

WASTE STREAM	5C304	Radiochemical Laboratory Decommissioning CHILW
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SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2026 - 31.3.2052	34.0		
Total future arisings:		34.0		
Total waste volume:		34.0		

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

Comment on arising rates: -

Additional information on quantities: Radiochemical Laboratory CHILW drums in stock are captured in 5C317

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.20
Stock (lower): x - Arisings (lower): x 0.80

WASTE SOURCE CHILW from decommissioning of the Radiochemical laboratory.

PHYSICAL CHARACTERISTICS

General description: Mainly metallic waste arising from miscellaneous items from decommissioning of cells, gloveboxes, ventilation systems and pipework.

Changes since waste generated: CHILW will be minimised by a number of techniques (size reduction, segregation, packing efficiency, compaction of soft wastes, etc.).

Bulk density (t/m³): ~ 3.0

Comment on density: The density of the waste varies with the nature of the waste items; 3 t/m³ is an average value.

CHEMICAL COMPOSITION

General description and components (%wt): Ferrous metals (~86%), other metals (0.5%), Lead (~3%), Cellulosics (~3%) and plastics (~2%). There may be some cementitious material.

Chemical state: Neutral

Sheet metal proportion / thickness: Metal is present in a large range of thicknesses.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	-	
Other ferrous metals.....	~ 86.0	The identity of steels/other alloys is not known.	
Iron.....	-	-	
Aluminium.....	~ 0.10	-	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	~ 0.40	-	
Lead.....	~ 3.0	-	
Magnox/Magnesium.....	TR	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	TR	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	TR	Other metals comprise uranium.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	3.0	-	
Paper, cotton.....	~ 1.5	-	
Wood.....	~ 1.5	-	
Halogenated plastics.....	~ 1.0	PVC and PTFE	
Total non-halogenated plastics.....	< 2.0	-	
Condensation polymers.....	< 1.0	-	
Others.....	< 1.0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	P	-	
Halogenated rubber.....	P	neoprene and hypalon.	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	NE	-	

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.....	~ 5.0	-	
Sand.....	-	-	
Glass/Ceramics.....	NE	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	TR	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
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.....	= 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.....	TR	-
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.....	-	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....		-

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 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 Containerisation Treatment not yet determined None	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

Waste will be treated by packing and encapsulation into 6m3 boxes pending disposal to the GDF.

Conditioning plants:

Plant Name	Location
HAR SWC	Harwell

Likely conditioning matrix:

Unknown

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
	6 m³ concrete box (SD)	100.0	1.7	5.8	20	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): < 3.0
 Conditioned density comment: Estimated range 2-3 t/m³.

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)	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 activity is contamination arising from a wide variety of work carried out in the facility, including fuels examination, radium recovery operations, thorium processing, experiments with beta/gamma isotopes.

Uncertainty: Fingerprint will vary from laboratory location and reflect historical processes performed. At this stage an assumed radioactivity is stated as the average specific activity; it will change based on the waste activity assessments performed during decommissioning work.

Measurement of radioactivities: The specific activities for the future arisings have been calculated based upon fingerprints derived from sampling and analysis and decayed.

Chemical form of radionuclides:

- H-3: Unknown
- C-14: Unknown
- Cl-36: -
- Se-79: -
- Tc-99: Unknown
- I-129: -
- Ra: Unknown
- Th: The chemical form of Thorium is unknown but probably comprises of mainly oxide with small amounts of nitrates.
- U: Unknown, probably present as metal and oxide.
- Np: Unknown
- Pu: Unknown, probably present as metal and oxide, with possibly traces of nitrate.

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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				8	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.24E-04	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			4.38E-05	C C 2	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	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55			2.78E-05	C C 2	Pb 210			5.47E-05	C C 2
Co 60			3.09E-04	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			1.14E-03	C C 2	Po 210			5.48E-05	C C 2
Zn 65				8	Ra 223			2.05E-05	C C 2
Se 79				8	Ra 225			7.83E-06	C C 2
Kr 81				8	Ra 226			4.81E-05	C C 2
Kr 85				8	Ra 228			1.04E-05	C C 2
Rb 87				8	Ac 227			2.07E-05	C C 2
Sr 90			1.53E-03	C C 2	Th 227			2.03E-05	C C 2
Zr 93				8	Th 228			8.64E-06	C C 2
Nb 91				8	Th 229			7.83E-06	C C 2
Nb 92				8	Th 230			2.31E-07	C C 2
Nb 93m				8	Th 232			1.48E-05	C C 2
Nb 94			5.56E-07	C C 2	Th 234			6.42E-05	C C 2
Mo 93				8	Pa 231			6.97E-05	C C 2
Tc 97				8	Pa 233			7.90E-04	C C 2
Tc 99			2.86E-05	C C 2	U 232				8
Ru 106			9.91E-09	C C 2	U 233			8.01E-05	C C 2
Pd 107				8	U 234			1.47E-04	C C 2
Ag 108m				8	U 235			4.66E-06	C C 2
Ag 110m				8	U 236			3.76E-07	C C 2
Cd 109				8	U 238			6.42E-05	C C 2
Cd 113m				8	Np 237			7.90E-04	C C 2
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			5.54E-02	C C 2
Sn 123				8	Pu 239			1.44E-02	C C 2
Sn 126				8	Pu 240			1.08E-02	C C 2
Sb 125			1.85E-08	C C 2	Pu 241			4.13E-01	C C 2
Sb 126				8	Pu 242			6.27E-06	C C 2
Te 125m			4.62E-09	C C 2	Am 241			9.66E-02	C C 2
Te 127m				8	Am 242m				8
I 129				8	Am 243			2.72E-06	C C 2
Cs 134			4.57E-08	C C 2	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137			2.35E-03	C C 2	Cm 244			9.48E-05	C C 2
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			1.52E-08	C C 2	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			5.03E-06	C C 2	Unsp a				
Eu 152			2.24E-06	C C 2	Unsp b/g				
Eu 154			9.70E-07	C C 2	Total a	0	*	1.79E-01	*
Eu 155				8	Total b/g	0	*	4.20E-01	*

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