

<b>WASTE STREAM</b>	<b>5B330</b>	<b>CHILW Retrievable Drum Store ILW</b>
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**SITE** Dounreay  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Dounreay Site Restoration Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: Yes

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0 m <sup>3</sup>
Future arisings -	1.4.2041 - 31.3.2042.....	0.6 m <sup>3</sup>
	1.4.2042 - 31.3.2043.....	0.1 m <sup>3</sup>
Total future arisings:		0.8 m <sup>3</sup>
Total waste volume:		0.8 m <sup>3</sup>

Comment on volumes: Arising rates have been revised in line with DSRL's provisional Life Time Plan which has been updated since 2019. Stocks volumes have been re-evaluated since 2016 and are currently zero as per LoC/29919616; these are now incorporated under 5B24.

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

**WASTE SOURCE** This waste arises from the decommissioning of the high alpha low beta/gamma retrievable drum store - those areas which are contaminated with CHILW.

**PHYSICAL CHARACTERISTICS**

General description: The waste will mainly be contaminated steel and components from a glovebox. No large items are expected.  
 Physical components (%wt): Glass (5.69%), Lead (2.85%), Mild Steel (83.09%), Plastic (7.32%), Rubber (0.08%), Paper / Cardboard (0.97%),  
 Sealed sources: Not yet determined.  
 Bulk density (t/m<sup>3</sup>): 0.25  
 Comment on density: The bulk density is based on consignor's estimates.

**CHEMICAL COMPOSITION**

General description and components (%wt): Glass (2.01%), Lead (4.55%), Mild Steel (92.46%), Plastic (0.95%), Rubber (0.02%), Paper / Cardboard (<0.01%)  
 Chemical state: Neutral  
 Chemical form of radionuclides: H-3: Not expected to be present.  
 C-14: Not expected to be present.  
 Cl-36: Not expected to be present.  
 I-129: Not expected to be present.  
 Ra: Not expected to be present.  
 Th: Not expected to be present.  
 U: May be present as oxide at low levels.  
 Np: May be present at low levels.  
 Pu: May be present as oxide at low levels.  
 Metals and alloys (%wt): The metal will probably be present as thin steel sheeting.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	92.5		
Iron.....			
Aluminium.....	NE		
Beryllium.....	0		
Cobalt.....	NE		

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Copper.....	NE
Lead.....	4.6
Magnox/Magnesium.....	0
Nickel.....	NE
Titanium.....	
Uranium.....	P
Zinc.....	NE
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	0		
Paper, cotton.....	TR		
Wood.....	NE		
Halogenated plastics .....	0.48		
Total non-halogenated plastics.....	0.48		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	0		
Total rubber.....	0.02		
Halogenated rubber .....	0.01		
Non-halogenated rubber.....	0.01		
Hydrocarbons.....			
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	0		

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.....	2.0		
Graphite.....	0		
Desiccants/Catalysts.....	0		

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

Inorganic anions (%wt):           Trace amounts of inorganic anions could be present.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	0	
Carbonate.....	NE	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	NE	
Sulphide.....	NE	

Materials of interest for           If present, will only be at trace levels.  
waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....		
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.....	0	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....		
Reacting with water.....	0	
Higher activity particles.....	0	
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances /           Lead is present. Traces of mercury could be present.  
non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		

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Benzene.....	NE
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	NE
Styrene.....	
Tri-butyl phosphate.....	NE
Other organophosphates.....	
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	
Boron.....	NE
Boron (in Boral).....	
Boron (non-Boral).....	
Cadmium.....	NE
Caesium.....	
Selenium.....	NE
Chromium.....	NE
Molybdenum.....	NE
Thallium.....	
Tin.....	NE
Vanadium.....	NE
Mercury compounds.....	
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	
EEE Type 2.....	
EEE Type 3.....	
EEE Type 4.....	
EEE Type 5.....	

Complexing agents (%wt):

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

Potential for the waste to contain discrete items:      No.

