

WASTE STREAM	5B306	Site Drains and Ducts ILW
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SITE Dounreay

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

Stocks:
Future arisings:

	Reported (m ³)
At 1.4.2025	
1.4.2037 - 31.3.2038	1.4
1.4.2038 - 31.3.2039	2.9
1.4.2039 - 31.3.2040	1.5
1.4.2064 - 31.3.2065	0.2
1.4.2065 - 31.3.2066	0.2
1.4.2066 - 31.3.2067	0.2
1.4.2067 - 31.3.2068	0.2
1.4.2068 - 31.3.2069	0.2
1.4.2069 - 31.3.2070	0.2
1.4.2070 - 31.3.2071	0.2
1.4.2071 - 31.3.2072	0.2
1.4.2072 - 31.3.2073	0.1

OR

Conditioned (m ³)	Packaged (m ³)

Total future arisings:
Total waste volume:

7.7
7.7

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

Comment on arising rates: Arisings dates are taken from Dounreay's Lifetime Plan 2024 as generated in December 2023

Additional information on quantities: Initial indications show ~2m3 CHILW from Zone H2 which contains declarable Pu. Also ~6m3 RHILW from a high active drain.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.02
Stock (lower): x - Arisings (lower): x 0.98

WASTE SOURCE Contamination and activation from years of operations and discharges via drainage system

PHYSICAL CHARACTERISTICS

General description: Pipework, drip tray

Changes since waste generated: -

Bulk density (t/m³): = 0.42

Comment on density: No consignor's records for ILW. Therefore, use LLW (5B305).

CHEMICAL COMPOSITION

General description and components (%wt): Iron (4.79%), Mild Steel (79.63%), Plastic (0.87%), Stainless steel (14.71%).

Chemical state: Neutral

Sheet metal proportion / thickness: Pipework is typically 3mm

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 14.7	-	
Other ferrous metals.....	= 79.6	Mild Steel	
Iron.....	= 4.8	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	NE	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	NE	-	
Titanium.....	NE	-	
Uranium.....	NE	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE	-	
Paper, cotton.....	NE	-	
Wood.....	NE	-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	= 0.87	-	
Condensation polymers.....	= 0	-	
Others.....	= 0.87	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	NE	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	NE	-	
Oil or grease.....	NE	-	
Fuel.....	NE	-	
Asphalt/Tarmac (cont.coal tar).....	NE	-	
Asphalt/Tarmac (no coal tar).....	NE	-	
Bitumen.....	NE	-	
Others.....	NE	-	
Other organics.....	NE	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	NE	-	
Soil.....	NE	-	
Brick/Stone/Rubble.....	NE	-	
Cementitious material.....	NE	-	
Sand.....	NE	-	
Glass/Ceramics.....	NE	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	NE	-	
Asbestos.....	NE	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	NE	-	
Free non-aqueous liquids.....	NE	-	
Powder/Ash.....	NE	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	NE	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
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.....	NE	-
Putrescible wastes.....	NE	-
Non-putrescible wastes.....	NE	-
Corrosive materials.....	NE	-
Pyrophoric materials.....	NE	-
Generating toxic gases.....	NE	-
Reacting with water.....	NE	-
Higher activity particles.....	NE	-
Soluble solids as bulk chemical compounds.....	NE	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	NE	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	NE	-
Barium.....	NE	-
Boron.....	NE	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	NE	-
Caesium.....	NE	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	NE	-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....	NE	-
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.....	0	-
Electronic & Electrical Equipment (EEE)		
EEE Type 1.....	NE	-
EEE Type 2.....	NE	-
EEE Type 3.....	NE	-
EEE Type 4.....	NE	-
EEE Type 5.....	NE	-

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:

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

Conditioning method:

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

Conditioning plants:

Plant Name	Location
Combined ILW Repackaging Facility	Dounreay

Likely conditioning matrix:

Non-standard

Further information on the conditioning matrix:

Dounreay will use: Cement PFA 3:1 OPC 42% water

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 (basket for waste)	74.7	0.20	0.40	29	-
	500 l drum (pucks)	25.3	0.49	0.40	4	-

Range in container waste loading: It is estimated that between 2 and 8 CHILW pucks will be placed into each 500l drum with the average being 5 drums per 500L drum. A small percentage of drums may not be suitable for supercompaction and will be directly immobilised into the 500l drum. Assume 3:2 Z6033 to 500L drum ratio.

Other information on packaging and conditioning: -

Conditioned density (t/m³): ~ 2.5

Conditioned density comment: The density is likely to be around 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: Not yet determined

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

RADIOACTIVITY

Source: From reactors and reprocessing facilities

Uncertainty: -

Measurement of radioactivities: -

Chemical form of radionuclides:

- H-3: Likely to be present as contamination.
- C-14: Likely to be present as contamination.
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: Not likely to be present.
- Th: Likely to be present as contamination.
- U: Likely to be present as contamination.
- Np: Likely to be present as contamination.
- Pu: Likely to be present as contamination.

WASTE STREAM		5B306		Site Drains and Ducts 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			= 4.19E-14	C C 2
Co 60			= 1.48E-04	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210			= 3.21E-14	C C 2
Zn 65					Ra 223			= 1.96E-12	C C 2
Se 79					Ra 225			= 1.79E-18	C C 2
Kr 81					Ra 226			= 7.06E-13	C C 2
Kr 85					Ra 228			= 6.11E-17	C C 2
Rb 87					Ac 227			= 2.04E-12	C C 2
Sr 90			= 6.78E-02	C C 2	Th 227			= 1.96E-12	C C 2
Zr 93					Th 228			= 2.89E-17	C C 2
Nb 91					Th 229			= 1.84E-18	C C 2
Nb 92					Th 230			= 5.44E-10	C C 2
Nb 93m					Th 232			= 2.12E-16	C C 2
Nb 94					Th 234				
Mo 93					Pa 231			= 2.27E-11	C C 2
Tc 97					Pa 233			= 7.71E-10	C C 2
Tc 99					U 232			=	
Ru 106					U 233			9.91E-15	C C 2
Pd 107					U 234			= 9.86E-06	C C 2
Ag 108m					U 235			= 1.79E-07	C C 2
Ag 110m					U 236			= 7.16E-07	C C 2
Cd 109					U 238				
Cd 113m					Np 237			= 7.85E-10	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238			= 3.42E-04	C C 2
Sn 123					Pu 239			= 6.83E-04	C C 2
Sn 126					Pu 240			1.76E-07	C C 2
Sb 125					Pu 241			= 1.25E-04	C C 2
Sb 126					Pu 242				
Te 125m					Am 241			= 4.03E-04	C C 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137			= 8.19E-02	C C 2	Cm 244			= 2.47E-04	C C 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					Unsp a				
Eu 152					Unsp b/g				
Eu 154					Total a	0	*	1.69E-03	*
Eu 155					Total b/g	0	*	1.50E-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