

WASTE STREAM	5B330	CHILW Retrievable Drum Store ILW
--------------	-------	----------------------------------

SITE Dounreay

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:	1.4.2047 - 31.3.2048	< 0.1		
	1.4.2048 - 31.3.2049	= 0.4		
	1.4.2049 - 31.3.2050	= 0.4		
Total future arisings:		0.8		
Total waste volume:		0.8		

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

Comment on arising rates: Programme data is based on Life Time Plan 2024 dataset generated in December 2023

Additional information on quantities: 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 1.20
Stock (lower): x - Arisings (lower): x 0.80

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.

Changes since waste generated: -

Bulk density (t/m³): = 0.25

Comment on density: Based on actuals data from Dounreay's waste consignment system between 2010-2019. Data considered acceptable for 2025 submission.

CHEMICAL COMPOSITION

General description and components (%wt): Glass (5.69%), Lead (2.85%), Mild Steel (83.09%), Paper (0.97%), Plastic (7.32%), Rubber (0.08%),

Chemical state: Neutral

Sheet metal proportion / thickness: 73.76% by wt of all metals will be bulk from tanks and gloveboxes.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	0	-	
Other ferrous metals.....	= 83.1	Mild Steel	
Iron.....	0	-	
Aluminium.....	0	-	
Beryllium.....	0	-	
Cobalt.....	0	-	
Copper.....	0	-	
Lead.....	= 2.8	-	
Magnox/Magnesium.....	0	-	
Nickel.....	0	-	
Titanium.....	0	-	
Uranium.....	0	-	
Zinc.....	0	-	
Zircaloy/Zirconium.....	0	-	
Other metals.....	0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 0.97	-	
Paper, cotton.....	= 0.97	-	
Wood.....	0	-	
Halogenated plastics.....	= 3.7	-	
Total non-halogenated plastics.....	= 3.7	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	0	-	
Total rubber.....	= 0.08	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	0	-	
Oil or grease.....	0	-	
Fuel.....	NE	-	
Asphalt/Tarmac (cont.coal tar).....	0	-	
Asphalt/Tarmac (no coal tar).....	0	-	
Bitumen.....	0	-	
Others.....	NE	-	
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.....	= 5.7	glass	
Graphite.....	0	-	
Desiccants/Catalysts.....	0	-	
Asbestos.....	0	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	0	-	
Free non-aqueous liquids.....	0	-	
Powder/Ash.....	0	-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	NE	-
Low flash point liquids.....	NE	-
Explosive materials.....	NE	-
Phosphorus.....	NE	-
Hydrides.....	NE	-
Biological etc. materials.....	NE	-
Biodegradable materials.....	0	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	NE	-
Pyrophoric materials.....	NE	-
Generating toxic gases.....	NE	-
Reacting with water.....	0	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	-
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 3	Solid sources Pu239+Am241
Electronic & Electrical Equipment (EEE)		
EEE Type 1.....		-
EEE Type 2.....	= 1	Hepa Filters
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	= 100.0
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		

Comments on planned treatments:

This waste will be processed through a dedicated ILW repackaging facility which will produce 500 L drums.

Conditioning method:

Waste will be conditioned using a grout matrix into 500l drums. This will be done through a dedicated ILW repackaging facility, which will handle both RHILW and CHILW 200l drums. This facility will produce conditioned 500l drums

Conditioning plants:

Plant Name	Location
Combined ILW Repackaging Facility	Dounreay

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

42% Water, Dounreay uses OPC instead of BFS (1:3 OPC:PFA)

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	500 l drum (pucks)	100.0	0.39	0.40	2	-

Range in container waste loading: 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 packaging and conditioning: -

Conditioned density (t/m³): ~ 2.5

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

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
Non-NSDF HAW	Dounreay LLWDV	NE	RED	There is potential for LLW to be diverted out of this stream during repackaging of ILW into 500L drums. However details of this will be confirmed through the design process of the repackaging plant

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.

Measurement of radioactivities: -

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.
- Se-79: -
- Tc-99: -
- 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.

WASTE STREAM		5B330		CHILW Retrievable Drum Store ILW					
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					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			= 1.93E-13	C C 2
Se 79					Ra 225			= 5.86E-18	C C 2
Kr 81					Ra 226				
Kr 85					Ra 228			= 1.58E-17	C C 2
Rb 87					Ac 227			= 2.05E-13	C C 2
Sr 90					Th 227			= 1.95E-13	C C 2
Zr 93					Th 228			= 6.04E-18	C C 2
Nb 91					Th 229			= 6.09E-18	C C 2
Nb 92					Th 230				
Nb 93m					Th 232			= 7.79E-17	C C 2
Nb 94					Th 234				
Mo 93					Pa 231			= 3.37E-12	C C 2
Tc 97					Pa 233			= 4.91E-09	C C 2
Tc 99					U 232				
Ru 106					U 233			= 4.31E-14	C C 2
Pd 107					U 234				
Ag 108m					U 235			= 5.32E-08	C C 2
Ag 110m					U 236			= 5.26E-07	C C 2
Cd 109					U 238				
Cd 113m					Np 237			= 5.08E-09	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239			= 9.00E+00	C C 2
Sn 126					Pu 240			= 3.00E+00	C C 2
Sb 125					Pu 241			= 4.49E-01	C C 2
Sb 126					Pu 242				
Te 125m					Am 241			= 4.98E-03	C C 2
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	*	1.20E+01	*
Eu 155					Total b/g	0	*	4.49E-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