

<b>WASTE STREAM</b>	<b>5B338</b>	<b>Decontamination and Waste Services ILW</b>
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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.....	12.4 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		12.4 m <sup>3</sup>

Comment on volumes: Arisings have been revised in line with Predictive Waste Inventory walk round exercise. No ILW arisings identified for this wastestream

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

**WASTE SOURCE** The waste is from the decommissioning of the decontamination facilities.

**PHYSICAL CHARACTERISTICS**

General description: The waste will consist of filters, glass, metal, concrete, parts of gloveboxes, process residues, tins, isomantles and general wastes such as tissues, swabs, plastic bags and rubber gloves.

Physical components (%vol): Stainless steel components (10.4%), metal consisting of tools, pumps, stands etc. (2.0%), filters (1.8%), glass (2.4%), plastic bags, bottles etc. (12.3%), PVC bottles, sheet etc. (9.9%), rubber gloves (14.5%), swabs, paper and tissues (21.5%), concrete (2.5%), process residues (0.6%) and others including tins, isomantles, lead, rubble and small plant items (22.1%).

Sealed sources: Not yet determined.

Bulk density (t/m<sup>3</sup>): 0.58

Comment on density: The density is based on consignor's records.

**CHEMICAL COMPOSITION**

General description and components (%wt): Stainless steel (34%), mild steel (45%), concrete (3%), glass (3.8%), non-halogenated plastics (9%), halogenated plastics (2%), cellulose (0.5%), rubber (1.3%) and others (1.4%).

Chemical state: Neutral

Chemical form of radionuclides: Cl-36: Not likely to be present.  
 I-129: Not likely to be present.  
 U: Likely to be present as oxides or nitrates.  
 Np: Possibly present in trace amounts.  
 Pu: Likely to be present as oxides or nitrates.

Metals and alloys (%wt): Both bulk and sheet metal may be present, proportions unknown.

Stainless steel.....	34.0	likely to be M316
Other ferrous metals.....	45.0	
Iron.....		
Aluminium.....	TR	
Beryllium.....	NE	
Cobalt.....	0	
Copper.....	TR	
Lead.....	TR	
Magnox/Magnesium.....	0	
Nickel.....	0	
Titanium.....		

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	Uranium.....	P	
	Zinc.....	TR	
	Zircaloy/Zirconium.....	0	
	Other metals.....	1.4	Other metals not specified.
Organics (%wt):	The waste will contain small amounts of organic material. PVC and neoprene are likely to be present.		
	Total cellulose.....	0.50	
	Paper, cotton.....	0.50	
	Wood.....	TR	
	Halogenated plastics .....	2.0	PVC
	Total non-halogenated plastics.....	9.0	
	Condensation polymers.....	NE	
	Others.....	9.0	
	Organic ion exchange materials....	0	
	Total rubber.....	1.3	
	Halogenated rubber .....	NE	Neoprene
	Non-halogenated rubber.....	1.3	
	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.....	3.0	
	Sand.....	0	
	Glass/Ceramics.....	3.8	
	Graphite.....	0	
	Desiccants/Catalysts.....	0	
	Asbestos.....	TR	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	The waste may contain traces of nitric acid.		

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	NE
Carbonate.....	NE
Nitrate.....	TR
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for  
waste acceptance criteria:

The waste may contain some asbestos lagging.

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:

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): No  
 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 drums will be supercompacted with the pucks being encapsulated in 500 litre drums for long term storage.

Plant Name: TBC  
 Location: Dounreay  
 Plant startup date: -  
 Total capacity (m<sup>3</sup>/y incoming waste): ~  
 Target start date for packaging this stream: -  
 Throughput for this stream (m<sup>3</sup>/y incoming waste): ~  
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l drum	100.0	1	0.5	13

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Likely container type comment:	The conditioned 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 500 litre 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 litre drum.
Other information on containers:	The drums will be manufactured from stainless steel.
Likely conditioning matrix:	Cement
Other information:	-
Conditioned density (t/m <sup>3</sup> ):	~2.5
Conditioned density comment:	The density is likely to be around 2 - 3 t/m <sup>3</sup>
Other information on conditioning:	-
Opportunities for alternative disposal routing:	No

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source:	The radioactivity arises from contamination of the Decontamination and Maintenance Centre. The predominant activity originates from irradiated PFR fuel. Some activity also originates from the uranium cycle.
Uncertainty:	The data is based on drummed CHILW LoC data which takes the activity of all CHILW drums in store. This makes the specific activity generic for all CHILW wastes.
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:	As there is no other information the total activity is assumed to be same as operational CHILW. The radionuclide fingerprint is based upon the drummed CHILW LoC.
Other information:	There are no unlisted radionuclides believed to be present at significant concentrations. Specific Activities have been reevaluated since the 2016 UK Inventory.

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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					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	9.23E-12	CC 2			Pb 205				
Fe 55					Pb 210	1.37E-11	CC 2		
Co 60	6.25E-06	CC 2			Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210	9.07E-12	CC 2		
Zn 65					Ra 223	8.14E-10	CC 2		
Se 79					Ra 225	1.20E-14	CC 2		
Kr 81					Ra 226	8.59E-11	CC 2		
Kr 85					Ra 228	8.45E-10	CC 2		
Rb 87					Ac 227	8.23E-10	CC 2		
Sr 90	8.05E-04	CC 2			Th 227	8.14E-10	CC 2		
Zr 93					Th 228	1.85E-07	CC 2		
Nb 91					Th 229	1.21E-14	CC 2		
Nb 92					Th 230	2.73E-08	CC 2		
Nb 93m					Th 232	1.21E-09	CC 2		
Nb 94					Th 234	4.46E-06	CC 2		
Mo 93					Pa 231	3.24E-09	CC 2		
Tc 97					Pa 233	2.69E-07	CC 2		
Tc 99					U 232	1.80E-07	CC 2		
Ru 106	2.55E-10	CC 2			U 233	1.51E-11	CC 2		
Pd 107					U 234	2.27E-04	CC 2		
Ag 108m					U 235	9.96E-06	CC 2		
Ag 110m					U 236	1.16E-05	CC 2		
Cd 109					U 238	4.46E-06	CC 2		
Cd 113m					Np 237	2.7E-07	CC 2		
Sn 119m					Pu 236				
Sn 121m					Pu 238	1.40E-02	CC 2		
Sn 123					Pu 239	1.67E-02	CC 2		
Sn 126					Pu 240	2.48E-02	CC 2		
Sb 125	1.45E-07	CC 2			Pu 241	4.39E-01	CC 2		
Sb 126					Pu 242	2.22E-05	CC 2		
Te 125m	3.54E-08	CC 2			Am 241	4.37E-02	CC 2		
Te 127m					Am 242m	1.15E-06	CC 2		
I 129					Am 243	1.57E-10	CC 2		
Cs 134	2.62E-07	CC 2			Cm 242	9.59E-07	CC 2		
Cs 135					Cm 243	9.12E-10	CC 2		
Cs 137	1.09E-03	CC 2			Cm 244	9.45E-06	CC 2		
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	3.28E-06	CC 2			Cf 251				
Sm 147	1.85E-15	CC 2			Cf 252				
Sm 151	2.12E-05	CC 2			Other a				
Eu 152	2.90E-06	CC 2			Other b/g	1.06E-06	CC 2		
Eu 154	9.92E-06	CC 2			<b>Total a</b>	<b>9.94E-02</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	3.85E-06	CC 2			<b>Total b/g</b>	<b>4.41E-01</b>	<b>CC 2</b>	<b>0</b>	

**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