WASTE STREAM 2D77/C Encapsulated Retrieved Miscellaneous Beta/Gamma Waste

SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Limited

WASTE TYPE ILW

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2019.....	0.5 m³	0.6 m³
Total future arisings:		0 m³	0 m³
Total waste volume:		0.5 m³	0.6 m³
Number of waste packages in stock:	At 1.4.2019.....	1 package(s)	

Comment on volumes: Single trial drum completed. No further arisings - WEP not selected as the waste disposal route.

Uncertainty factors on volumes:

Stock (upper):	x 1.1	Arisings (upper)	x
Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Waste metal items removed from storage pond, consigned to WEP in a scrap basket, which is subsequently grouted in a 500 litre drum.

PHYSICAL CHARACTERISTICS

General description: It will be metallic waste mainly comprising of mild steel and stainless steel items. These items will fit into a standard scrap bucket and will fit into a 500 litre drum for grouting operations. This will be final product, therefore no changes expected.

Physical components (%wt): Concrete 76%, Stainless steel 12%, Mild steel 11%, Others 1% (eg phosphor bronze bearings).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 2.6

Comment on density: Density of conditioned waste . Raw waste ~1.6t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Grout 76%, Stainless steel 12%, Mild Steel 11%, Others 1% (eg phosphor bronze).

Chemical state: Alkali

Chemical form of radionuclides:
H-3: Not estimated.
C-14: Not estimated.
Cl-36: Present in trace amounts as clathrate compounds of metallic salts readilty lost to aqueous solution.
Se-79: Not estimated.
Tc-99: Not estimated.
I-129: Present in trace amounts as clathrate compounds of metallic salts readilty lost to aqueous solution.
Ra: Not estimated.
Th: Not estimated.
U: Not estimated.
Np: Not estimated.
Pu: Not estimated.

Metals and alloys (%wt): Not expected in sheet form, ususally in variable sized pieces.

Stainless steel.....	12.0	316L, 304.
Other ferrous metals.....	11.0	Mild steel, carbon steel.
Iron.....		
Aluminium.....	NE	
Beryllium.....	TR	
Cobalt.....	NE	

WASTE STREAM	2D77/C	Encapsulated Retrieved Miscellaneous Beta/Gamma Waste

	Copper	NE	
	Lead		
	Magnox/Magnesium	NE	
	Nickel	NE	
	Titanium	NE	
	Uranium	<0.01	
	Zinc	NE	
	Zircaloy/Zirconium	NE	
	Other metals	0.99	Phosphorbronze. Niobium and molybdenum may be present in trace amounts.
Organics (%wt):	Traces of rubbers from hose attachments and valve liners are present.		
	Total cellulosics	NE	
	Paper, cotton	NE	
	Wood	NE	
	Halogenated plastics	TR	
	Total non-halogenated plastics	TR	
	Condensation polymers	TR	
	Others	NE	
	Organic ion exchange materials	NE	
	Total rubber	TR	
	Halogenated rubber	TR	
	Non-halogenated rubber	TR	
	Hydrocarbons		
	Oil or grease		
	Fuel		
	Asphalt/Tarmac (cont.coal tar)		
	Asphalt/Tarmac (no coal tar)		
	Bitumen		
	Others		
	Other organics	NE	
Other materials (%wt):	Small amounts of graphite may be included. However, it's not anticipated to be in large amounts.		
	Inorganic ion exchange materials.	NE	
	Inorganic sludges and flocs	NE	
	Soil	NE	
	Brick/Stone/Rubble	NE	
	Cementitious material	76.0	
	Sand	0	No sand present in encapsulation grout.
	Glass/Ceramics	NE	
	Graphite	TR	
	Desiccants/Catalysts	NE	
	Asbestos	0	

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	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	-		
	Fluoride.....	NE	
	Chloride.....	NE	
	Iodide.....	NE	
	Cyanide.....	NE	
	Carbonate.....	NE	
	Nitrate.....	NE	
	Nitrite.....	NE	
	Phosphate.....	TR	
	Sulphate.....	NE	
	Sulphide.....	NE	
Materials of interest for waste acceptance criteria:	None determined.		
	Combustible metals.....	0	
	Low flash point liquids.....	0	
	Explosive materials.....	0	
	Phosphorus.....		
	Hydrides.....	0	
	Biological etc. materials.....	0	
	Biodegradable materials.....	0	
	Putrescible wastes.....	0	
	Non-putrescible wastes.....	NE	
	Corrosive materials.....	P	Alakine grout.
	Pyrophoric materials.....	0	
	Generating toxic gases.....	0	
	Reacting with water.....	0	
	Active particles.....	P	Small fraction will be present.
	Soluble solids as bulk chemical compounds.....	P	Soluble sodium and magnesium compounds.
Hazardous substances / non hazardous pollutants:	-		
	Acrylamide.....		
	Benzene.....	0	
	Chlorinated solvents.....		
	Formaldehyde.....		
	Organometallics.....		
	Phenol.....	0	

Styrene.....		
Tri-butyl phosphate.....	0	
Other organophosphates.....		
Vinyl chloride.....	0	
Arsenic.....	0	
Barium.....		
Boron.....	0	
Cadmium.....	0	
Caesium.....		
Selenium.....	0	
Chromium.....	0	
Molybdenum.....	0	
Thallium.....		
Tin.....	P	Trace from cement in grout.
Vanadium.....	0	
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.....	NE

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	1

Container type comment: -

Range in container waste volume: -

Other information on containers: 500 litre stainless steel drum.

Conditioned density (t/m^3): 2.6

Conditioned density comment: Density of conditioned waste. Raw waste density 1.6t/m^3.

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Other information on conditioning:	-

RADIOACTIVITY

Source:	Activity associated with waste, is from pond sludges and heavy metals that have contaminated and irradiated the material during long term storage.
Uncertainty:	These specific activities are based on sampling results prior to trial drum being processed.
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:	-
Other information:	Nb 95 2.17E-05, Sr 89 1.12E-05, Zr95 2.17E-05.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ 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	1.91E-05	B B 2			Pb 205				
Fe 55					Pb 210				
Co 60	1.83E-06	B B 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				
Sr 90	3.10E-03	B B 2			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	1.14E-05	B B 2			U 233				
Pd 107					U 234	7.93E-09	B B 2		
Ag 108m					U 235				
Ag 110m					U 236	1.58E-09	B B 2		
Cd 109					U 238	7.92E-09	B B 2		
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	1.22E-06	B B 2		
Sn 123					Pu 239	3.34E-06	B B 2		
Sn 126					Pu 240	3.59E-06	B B 2		
Sb 125	2.09E-05	B B 2			Pu 241	7.96E-05	B B 2		
Sb 126					Pu 242	1.58E-09	B B 2		
Te 125m					Am 241	7.21E-06	B B 2		
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	1.09E-04	B B 2			Cm 242				
Cs 135					Cm 243				
Cs 137	1.17E-02	B B 2			Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	6.61E-06	B B 2			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	3.88E-05	B B 2			**Total a**	**1.54E-05**	**B B 2**	**0**	
Eu 155	3.55E-05	B B 2			**Total b/g**	**1.51E-02**	**B B 2**	**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 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