

WASTE STREAM	5B363	Effluent Treatment Plant ILW
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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 ³
Future arisings -	1.4.2022 - 31.3.2023.....	<< 0.1 m ³
	1.4.2023 - 31.3.2024.....	0 m ³
	1.4.2024 - 31.3.2025.....	0 m ³
	1.4.2025 - 31.3.2026.....	0 m ³
	1.4.2026 - 31.3.2027.....	0 m ³
	1.4.2027 - 31.3.2028.....	0 m ³
	1.4.2028 - 31.3.2029.....	0 m ³
	1.4.2029 - 31.3.2030.....	0 m ³
	1.4.2030 - 31.3.2031.....	0 m ³
	1.4.2031 - 31.3.2032.....	0 m ³
	1.4.2032 - 31.3.2033.....	0.4 m ³
	1.4.2033 - 31.3.2034.....	2.6 m ³
Total future arisings:		3.0 m ³
Total waste volume:		3.0 m ³

Comment on volumes: Arisings based on the findings from the recent inventory walk down of D1211. It should be noted that DSRL are currently using a provisional site programme and that arisings dates are subject to change. This waste is contained mostly within a concrete tank with a small amount in the Pump Well valves. Conditions do not allow access to the waste within the tank therefore an assumption has been made as to the waste volume; this could be a maximum of 5m³. An LoC is to be produced to capture this waste stream.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.6
 Stock (lower): x Arisings (lower) x 0.9

WASTE SOURCE Sludge arising from historic operation of D1211.

PHYSICAL CHARACTERISTICS

General description: Sludge from the suction sump; an area which collected sludge from both effluent tanks and transferred it to D9833 Silo, in which the solid particles were deposited and the liquid returned to D1211.

Physical components (%vol): Inorganic sludges and flocs (99.90%), Other Liquid (0.10%),

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 1

Comment on density: 1 g/ml according to sample results 'D1211 Seaward pipe 1,2,3'

CHEMICAL COMPOSITION

General description and components (%wt): Inorganic sludges and flocs (99.90%), Other Liquid (0.10%), Further sampling will be required to provide a detailed breakdown of this waste.

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

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	(%wt)	Type(s) / Grade(s) with proportions		% of total C14 activity
Stainless steel.....				
Other ferrous metals.....				
Iron.....				
Aluminium.....				
Beryllium.....				
Cobalt.....				
Copper.....				
Lead.....				
Magnox/Magnesium.....				
Nickel.....				
Titanium.....				
Uranium.....				
Zinc.....				
Zircaloy/Zirconium.....				
Other metals.....				

Organics (%wt): -

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

Other materials (%wt): -

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	(%wt)	Type(s) and comment		% of total C14 activity
Inorganic ion exchange materials..				
Inorganic sludges and flocs.....	99.9			
Soil.....				
Brick/Stone/Rubble.....				
Cementitious material.....				
Sand.....				
Glass/Ceramics.....				
Graphite.....				
Desiccants/Catalysts.....				
Asbestos.....				
Non/low friable.....				
Moderately friable.....				
Highly friable.....				
Free aqueous liquids.....				
Free non-aqueous liquids.....	0.10			
Powder/Ash.....				

Inorganic anions (%wt): -

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

Materials of interest for waste acceptance criteria: -

	(%wt)	Type(s) and comment
Combustible metals.....		
Low flash point liquids.....		
Explosive materials.....		
Phosphorus.....		
Hydrides.....		
Biological etc. materials.....		
Biodegradable materials.....		
Putrescible wastes.....		
Non-putrescible wastes.....		

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- Corrosive materials.....
- Pyrophoric materials.....
- Generating toxic gases.....
- Reacting with water.....
- Higher activity particles.....
- Soluble solids as bulk chemical compounds.....

Hazardous substances /
non hazardous pollutants: -

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

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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: Not yet determined. The waste contains sludge.

PACKAGING AND CONDITIONING

Conditioning method: The assumption is that the sludge will be sent to the Shaft & Silo headworks for processing. The sludge will be solidified in a 200l annular drum. The 200l drums will be supercompacted and packaged.

Plant Name: TBC

Location: -

Plant startup date: -

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: Route TBC

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	500 l drum	100.0	~0.246	0.5	13

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: The sludge will be managed in the Shaft and Silo headworks.

Opportunities for alternative disposal routing: Not yet determined

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

Source:	Sludge comprises of contaminated particles that has originated from active effluent discharges from Reactor and reprocessing facilities.
Uncertainty:	Based on sample results 'D1211 Seaward pipe 1,2,3', which is sampling the same pipework the sludge has been identified as contained within.
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:	Sample analysis. Specific activity derived using 2019 UKRWI data decayed to 2022.
Other information:	Further detail on this waste stream cannot be provided at this time.

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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				
Co 60			8.75E-06	BB 1	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			1.73E-03	BB 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94			2.12E-05	BB 1	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234		3.43E-05	BB 1	
Ag 108m					U 235		1.9E-06	BB 1	
Ag 110m					U 236		1.9E-06	BB 1	
Cd 109					U 238		1.9E-06	BB 1	
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		7.07E-03	BB 1	
Sn 123					Pu 239		5.51E-03	BB 1	
Sn 126					Pu 240		2.97E-03	BB 1	
Sb 125					Pu 241		3.52E-02	BB 1	
Sb 126					Pu 242				
Te 125m					Am 241		3.45E-03	BB 1	
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137			1.29E-02	BB 1	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					Other a				
Eu 152					Other b/g				
Eu 154			9.41E-06	BB 1	Total a	0	1.90E-02	BB 1	
Eu 155					Total b/g	0	4.98E-02	BB 1	

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