WASTE STREAM 2F42/C Encapsulated MEP, Thorp and WEP POCO

SITE	Sellafield
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Sellafield Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	0 m³	0 m³
Future arisings -	1.4.2022 - 31.3.2023.....	32.5 m³	37.1 m³
	1.4.2023 - 31.3.2024.....	5.0 m³	5.7 m³
	1.4.2025 - 31.3.2026.....	12.5 m³	14.3 m³
	1.4.2026 - 31.3.2027.....	12.5 m³	14.3 m³
	1.4.2040 - 31.3.2041.....	173.5 m³	198.1 m³
	1.4.2041 - 31.3.2042.....	38.5 m³	44.0 m³
Total future arisings:		274.5 m³	313.5 m³
Total waste volume:		274.5 m³	313.5 m³
Number of waste packages in stock:	At 1.4.2022.....	0 package(s)	

Comment on volumes:	Arising based on current MPS but likely to change in both volumes, wasteform and timescales with re-purposing of MEP & WEP. Not yet determined in absence of formal review of POCO wastes. Plant lives extended.			
Uncertainty factors on volumes:	Stock (upper):	x	Arisings (upper)	x 1.5
	Stock (lower):	x	Arisings (lower)	x 0.5
WASTE SOURCE	Processing of POCO wastes from MEP, Thorp and WEP.			

PHYSICAL CHARACTERISTICS

General description:	Cave construction materials and equipment. This waste will be packaged 'as is' with only size reduction if appropriate to fit a waste container.
Physical components (%vol):	-
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m³):	2.9
Comment on density:	The quoted density is based on the assumption that each package will contain 0.1m3 of metal that is encapsulated in grout.

CHEMICAL COMPOSITION

General description and components (%wt):	stainless steel (52%), mild steel (13%), lead (1%), cementitious material (30%), others (4%).
Chemical state:	Alkali
Chemical form of radionuclides:	H-3: Not estimated. C-14: Not estimated. Cl-36: Present as trace amounts of clathrate compounds of metallic salts readily lost to aqueous solution. Se-79: Not estimated. Tc-99: Not estimated. I-129: Present as trace amounts of clathrate compounds of metallic salts readily lost to aqueous solution. Ra: Not estimated. Th: Not estimated. U: Not estimated. Np: Not estimated. Pu: Not estimated.
Metals and alloys (%wt):	This is unquantified.

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel	51.9	316L, 304.	
Other ferrous metals	13.0	Mild steel, carbon steel.	
Iron			
Aluminium	TR		
Beryllium	TR		
Cobalt	TR		
Copper	NE		
Lead	1.0		
Magnox/Magnesium	2.0	Includes a provision for corrosion products.	
Nickel	P		
Titanium	NE		
Uranium	P		
Zinc	NE		
Zircaloy/Zirconium	P	Present as fines.	
Other metals			

Organics (%wt): Level of organics to be confirmed by an appropriate POCO study.

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

Other materials (%wt): -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	2.0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	30.0		
Sand.....	<0.10	Only present in concrete.	
Glass/Ceramics.....	0		
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	NE	To be confirmed by POCO study.	
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): -

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	P	
Iodide.....	P	
Cyanide.....	0	
Carbonate.....	P	
Nitrate.....	P	
Nitrite.....	P	
Phosphate.....	NE	
Sulphate.....	NE	
Sulphide.....	NE	

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	Trace amount may persist.
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....		
Non-putrescible wastes.....		

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Corrosive materials.....	P	Akaline grout.
Pyrophoric materials.....	0	
Generating toxic gases.....	P	Low level of residual hydrogen generation.
Reacting with water.....	0	
Higher activity particles.....	P	Small fraction may be present but bound in grout.
Soluble solids as bulk chemical compounds.....	P	Some calcium and magnesium compounds.

Hazardous substances / non hazardous pollutants: Lead 1%.

	(%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	Only as stainless steel.
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.....		

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Complexing agents (%wt):

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

Potential for the waste to contain discrete items: No.

PACKAGING AND CONDITIONING

Container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
500 l drum	100.0	0.5	0.5	549

Container type comment: The waste is already conditioned.

Range in container waste volume: Wide variation expected.

Other information on containers: Stainless steel

Conditioned density (t/m^3): 1.9

Conditioned density comment: Wide variation expected.

Other information on conditioning: -

RADIOACTIVITY

Source: Particulate fuel debris and fines and activate metals fines.

Uncertainty: -

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: Based on worst case high activity components in MEP and WEP. Therefore there could be wide variations in individual consignments.

Other information: -

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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					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**	**0**		**1.94E+00**	**C 3**
Eu 155					**Total b/g**	**0**		**3.05E+02**	**C 3**

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