

WASTE STREAM	2D21	Solid Waste Storage Cells
--------------	------	---------------------------

SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 440.0		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		440.0		

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

Comment on arising rates: There will be no future arisings to this stream.

Additional information on quantities: It is believed that a more or less complete inventory is available from tipping records; this gives a total consigned volume of 55m³. This has been assumed to be the volume of waste in every cell, hence total waste = 8 x 55 = 440m³. Note some original consignments contained significant voidage. All of this volume is conservatively assumed to be ILW.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x -
Stock (lower): x 0.50 Arisings (lower): x -

WASTE SOURCE In cell stored waste was general operational waste associated with disposal of contaminated plant items and secondary wastes. Also, HEPA filters from ventilation systems, stored in mild steel boxes.

PHYSICAL CHARACTERISTICS

General description: Miscellaneous (beta/gamma active) solid waste (redundant pipework, plant equipment, HEPA filters, etc.). The waste includes a mast 28 ft long, a cast iron flask (approx 42 t) and two concrete blocks (6 t each). Free liquor has been identified in one of the cells however this is due to be removed prior to waste export.

Changes since waste generated: Cells were originally open to the weather and so the cell wastes have deteriorated due to the damp conditions that occurred.

Bulk density (t/m³): * 2.5

Comment on density: * The density has been estimated from typical values for broken ferrous scrap. The average density of HEPA filters is 0.2 t/m³ as stored.

CHEMICAL COMPOSITION

General description and components (%wt): Metals (iron, steel, lead) >75%, organics (paper, wood, PVC, soil) <10%, concrete <10%, glass fibre <5%.

Chemical state: Neutral

Sheet metal proportion / thickness: Both sheet and bulk metal likely to be present, proportions not estimated.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	The split of material between stainless steel and other ferrous materials is unknown.	
Other ferrous metals.....	P	-	
Iron.....	P	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	NE	-	
Copper.....	NE	-	
Lead.....	P	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	NE	-	
Titanium.....	-	-	
Uranium.....	NE	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose...	< 2.0	-	
Paper, cotton...	-	-	
Wood...	-	-	
Halogenated plastics...	~ 1.5	-	
Total non-halogenated plastics...	~ 0.50	-	
Condensation polymers...	~ 0.25	-	
Others...	~ 0.25	-	
Organic ion exchange materials...	= 0	-	
Total rubber...	~ 0.50	-	
Halogenated rubber...	< 0.25	-	
Non-halogenated rubber...	~ 0.25	-	
Hydrocarbons...	-	-	
Oil or grease...	-	-	
Fuel...	-	-	
Asphalt/Tarmac (cont.coal tar)...	-	-	
Asphalt/Tarmac (no coal tar)...	-	-	
Bitumen...	-	-	
Others...	-	-	
Other organics...	< 1.0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials...	= 0	-	
Inorganic sludges and flocs...	= 0	-	
Soil...	P	-	
Brick/Stone/Rubble...	P	-	
Cementitious material...	< 5.0	-	
Sand...	-	-	
Glass/Ceramics...	< 1.0	-	
Graphite...	= 0	-	
Desiccants/Catalysts...	-	-	
Asbestos...	P	-	
Non/low friable...	-	-	
Moderately friable...	-	-	
Highly friable...	-	-	
Free aqueous liquids...	NE	-	
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...	NE	-
Chloride...	TR	-
Iodide...	NE	-
Cyanide...	NE	-
Carbonate...	NE	-
Nitrate...	NE	-
Nitrite...	NE	-
Phosphate...	NE	-
Sulphate...	NE	-
Sulphide...	NE	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals...	NE	-
Low flash point liquids...	= 0	-
Explosive materials...	= 0	-
Phosphorus...	NE	-
Hydrides...	NE	-
Biological etc. materials...	= 0	-
Biodegradable materials...	NE	-
Putrescible wastes...	NE	-
Non-putrescible wastes...	NE	-
Corrosive materials...	= 0	-
Pyrophoric materials...	= 0	-
Generating toxic gases...	NE	-
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.....	NE	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....	NE	-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....	NE	-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....	NE	-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....	NE	-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....	NE	-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....	NE	-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....	= 0	-
Total complexing agents.....		-

Physical components:

	Number	Type(s) and comment
Sources.....	TR	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	~ 0	-
EEE Type 2.....	P	-
EEE Type 3.....	P	-
EEE Type 4.....	~ 0	-
EEE Type 5.....	~ 0	-

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:

-

Conditioning method:

Waste will be size reduced and segregated on plant as retrieved. The ILW component is planned to be flood grouted in a DCC.

