

WASTE STREAM

9G48/C

Encapsulated Skips and Debris from Fuel Cooling Pond

Stainless steel.....	0
Other ferrous metals.....	~14.0
Iron.....	
Aluminium.....	0
Beryllium.....	TR
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	~6.0
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	TR
Other metals.....	0

There are no "other" metals.

Organics (%wt):

The grout contains 1 to 1.5% superplasticiser (sulphonated naphthalene formaldehyde). The fuel skip was painted with 9kg Calvinac HR800. There are no halogenated plastics or rubbers present with the waste.

Total cellulose.....	0
Paper, cotton.....	0
Wood.....	0
Halogenated plastics	0
Total non-halogenated plastics.....	0
Condensation polymers.....	0
Others.....	0
Organic ion exchange materials....	0
Total rubber.....	0
Halogenated rubber	0
Non-halogenated rubber.....	0
Hydrocarbons.....	
Oil or grease	
Fuel.....	
Asphalt/Tarmac (cont.coal tar)...	
Asphalt/Tarmac (no coal tar)....	
Bitumen.....	
Others.....	
Other organics.....	<1.0

Grout contains 1 to 1.5% superplasticiser (sulphonated naphthalene formaldehyde). The fuel skip was painted with 9kg Calvinac HR800.

Other materials (%wt):

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Inorganic ion exchange materials.....	0	
Inorganic sludges and flocs.....	0	
Soil.....	0	
Brick/Stone/Rubble.....	0	
Cementitious material.....	~80.0	Grout
Sand.....		
Glass/Ceramics.....	0	
Graphite.....	TR	
Desiccants/Catalysts.....		
Asbestos.....	0	
Non/low friable.....		
Moderately friable.....		
Highly friable.....		
Free aqueous liquids.....	0	
Free non-aqueous liquids.....	0	
Powder/Ash.....	0	

Inorganic anions (%wt):

Not fully assessed. There will be aluminates and silicates associated with the grout.

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	0
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for waste acceptance criteria:

The Magnox is encapsulated in grout and so does not constitute a fire hazard.

Combustible metals.....	~6.0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	0
Biological etc. materials.....	0
Biodegradable materials.....	
Putrescible wastes.....	0
Non-putrescible wastes.....	
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	~6.0
Active particles.....	

	Soluble solids as bulk chemical compounds.....
Hazardous substances / non hazardous pollutants:	None expected.
	Acrylamide.....
	Benzene.....
	Chlorinated solvents.....
	Formaldehyde.....
	Organometallics.....
	Phenol.....
	Styrene.....
	Tri-butyl phosphate.....
	Other organophosphates.....
	Vinyl chloride.....
	Arsenic.....
	Barium.....
	Boron.....
	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):	No
	EDTA.....
	DPTA.....
	NTA.....
	Polycarboxylic acids.....
	Other organic complexants.....
	Total complexing agents..... 0

PACKAGING AND CONDITIONING

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Container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	3m ³ box (round corners)	100.0	2.7	2.7	3

Container type comment: The waste has been conditioned.

Range in container waste volume: There is no significant variability in the volume of waste per container

Other information on containers: The container material is stainless steel.

Conditioned density (t/m³): 1.8

Conditioned density comment: -

Other information on conditioning: -

RADIOACTIVITY

Source: The source of the waste is mostly splitter debris from fuel elements prior to dispatch of the elements to Sellafield. Activation of trace nuclides in the Magnox and contamination by fission products and actinides will be the main sources of activity. There are 155 small, but highly-activated, Nimonic springs in one package, within a steel pot, one-inch thick. There are a number of other small contaminated scrap items from the pond floor.

Uncertainty: The uncertainties are a combination of systematic and counting errors at the one sigma level.

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: Values were derived from spectrometry measurements, and fingerprinting of debris samples.

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³			Nuclide	Mean radioactivity, TBq/m ³		
	Waste at 1.4.2019	Bands and Code	Future arisings		Waste at 1.4.2019	Bands and Code	Future arisings
H 3		6		Gd 153		8	
Be 10		6		Ho 163		8	
C 14		6		Ho 166m		8	
Na 22		8		Tm 170		8	
Al 26		8		Tm 171		8	
Cl 36		6		Lu 174		8	
Ar 39		8		Lu 176		8	
Ar 42		8		Hf 178n		8	
K 40		8		Hf 182		8	
Ca 41		6		Pt 193		8	
Mn 53		8		Tl 204		8	
Mn 54		6		Pb 205		8	
Fe 55		6		Pb 210		8	
Co 60	2.14E-02	CC 1		Bi 208		8	
Ni 59		6		Bi 210m		8	
Ni 63		6		Po 210		8	
Zn 65		6		Ra 223		8	
Se 79		8		Ra 225		8	
Kr 81		8		Ra 226		8	
Kr 85		8		Ra 228		8	
Rb 87		8		Ac 227		8	
Sr 90		6		Th 227		8	
Zr 93		6		Th 228		8	
Nb 91		8		Th 229		8	
Nb 92		8		Th 230		8	
Nb 93m		6		Th 232		8	
Nb 94		8		Th 234		8	
Mo 93		6		Pa 231		8	
Tc 97		8		Pa 233	5.72E-09	CC 2	
Tc 99		6		U 232		8	
Ru 106		6		U 233		8	
Pd 107		8		U 234		6	
Ag 108m		6		U 235		8	
Ag 110m		8		U 236		6	
Cd 109		8		U 238		6	
Cd 113m		8		Np 237	5.79E-09	CC 2	
Sn 119m		8		Pu 236		8	
Sn 121m		6		Pu 238		6	
Sn 123		8		Pu 239		6	
Sn 126		8		Pu 240		6	
Sb 125		8		Pu 241		6	
Sb 126		8		Pu 242		6	
Te 125m		8		Am 241	1.97E-03	CC 2	
Te 127m		8		Am 242m		6	
I 129		8		Am 243		6	
Cs 134		6		Cm 242		6	
Cs 135		8		Cm 243		6	
Cs 137	<4.88E-03	C 1		Cm 244		6	
Ba 133		8		Cm 245		8	
La 137		8		Cm 246		8	
La 138		8		Cm 248		8	
Ce 144		6		Cf 249		8	
Pm 145		8		Cf 250		8	
Pm 147		6		Cf 251		8	
Sm 147		8		Cf 252		8	
Sm 151		6		Other a			
Eu 152		6		Other b/g			
Eu 154	2.91E-04	CC 2		Total a	1.97E-03	CC 2	0
Eu 155	1.95E-05	CC 2		Total b/g	2.66E-02	CC 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