

WASTE STREAM	2D98	MSSS Secondary ILW from SMF
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SITE Sellafield
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Sellafield Limited
WASTE TYPE ILW
 Is the waste subject to Scottish Policy: No

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.....	~0.1 m ³
	1.4.2024 - 31.3.2025.....	~7.2 m ³
	1.4.2025 - 31.3.2026.....	~0.2 m ³
	1.4.2026 - 31.3.2027.....	~0.8 m ³
	1.4.2027 - 31.3.2028.....	~0 m ³
	1.4.2028 - 31.3.2029.....	~12.3 m ³
	1.4.2029 - 31.3.2030.....	~7.3 m ³
	1.4.2030 - 31.3.2031.....	~13.9 m ³
	1.4.2031 - 31.3.2032.....	~1.1 m ³
	1.4.2032 - 31.3.2033.....	~31.1 m ³
	1.4.2033 - 31.3.2034.....	~25.0 m ³
	1.4.2034 - 31.3.2035.....	~0.3 m ³
	1.4.2035 - 31.3.2036.....	~7.3 m ³
	1.4.2036 - 31.3.2037.....	~13.9 m ³
	1.4.2037 - 31.3.2038.....	~23.2 m ³
	1.4.2038 - 31.3.2039.....	~19.3 m ³
	1.4.2039 - 31.3.2040.....	~13.9 m ³
	1.4.2040 - 31.3.2041.....	~0.3 m ³
Total future arisings:		177.1 m ³
Total waste volume:		177.1 m ³

Comment on volumes: CA/PLN-3755/PROC/00117_B (2015) gives a secondary waste forecast from 2020 (assumed MSSS retrievals start) which has been adjusted to start at 2022 for the purpose of the UKRWI. Volumes only taken up to 2040. Uncertainty unknown as predictions made for item failure without knowledge of reliability. 50% assumed.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.5
 Stock (lower): x Arisings (lower) x 0.5

WASTE SOURCE Failed plant tools and items which will be disposed of as ILW in MSSS SEP Skip with other MSSS wastes or via LLW waste routes.

PHYSICAL CHARACTERISTICS

General description: ILW tooling from contact with MSSS wastes, e.g. SEP machine Petal Grab or Clamshell Grab, Modular Rake, Hydraulic Shear Tool, etc. LLW None assumed

Physical components (%vol): Stainless steel (97.23%), Carbon Steel (1.97%), Hydraulic Oil (Renolin 32) (0.04%), HB500 Steel (0.72%), DEVA BM 302 (0.02%), PVC (0.01%), Rubber (0.01%). Small quantities of Oilite, Bronze, Nylon, Aluminium, Loctite. Additional RENOLIN 32 hydraulic oil will be present based on the amount carried over to the waste skip within failed item.

Sealed sources: Not yet determined.

Bulk density (t/m³): ~0.93

Comment on density: Total mass to 2040 = 164762.3kg assumed, total volume = 177.09 m³. Assumed forecast based on predicted plant item failure.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (97.23%), Carbon Steel (1.97%), Hydraulic Oil (Renolin 32) (0.04%), HB500 Steel (0.72%), DEVA BM 302 (0.02%), PVC (0.01%), Rubber (0.01%). Small quantities of Oilite, Bronze, Nylon, Aluminium, Loctite. Additional RENOLIN 32 hydraulic oil will be present based on the amount carried over to the waste skip within failed item.

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Chemical state: Neutral

Chemical form of radionuclides: -

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	97.2		
Other ferrous metals.....	2.7		
Iron.....			
Aluminium.....	<0.01		
Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....			
Magnox/Magnesium.....			
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....			
Zircaloy/Zirconium.....			
Other metals.....	<0.01		

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....			
Paper, cotton.....			
Wood.....			
Halogenated plastics	0.01		
Total non-halogenated plastics.....	<0.01		
Condensation polymers.....			
Others.....			
Organic ion exchange materials....			
Total rubber.....	0.01		
Halogenated rubber	0.01		
Non-halogenated rubber.....			
Hydrocarbons.....	0.04		
Oil or grease	0.04		
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	<0.01		

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.....			
Highly friable.....			
Free aqueous liquids.....			
Free non-aqueous liquids.....			
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.....		

- 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.....

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.

PACKAGING AND CONDITIONING

Conditioning method: The waste will be stored in an unconditioned state for a period of 70 years. Following the period of storage it will be retrieved (from storage) and conditioned for ultimate disposal to the GDF.

Plant Name: TBD

Location: Sellafield

Plant startup date: 2070-2090

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

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

Other information: The plant has not yet been designed. Hence, throughputs & capacities cannot be quoted at this time.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	Sellafield enhanced 3m³ box	84.5	0.940	2.15	160
	Other(HHISO)	15.5	NE	NE	

Likely container type comment: 1 skip of retrieved waste (max 1,400 litres) in = 1 package out.

Range in container waste volume: There will be considerable variability in unconditioned waste volume per package due to variations in skip loading and content. The actual number of packages produced is identified in the Sellafield Retrievals Product and Secondary Waste Plan.

Other information on containers: Stainless Steel.

Likely conditioning matrix: BFS/OPC;PFA/OPC

Other information: -

Conditioned density (t/m³): ~2.0

Conditioned density comment: Density of conditioned waste will be fairly uniform.

Other information on conditioning: Waste matrix (as retrieved) will be in-filled with grout. A second pour of capping grout will be added. Void spaces between Skip wall and Box wall will be filled with grout.

Opportunities for alternative disposal routing: No

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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: Contamination of ILW carryover from contact with MSSS compartment waste.

Uncertainty: Activity unknown as contamination levels and predicitions of number of items unknown.

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: Specific activity not calculated as it depends on the amount of contamination / sludge carryover per waste item from contact with MSSS waste, the associated compartment from which it came. Arisings forecast not detailed enough to calculate this information.

Other information: -

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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					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					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					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					Total a				NE
Eu 155					Total b/g				NE

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