Conditioning plants:

Plant Name	Location
Decommissioning Encapsulation Plants (DEP)	Sellafield

Likely conditioning matrix:

-

Further information on the conditioning matrix:

Cementitious grout, matrix not yet defined.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	DCC	100.0	1.5	1.5	294	-

Range in container waste loading: There is likely to be a range of unconditioned waste per container due to the diverse nature of the cell inventory.

Other information on packaging and conditioning: -

Conditioned density (t/m³): ~ 1.3

Conditioned density comment: This conditioned waste density is calculated from the conditioned waste volume and mass of the waste.

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: Yes

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
GDF	LLWR	NE	AMBER	Some of this waste may be suitable for LLWR but quantities cannot yet be specified.

RADIOACTIVITY

Source: The activity arises from activated steel or from fixed beta/gamma or alpha emitting contaminants (miscellaneous).

Uncertainty: The specific activities have been derived by calculation. A number of assumptions have been made in the calculation and additional uncertainties introduced due to the following: The four main plants have between them consigned approximately 84% of the recorded inventory. The highest recorded dose rates are up to 1 order of magnitude greater than the average dose rate and up to 2 orders of magnitude greater than the lowest dose rates. Waste consignments started in the early 1970s and hence some waste will have had over 40 years decay. The known inventory records cover approximately 60% of the total assumed inventory.

Measurement of radioactivities: Fingerprints for wastes from the four main consignors have been determined. These have been used in conjunction with dose rates at time of tipping (assumed to be 1986) and then decayed, to calculate the specific activities in average case packages for each main consignor, then averaging these in line with the volume percent of waste consigned from each plant.

Chemical form of radionuclides:

- H-3: NE
- C-14: NE
- Cl-36: NE
- Se-79: NE
- Tc-99: NE
- I-129: NE
- Ra: NE
- Th: NE
- U: NE
- Np: NE
- Pu: NE

WASTE STREAM		2D21		Solid Waste Storage Cells					
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	1.09E-05	C D 2			Gd 153				
Be 10					Ho 163				
C 14	1.90E-07	C D 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					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60	5.71E-05	C D 2			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	3.29E-12	C D 2		
Sr 90	2.22E-02	C D 2			Th 227	3.23E-12	C D 2		
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230	1.44E-10	C D 2		
Nb 93m					Th 232				
Nb 94					Th 234	5.00E-07	C D 2		
Mo 93					Pa 231	8.20E-12	C D 2		
Tc 97					Pa 233	2.10E-05	C D 2		
Tc 99	1.70E-04	C D 2			U 232				
Ru 106	1.10E-12	C D 2			U 233	5.49E-10	C D 2		
Pd 107					U 234	4.60E-07	C D 2		
Ag 108m					U 235	1.10E-08	C D 2		
Ag 110m					U 236	5.40E-08	C D 2		
Cd 109					U 238	5.00E-07	C D 2		
Cd 113m					Np 237	2.10E-05	C D 2		
Sn 119m					Pu 236				
Sn 121m					Pu 238	5.55E-04	C D 2		
Sn 123					Pu 239	2.00E-03	C D 2		
Sn 126	2.57E-08	C D 2			Pu 240	1.90E-03	C D 2		
Sb 125	2.63E-07	C D 2		Pu 241	4.08E-03	C D 2			
Sb 126				Pu 242	1.70E-06	C D 2			
Te 125m	6.59E-08	C D 2		Am 241	1.45E-03	C D 2			
Te 127m				Am 242m					
I 129	3.30E-04	C D 2		Am 243					
Cs 134	6.87E-08	C D 2		Cm 242	2.29E-19	C D 2			
Cs 135				Cm 243	5.67E-08	C D 2			
Cs 137	4.09E-02	C D 2		Cm 244	1.10E-06	C D 2			
Ba 133				Cm 245					
La 137				Cm 246					
La 138				Cm 248					
Ce 144	8.15E-16	C D 2		Cf 249					
Pm 145				Cf 250					
Pm 147	2.24E-06	C D 2		Cf 251					
Sm 147				Cf 252					
Sm 151	1.74E-05	C D 2		Unsp a					
Eu 152	7.09E-07	C D 2		Unsp b/g					
Eu 154	9.37E-05	C D 2		Total a	5.93E-03	*	0	*	
Eu 155	1.03E-05	C D 2		Total b/g	6.79E-02	*	0	*	

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