WASTE STREAM 5B340 PIE Facility ILW

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.....	61.9 m³
Future arisings -	1.4.2022 - 31.3.2023.....	< 0.1 m³
	1.4.2023 - 31.3.2024.....	< 0.1 m³
	1.4.2024 - 31.3.2025.....	< 0.1 m³
	1.4.2025 - 31.3.2026.....	< 0.1 m³
	1.4.2026 - 31.3.2027.....	< 0.1 m³
	1.4.2027 - 31.3.2028.....	0.4 m³
Total future arisings:		0.6 m³
Total waste volume:		62.5 m³

Comment on volumes: It should be noted that the DSRL is using a provisional site programme site programme and arisings dates are subject to change. Arisings volumes have been updated after Predictive Waste Inventory Walkdown exercise.

Uncertainty factors on volumes:

Stock (upper):	x 1.02	Arisings (upper)	x 1.1
Stock (lower):	x 0.98	Arisings (lower)	x 0.9

WASTE SOURCE Filters and other waste generated during decommissioning of cells.

PHYSICAL CHARACTERISTICS

General description:	Cell contents
Physical components (%vol):	Detailed breakdown not available. Arisings contain 100% mild steel
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m³):	0.5
Comment on density:	The density is based on Consignor's records

CHEMICAL COMPOSITION

General description and components (%wt):	Mild Steel (100.00%),
Chemical state:	Neutral
Chemical form of radionuclides:	-
Metals and alloys (%wt):	-

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....	100.0		
Iron.....			
Aluminium.....			
Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....			
Magnox/Magnesium.....			

WASTE STREAM 5B340 PIE Facility ILW

Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....		
Zircaloy/Zirconium.....		
Other metals.....	Not specified.	

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....			
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): -

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

WASTE STREAM 5B340 PIE Facility ILW

Highly friable	
Free aqueous liquids	
Free non-aqueous liquids	
Powder/Ash	

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride	0	
Chloride	0	
Iodide	0	
Cyanide	0	
Carbonate	0	
Nitrate	0	
Nitrite	0	
Phosphate	0	
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	0	

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.....	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

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

Potential for the waste to contain discrete items: Yes. The waste has the potential to contain redundant power tools and durable engineered structures.

PACKAGING AND CONDITIONING

Conditioning method: Remote Handled ILW will be packaged into 500 litre drums for long term storage. Contact Handled ILW will be supercompacted with pucks being encapsulated in 500 litre drums for long term storage.

Plant Name: CHILW repack facility; RHILW repack facility

Location: Dounreay

WASTE STREAM 5B340 PIE Facility ILW

Plant startup date:	2026: 2028 respectively
Total capacity (m^3/y incoming waste):	~0.4
Target start date for packaging this stream:	-
Throughput for this stream (m^3/y incoming waste):	~0.4
Other information:	Repack facilities are currently in design phase

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
500 l drum	~100.0	0.365	0.5	172

Likely container type comment:	The conditioning factor for RHILW is about 1.7, while that for CHILW is about 0.5.
Range in container waste volume:	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 containers:	-
Likely conditioning matrix:	Pulverised fuel ash/Ordinary Portland cement mixture
Other information:	-
Conditioned density (t/m^3):	~2.5
Conditioned density comment:	The density is likely to be around 2 - 3 t/m3
Other information on conditioning:	-
Opportunities for alternative disposal routing:	No

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

RADIOACTIVITY

Source:	Representative swab, bench samples and radiation readings have been taken from the North and South Cells and analysed by the labs to determine the radionuclide fingerprint.
Uncertainty:	Stocks data is taken from RHILW Soild and CHILW drummed LoCS. These LoCs provide a generic activity for all CHILW/RHILW wastes in store.
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:	Stocks is based on LoC data for ILW in stocks. Arisings is based on consignors data.
Other information:	Specific activity uses 2019 UKRWI data decayed to 2022.

