

WASTE STREAM	5B358	Previously Disposed LLW
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SITE Dounreay

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:				
Total future arisings:				
Total waste volume:	0.0			

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

Comment on arising rates: Change to Site Strategy - Approximately 33620m³ of waste has been previously disposed to the old authorised LLW facility. The site now intends to develop an engineering solution and an Environmental Safety Case to leave the waste in situ. Therefore no arisings are now expected from this waste stream.

Additional information on quantities: Current assumption is that the PITs waste will remain in-situ, however this assumption may change in the future. Therefore, we have presented the future arisings data for reference. Upper and lower uncertainty around waste volumes is 20%. Strategy is subject to agreement from the Regulators.

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

WASTE SOURCE Historically LLW was disposed of to shallow burial facilities at Dounreay. These facilities do not meet current standards and it is now the intention to develop an appropriate engineering solution and an environmental safety case to leave the facility contents in situ i.e. not retrieve the waste.

PHYSICAL CHARACTERISTICS

General description: There is little detailed information available on the physical and chemical characteristics of the Pits wastes in addition to that given below. The types of waste disposed of comprises: building rubble; process plant material; protective materials (PVC and rubber gloves); metals; incinerator ash; cemented sludge; glassware; plastic; fabric; wood; paper and cardboard; filter materials (may contain some wood pulp); and low specific activity scale. The volumes of putrescible materials are low and amounts of methane generated through waste degradation are also expected to be low, especially since a LLW incinerator was operated from 1959 to 1997.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.0

Comment on density: The density is estimated to be around 1 te/m³, though no exact information is available.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (25%), other ferrous metals (25%), aluminium (0.13%), copper (1%), lead (5%), asbestos (2.15%), halogenated plastics (1.2%), non-halogenated plastics (2.3%), halogenated rubber (2.6%), cementitious rubble (26.8%), glass (8.5%), others (0.32%).

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 25.0	-	
Other ferrous metals.....	~ 25.0	-	
Iron.....	-	-	
Aluminium.....	~ 0.13	-	
Beryllium.....	TR	-	
Cobalt.....	= 0	-	
Copper.....	~ 1.0	-	
Lead.....	~ 5.0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	P	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	= 0.32	Other metals may be present	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	TR	-	
Paper, cotton.....	TR	-	
Wood.....	TR	-	
Halogenated plastics.....	~ 1.2	-	
Total non-halogenated plastics.....	~ 2.3	-	
Condensation polymers.....	NE	-	
Others.....	~ 2.3	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	~ 2.6	-	
Halogenated rubber.....	~ 2.6	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	P	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	TR	-	
Brick/Stone/Rubble.....	NE	-	
Cementitious material.....	~ 26.8	-	
Sand.....	-	-	
Glass/Ceramics.....	~ 8.5	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 2.2	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
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.....	= 0	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	= 0	-
Nitrate.....	TR	-
Nitrite.....	= 0	-
Phosphate.....	TR	-
Sulphate.....	= 0	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 0	-
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.....	= 0	-
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.....		-
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.....	TR	-
Caesium.....		-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....		-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....		-
Others.....	NE	-

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....	NE	-
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:

The waste will be left in situ within an upgraded facility. Exact engineering solutions to support this strategy have yet to be developed.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

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
Not yet determined	100.0	-	-	-	-

Range in container waste loading: No packaging will be required

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

-

Conditioned density comment:

-

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: Radionuclide Specific Activity data use information that has come from a comparison of older studies, borehole sample data, and old inventory records.

Uncertainty: Within a factor of three.

Measurement of radioactivities: Radionuclide data was divided by the total volume of the LLW Pits. It has also been decayed from 2022 to 2025

Chemical form of radionuclides: H-3: -
C-14: -
Cl-36: Not likely to be present.
Se-79: May be present as contamination.
Tc-99: May be present as contamination.
I-129: May be present in very small quantities.
Ra: May be present as contamination.
Th: May be present as contamination.
U: May be present as contamination.
Np: May be present as contamination.
Pu: May be present as contamination.

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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					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					Ti 204				
Mn 54					Pb 205				
Fe 55					Pb 210			= 1.48E-07	B B 2
Co 60			= 4.39E-08	B B 2	Bi 208				
Ni 59			= 4.01E-08	B B 2	Bi 210m				
Ni 63			= 2.74E-06	B B 2	Po 210			= 1.45E-07	B B 2
Zn 65					Ra 223			4.72E-12	
Se 79			= 7.73E-10	B B 2	Ra 225			7.93E-18	
Kr 81					Ra 226			= 2.92E-07	B B 2
Kr 85					Ra 228			= 5.60E-09	B B 2
Rb 87					Ac 227			= 4.94E-12	B B 2
Sr 90			= 5.16E-05	B B 2	Th 227			4.74E-12	
Zr 93			= 5.07E-09	B B 2	Th 228			= 8.32E-09	B B 2
Nb 91					Th 229			= 7.98E-18	B B 2
Nb 92					Th 230			= 9.92E-10	B B 2
Nb 93m			= 3.91E-09	B B 2	Th 232			= 3.57E-16	B B 2
Nb 94			= 1.22E-08	B B 2	Th 234			1.05E-07	
Mo 93					Pa 231			= 6.36E-11	B B 2
Tc 97					Pa 233			4.18E-11	
Tc 99			= 3.33E-08	B B 2	U 232				
Ru 106					U 233			= 9.56E-15	B B 2
Pd 107			= 4.69E-10	B B 2	U 234			= 1.08E-05	B B 2
Ag 108m					U 235			= 3.01E-07	B B 2
Ag 110m					U 236			= 7.24E-07	B B 2
Cd 109					U 238			= 1.05E-07	B B 2
Cd 113m					Np 237			= 4.21E-11	B B 2
Sn 119m					Pu 236				
Sn 121m					Pu 238			= 2.25E-06	B B 2
Sn 123					Pu 239			= 1.68E-05	B B 2
Sn 126			= 5.69E-09	B B 2	Pu 240			= 6.50E-06	B B 2
Sb 125			= 5.28E-11	B B 2	Pu 241			= 4.82E-05	B B 2
Sb 126			5.69E-09		Pu 242			= 2.52E-09	B B 2
Te 125m			1.25E-11		Am 241			= 7.62E-06	B B 2
Te 127m					Am 242m			= 7.71E-08	B B 2
I 129			= 6.26E-11	B B 2	Am 243				
Cs 134			= 5.59E-12	B B 2	Cm 242			= 6.44E-08	B B 2
Cs 135			= 3.33E-09	B B 2	Cm 243				
Cs 137			= 6.58E-05	B B 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147			= 1.22E-09	B B 2	Cf 251				
Sm 147			= 5.05E-18	B B 2	Cf 252				
Sm 151			= 4.89E-06	B B 2	Unsp a				
Eu 152			= 6.95E-06	B B 2	Unsp b/g				
Eu 154			= 2.07E-07	B B 2	Total a	0	*	4.56E-05	*
Eu 155			= 1.82E-08	B B 2	Total b/g	0	*	1.81E-04	*

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