**PACKAGING AND CONDITIONING**

Conditioning method: The waste will continue to be stored in 200 litre drums until a conditioning route is available. The current strategy is for this material to be compacted, with the resultant pucks grouted into 500 litre drums. Some waste drums may not be suitable for compaction and these will be directly loaded into 500 l drums. This waste stream will be copackaged into 500L drums alongside all wastes from 5B19 and the CHILW from decommissioning waste streams.

Plant Name: CHILW Repacking Facility

Location: Dounreay

Plant startup date: 2026

Total capacity (m<sup>3</sup>/y incoming waste): -

Target start date for packaging this stream: 2026

Throughput for this stream (m<sup>3</sup>/y incoming waste): -

Other information: Material may be processed with other CHILW.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum	100.0	1	0.5	< 1

Likely container type comment: The conditioning factor for CHILW is about 0.5

Range in container waste volume: It is estimated that between 2 and 8 pucks with an average of 5 pucks will be placed in a 500 l drum. A small percentage of drums unsuitable for suercompaction will be grouted directly into the 500 l drum.

Other information on containers: Stainless steel.

Likely conditioning matrix: Cement

Other information: -

Conditioned density (t/m<sup>3</sup>): ~2.5

Conditioned density comment: The density of the conditioned product is likely to be in the range 2-3 te/m3.

Other information on conditioning: -

Opportunities for alternative disposal routing: No

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

**RADIOACTIVITY**

Source: The source of radioactivity is from the CHILW repackaging and storage operations previously carried out in the facility.

Uncertainty: Specific activity of waste arisings is based on 5B24 operational waste and should be regarded as a worst case estimate.

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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:

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Other information:

Specific Activity uses 2019 data decayed to 2022.

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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					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		3.78E-15	CC 2	
Co 60			6.01E-06	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210		2.28E-15	CC 2	
Zn 65					Ra 223		6.44E-13	CC 2	
Se 79					Ra 225		1.11E-17	CC 2	
Kr 81					Ra 226		1.26E-13	CC 2	
Kr 85					Ra 228		1.02E-17	CC 2	
Rb 87					Ac 227		6.97E-13	CC 2	
Sr 90			1.50E-04		Th 227		6.55E-13	CC 2	
Zr 93					Th 228		2.95E-18	CC 2	
Nb 91					Th 229		1.18E-17	CC 2	
Nb 92					Th 230		1.94E-10	CC 2	
Nb 93m					Th 232		6.35E-17	CC 2	
Nb 94					Th 234		9.83E-06	CC 2	
Mo 93					Pa 231		1.51E-11	CC 2	
Tc 97					Pa 233		2.09E-08	CC 2	
Tc 99					U 232				
Ru 106			7.52E-06	CC 2	U 233		1.30E-13	CC 2	
Pd 107					U 234		7.11E-06	CC 2	
Ag 108m					U 235		2.38E-07	CC 2	
Ag 110m					U 236		4.3E-07	CC 2	
Cd 109					U 238		9.83E-06	CC 2	
Cd 113m					Np 237		2.17E-08	CC 2	
Sn 119m					Pu 236				
Sn 121m					Pu 238		1.62E-02	CC 2	
Sn 123					Pu 239		1.95E-02	CC 2	
Sn 126					Pu 240		2.25E-02	CC 2	
Sb 125			1.37E-04	CC 2	Pu 241		3.46E-01	CC 2	
Sb 126					Pu 242		1.43E-05	CC 2	
Te 125m			3.25E-05	CC 2	Am 241		2.32E-02	CC 2	
Te 127m					Am 242m		1.17E-05	CC 2	
I 129					Am 243		2.27E-12	CC 2	
Cs 134			2.03E-06	CC 2	Cm 242		9.70E-06	CC 2	
Cs 135					Cm 243		3.25E-06	CC 2	
Cs 137			4.49E-04	CC 2	Cm 244		3.53E-05	CC 2	
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		2.31E-12	CC 2	
Eu 152					Other b/g		6.03E-04	CC 2	
Eu 154			1.04E-04	CC 2	<b>Total a</b>	<b>0</b>	<b>8.14E-02</b>	<b>CC 2</b>	
Eu 155			5.31E-05	CC 2	<b>Total b/g</b>	<b>0</b>	<b>3.48E-01</b>	<b>CC 2</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