WASTE STREAM 5B340 PIE Facility ILW

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	7.56E-02	C C 2			Gd 153				
Be 10	4.15E-07	C C 2			Ho 163				
C 14	7.75E-03	C C 2			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	1.09E-05	C C 2			Pt 193				
Mn 53	6.63E-03	C C 2			Tl 204				
Mn 54	1.13E-08	C C 2			Pb 205				
Fe 55	8.67E-02	C C 2			Pb 210	8.13E-12	C C 2	3.62E-14	C C 2
Co 60	6.94E+00	C C 2	4.91E-03	C C 2	Bi 208				
Ni 59	2.58E-02	C C 2			Bi 210m				
Ni 63	6.88E+00	C C 2			Po 210	7.57E-12	C C 2	2.18E-14	C C 2
Zn 65	1.40E-13	C C 2			Ra 223	3.47E-10	C C 2	5.26E-12	C C 2
Se 79	1.39E-05	C C 2			Ra 225	2.60E-09	C C 2	1.10E-20	C C 2
Kr 81					Ra 226	4.30E-11	C C 2	1.20E-12	C C 2
Kr 85					Ra 228	2.42E-10	C C 2	4.94E-17	C C 2
Rb 87					Ac 227	3.50E-10	C C 2	5.70E-12	C C 2
Sr 90	8.44E-01	C C 2	4.17E-02	C C 2	Th 227	3.43E-10	C C 2	5.35E-12	C C 2
Zr 93	1.27E-04	C C 2			Th 228	4.21E-08	C C 2	1.43E-17	C C 2
Nb 91					Th 229	2.60E-09	C C 2	1.17E-20	C C 2
Nb 92					Th 230	1.01E-08	C C 2	1.85E-09	C C 2
Nb 93m	3.14E-02	C C 2			Th 232	2.83E-10	C C 2	3.07E-16	C C 2
Nb 94	2.40E-03	C C 2			Th 234	8.95E-06	C C 2	1.78E-06	C C 2
Mo 93	1.43E-02	C C 2			Pa 231	1.20E-09	C C 2	1.23E-10	C C 2
Tc 97					Pa 233	4.45E-06	C C 2	2.1E-11	C C 2
Tc 99	6.87E-04	C C 2			U 232	3.96E-08	C C 2		
Ru 106	1.69E-06	C C 2			U 233	1.38E-06	C C 2	1.30E-16	C C 2
Pd 107					U 234	5.98E-05	C C 2	6.70E-05	C C 2
Ag 108m	1.11E-04	C C 2			U 235	2.73E-06	C C 2	1.94E-06	C C 2
Ag 110m	5.01E-13	C C 2			U 236	2.91E-06	C C 2	2.08E-06	C C 2
Cd 109					U 238	8.95E-06	C C 2	1.78E-06	C C 2
Cd 113m	1.04E-03	C C 2			Np 237	4.47E-06	C C 2	2.18E-11	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.03E-02	C C 2	1.07E-05	C C 2
Sn 123					Pu 239	3.20E-01	C C 2	6.15E-04	C C 2
Sn 126	2.51E-05	C C 2			Pu 240	3.00E-01	C C 2	8.50E-05	C C 2
Sb 125	7.44E-04	C C 2			Pu 241	4.97E+00	C C 2	5.58E-04	C C 2
Sb 126	3.51E-06	C C 2			Pu 242	2.61E-04	C C 2		
Te 125m	1.86E-04	C C 2			Am 241	4.78E-01	C C 2	2.38E-05	C C 2
Te 127m					Am 242m	4.43E-02	C C 2		
I 129	1.17E-06	C C 2			Am 243	4.30E-04	C C 2		
Cs 134	3.39E-04	C C 2			Cm 242	3.66E-02	C C 2	3.73E-09	C C 2
Cs 135	2.19E-05	C C 2			Cm 243	2.23E-03	C C 2		
Cs 137	2.45E+00	C C 2	6.37E-02	C C 2	Cm 244	1.77E-01	C C 2		
Ba 133					Cm 245	6.01E-06	C C 2		
La 137					Cm 246	6.00E-07	C C 2		
La 138					Cm 248				
Ce 144	6.41E-10	C C 2			Cf 249				
Pm 145					Cf 250				
Pm 147	5.61E-03	C C 2			Cf 251				
Sm 147	1.24E-11	C C 2			Cf 252				
Sm 151	9.38E-02	C C 2			Other a			1.94E-11	C C 2
Eu 152	6.49E-02	C C 2	7.52E-03	C C 2	Other b/g	2.52E-07	C C 2	1.02E-01	C C 2
Eu 154	3.05E-02	C C 2	7.23E-03	C C 2	**Total a**	**1.39E+00**	**C C 2**	**8.07E-04**	**C C 2**
Eu 155	1.38E-02	C C 2	6.54E-05	C C 2	**Total b/g**	**2.26E+01**	**C C 2**	**2.27E-01**	**C C 2**

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