

<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

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	0 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2022.....	0.8 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: It should be noted that the DSRL site programme is currently under review and arisings dates are subject to change. Arisings volumes revised in line with Predictive Waste Inventory review. 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 from the cell walls. No large items are expected.  
 Physical components (%vol): 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 stainless steel sheeting.

Stainless steel.....	0
Other ferrous metals.....	92.5
Iron.....	
Aluminium.....	NE
Beryllium.....	0
Cobalt.....	NE
Copper.....	NE
Lead.....	4.6
Magnox/Magnesium.....	0

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	Nickel.....	NE	
	Titanium.....		
	Uranium.....	P	
	Zinc.....	NE	
	Zircaloy/Zirconium.....	0	
	Other metals.....	0	Other metals are not specified.
Organics (%wt):	-		
	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):	-		
	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	
	Asbestos.....	NE	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	

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

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	0
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

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

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
Active particles.....	0
Soluble solids as bulk chemical compounds.....	0

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

Acrylamide.....	
Benzene.....	NE
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	NE
Styrene.....	
Tri-butyl phosphate.....	NE
Other organophosphates.....	
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	

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Boron..... NE  
 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):    Not yet determined  
     EDTA.....  
     DPTA.....  
     NTA.....  
     Polycarboxylic acids.....  
     Other organic complexants.....  
     Total complexing agents..... NE

**PACKAGING AND CONDITIONING**

Conditioning method:        The waste will be supercompacted, if suitable, then grouted into 500 litre drums

Plant Name:                TBC

Location:                 Dounreay

Plant startup date:        -

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

Target start date for  
packaging this stream:    -

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

Other information:        While the conditioning route has not yet been finalised, the current strategy is that this waste will be supercompacted and encapsulated in 500 litre drums .

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

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Likely container type comment: -

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

Treatment	Stream volume (%)	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.

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: Specific Activities have been re-evaluated since the 2016 UK Inventory.

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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					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			8.92E-06	CC 2	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			1.61E-04	CC 2	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			5.78E-05	CC 2	U 233				
Pd 107					U 234		6.97E-06	CC 2	
Ag 108m					U 235		2.38E-07	CC 2	
Ag 110m					U 236		4.28E-07	CC 2	
Cd 109					U 238		9.83E-06	CC 2	
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		1.66E-02	CC 2	
Sn 123					Pu 239		1.95E-02	CC 2	
Sn 126					Pu 240		2.25E-02	CC 2	
Sb 125			2.92E-04	CC 2	Pu 241		4E-01	CC 2	
Sb 126					Pu 242		1.43E-05	CC 2	
Te 125m					Am 241		2.15E-02	CC 2	
Te 127m					Am 242m		1.19E-05	CC 2	
I 129					Am 243				
Cs 134			5.56E-06	CC 2	Cm 242				
Cs 135					Cm 243		3.48E-06	CC 2	
Cs 137			4.81E-04	CC 2	Cm 244		3.96E-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				
Eu 152					Other b/g				
Eu 154			1.33E-04	CC 2	<b>Total a</b>	<b>0</b>	<b>8.01E-02</b>	<b>CC 2</b>	
Eu 155			8.23E-05	CC 2	<b>Total b/g</b>	<b>0</b>	<b>4.01E-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