

WASTE STREAM	5B340	PIE Facility ILW
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SITE Dounreay
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Dounreay Site Restoration Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	61.7 m ³
Future arisings -	1.4.2019 - 31.3.2020.....	0.6 m ³
Total future arisings:		0.6 m ³
Total waste volume:		62.3 m ³

Comment on volumes: It should be noted that the DSRL site programme is currently under review 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: Filters, waste cans, sweepings from bench grinding operations, redundant power tools and cables, manipulator gaiters, posting bags, string, swabs and manipulator jaws.
 Physical components (%vol): Detailed breakdown not available. Arisings contain 100% stainless 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): Stainless steel (5.6%), other ferrous metals (30.7%), lead (2.5%), paper (32%), wood (5.4%), halogenated plastics (17.5%), glass (1.6%), others (4.7%).

Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

Stainless steel.....	5.6	
Other ferrous metals.....	30.7	
Iron.....		
Aluminium.....		
Beryllium.....	NE	
Cobalt.....	0	
Copper.....		
Lead.....	2.5	
Magnox/Magnesium.....	0	
Nickel.....		
Titanium.....		
Uranium.....	P	
Zinc.....	0	
Zircaloy/Zirconium.....	0	
Other metals.....	4.7	Not specified.

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Organics (%wt):

-	
Total celluloseics.....	37.4
Paper, cotton.....	32.0
Wood.....	5.4
Halogenated plastics	17.5
Total non-halogenated plastics.....	0
Condensation polymers.....	0
Others.....	0
Organic ion exchange materials....	0
Total rubber.....	0
Halogenated rubber	0
Non-halogenated rubber.....	0
Hydrocarbons.....	
Oil or grease	
Fuel.....	
Asphalt/Tarmac (cont.coal tar)...	
Asphalt/Tarmac (no coal tar)....	
Bitumen.....	
Others.....	
Other organics.....	0

Other materials (%wt):

-	
Inorganic ion exchange materials.	0
Inorganic sludges and flocs.....	0
Soil.....	0
Brick/Stone/Rubble.....	0
Cementitious material.....	0
Sand.....	0
Glass/Ceramics.....	1.6
Graphite.....	0
Desiccants/Catalysts.....	0
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt):

-

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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:

-	
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
Active particles.....	NE
Soluble solids as bulk chemical compounds.....	0

Hazardous substances /
non hazardous pollutants:

Lead (2.5%)	
Acrylamide.....	
Benzene.....	NE
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	NE
Styrene.....	
Tri-butyl phosphate.....	NE
Other organophosphates.....	
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	
Boron.....	NE

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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
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents.....

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: TBC.
 Location: Dounreay
 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: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	0.53	0.5	118

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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 expected that between 2 and 8 CHILW compacted pucks will be packaged into each 500 ltr drum with the average being 5 drums per 500 ltr drum. A small percentage of drums may not be suitable for supercompaction and will be directly immobilised into the 500 ltr drum

Other information on containers: -

Likely conditioning matrix: Pulverised fuel ash/Ordinary Portland cement mixture

Other information: -

Conditioned density (t/m³): ~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

Treatment	Stream volume (%)	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 activities have been re-evaluated since the 2016 UK Inventory.

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	9.03E-02	CC 2			Gd 153				
Be 10	4.19E-07	CC 2			Ho 163				
C 14	7.83E-03	CC 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	1.10E-05	CC 2			Pt 193				
Mn 53	6.69E-03	CC 2			Tl 204				
Mn 54	1.30E-07	CC 2			Pb 205				
Fe 55	1.87E-01	CC 2			Pb 210	5.42E-12	CC 2		
Co 60	1.04E+01	CC 2	7.28E-03	CC 2	Bi 208				
Ni 59	2.60E-02	CC 2			Bi 210m				
Ni 63	7.09E+00	CC 2			Po 210	3.52E-12	CC 2		
Zn 65	3.17E-12	CC 2			Ra 223	2.74E-10	CC 2		
Se 79	1.41E-05	CC 2			Ra 225	2.23E-09	CC 2		
Kr 81					Ra 226	3.14E-11	CC 2		
Kr 85					Ra 228	2.26E-10	CC 2		
Rb 87					Ac 227	2.77E-10	CC 2		
Sr 90	9.16E-01	CC 2	4.48E-02	CC 2	Th 227	2.74E-10	CC 2		
Zr 93	1.29E-04	CC 2			Th 228	4.58E-08	CC 2		
Nb 91					Th 229	2.24E-09	CC 2		
Nb 92					Th 230	8.50E-09	CC 2		
Nb 93m	3.44E-02	CC 2			Th 232	2.86E-10	CC 2		
Nb 94	2.42E-03	CC 2			Th 234	9.02E-06	CC 2		
Mo 93	1.45E-02	CC 2			Pa 231	1.03E-09	CC 2		
Tc 97					Pa 233	4.04E-06	CC 2		
Tc 99	6.94E-04	CC 2			U 232	4.12E-08	CC 2		
Ru 106	1.34E-05	CC 2			U 233	1.39E-06	CC 2		
Pd 107					U 234	5.92E-05	CC 2	6.70E-05	CC 2
Ag 108m	1.13E-04	CC 2			U 235	2.74E-06	CC 2	1.94E-06	CC 2
Ag 110m	1.06E-11	CC 2			U 236	2.89E-06	CC 2	2.08E-06	CC 2
Cd 109					U 238	9.02E-06	CC 2	1.79E-06	CC 2
Cd 113m	1.23E-03	CC 2			Np 237	4.06E-06	CC 2		
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.18E-02	CC 2	1.1E-05	CC 2
Sn 123					Pu 239	3.24E-01	CC 2	6.15E-04	CC 2
Sn 126	2.53E-05	CC 2			Pu 240	3.03E-01	CC 2	8.50E-05	CC 2
Sb 125	1.60E-03	CC 2			Pu 241	5.80E+00	CC 2	6.45E-04	CC 2
Sb 126	3.55E-06	CC 2			Pu 242	2.63E-04	CC 2		
Te 125m	3.89E-04	CC 2			Am 241	4.59E-01	CC 2	2.10E-05	CC 2
Te 127m					Am 242m	4.54E-02	CC 2		
I 129	1.19E-06	CC 2			Am 243	4.35E-04	CC 2		
Cs 134	9.36E-04	CC 2			Cm 242	3.79E-02	CC 2	3.95E-07	CC 2
Cs 135	2.22E-05	CC 2			Cm 243	2.41E-03	CC 2		
Cs 137	2.65E+00	CC 2	6.83E-02	CC 2	Cm 244	2.01E-01	CC 2		
Ba 133					Cm 245	6.07E-06	CC 2		
La 137					Cm 246	6.06E-07	CC 2		
La 138					Cm 248				
Ce 144	9.31E-09	CC 2			Cf 249				
Pm 145					Cf 250				
Pm 147	1.25E-02	CC 2			Cf 251				
Sm 147	1.23E-11	CC 2			Cf 252				
Sm 151	9.69E-02	CC 2			Other a				
Eu 152	7.63E-02	CC 2	8.77E-03	CC 2	Other b/g	2.52E-07	CC 2	7.21E-06	CC 2
Eu 154	3.91E-02	CC 2	9.21E-03	CC 2	Total a	1.40E+00	CC 2	8.05E-04	CC 2
Eu 155	2.14E-02	CC 2	1.01E-04	CC 2	Total b/g	2.75E+01	CC 2	1.39E-01	CC 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