used to estimate future arisings.

Chemical form of radionuclides: H-3: Mainly outgassed tritium present in the form of tritiated water vapour.
C-14: -
Cl-36: -
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: -
Np: -
Pu: -

WASTE STREAM		5H310		UKAEA LLW					
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	~ 3.92E-02	D D 2	~ 3.92E-02	D D 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					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					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					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	0	*	0	*
Eu 155					Total b/g	3.92E-02	*	3.92E-02	*

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