

WASTE STREAM

9G20/C

Ion Exchange Material - Conditioned Waste

Stainless steel.....	0
Other ferrous metals.....	~77.0
Iron.....	
Aluminium.....	0
Beryllium.....	0
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

The packaging includes mild steel liners, iron shot in the concrete, mild steel reinforcing bars, the mild steel mixing paddle and a grout capping layer. Mild steel makes up 1.7% of the filled packages by weight, iron shot 74.8% (by wt), and iron grit about 0.5% by weight.

The conditioned waste incorporates iron grit.

Organics (%wt):

Proprietary ion exchange resins and DOW polymer are present. The DOW polymer is a mixed polymer formed mainly by addition polymerisation but with some condensation cross-linking. The total wt% has been assigned to condensation polymers in the table.

Total cellulosics.....	0
Paper, cotton.....	0
Wood.....	0
Halogenated plastics	0
Total non-halogenated plastics.....	6.1
Condensation polymers.....	6.1
Others.....	0
Organic ion exchange materials....	~1.9
Total rubber.....	TR
Halogenated rubber	TR
Non-halogenated rubber.....	
Hydrocarbons.....	
Oil or grease	
Fuel.....	
Asphalt/Tarmac (cont.coal tar)...	
Asphalt/Tarmac (no coal tar)....	
Bitumen.....	
Others.....	
Other organics.....	0

neoprene

Other materials (%wt):

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Inorganic ion exchange materials.....	~3.8
Inorganic sludges and flocs.....	NE
Soil.....	0
Brick/Stone/Rubble.....	0
Cementitious material.....	~8.8
Sand.....	
Glass/Ceramics.....	0
Graphite.....	0
Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	2.4
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt):

Inorganic anions are assessed as 0% wt apart from any which may be present in the 8.8 wt% of cementitious grout/cement paste. These have not been assessed.

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:

No materials likely to pose a fire or other non-radiological hazard have been identified.

Combustible metals.....	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.....	0

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	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
	4m box (200mm concrete shielding)	100.0	4.56	10.9	42

Container type comment: .

Range in container waste volume: No significant variability is expected

Other information on containers: The 4m ILW box will be made of stainless steel.

Conditioned density (t/m³): 2.5Conditioned density comment: The density of the wasteform is estimated to be approximately 2.5 t/m³. The wasteform is taken as being 6 type 1803 drums packaged in the available volume in a 4m box.

Other information on conditioning: The original conditioned package is the type 1803C drum of approximately 760 litre overall volume. Currently it is anticipated that the drums will be overpacked in a 4m ILW box before being consigned to a repository.

RADIOACTIVITY

Source: Conditioned used ion exchange resins arising from the treatment of pond and effluent water. Contamination by fission products is the main source of activity. Some actinides are also present.

Uncertainty: Specific activity is a function of Station operating history. Values were derived from available measurements. The values quoted are indicative of the activities that might be expected.

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: The specific activities were derived from the activities of the raw waste, reduced by a factor to account for the volume increase on conditioning.

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	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	<1.21E-07	C 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-07	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2E-07	CC 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	4E-09	CC 2			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	2.02E-08	CC 2			Pb 210		8		
Co 60	1.53E-07	CC 2			Bi 208		8		
Ni 59	4E-09	CC 2			Bi 210m		8		
Ni 63	9.39E-07	CC 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	1.72E-09	CC 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	5.65E-04	CC 2			Th 227		8		
Zr 93	4E-08	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.94E-08	CC 2			Th 232		8		
Nb 94		8			Th 234	1E-07	CC 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	2E-07	CC 2		
Tc 99	<2E-04	C 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107	2E-09	CC 2			U 234	1E-07	CC 2		
Ag 108m		8			U 235	1E-08	CC 2		
Ag 110m		8			U 236	6E-09	CC 2		
Cd 109		8			U 238	1E-07	CC 2		
Cd 113m		8			Np 237	2E-07	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	3.56E-04	CC 2			Pu 238	9.37E-07	CC 2		
Sn 123		8			Pu 239	1.00E-06	CC 2		
Sn 126	8.7E-09	CC 2			Pu 240	2.00E-06	CC 2		
Sb 125	9.32E-09	CC 2			Pu 241	1.95E-05	CC 2		
Sb 126	1.22E-09	CC 2			Pu 242	2E-08	CC 2		
Te 125m	2.33E-09	CC 2			Am 241	1.03E-05	CC 2		
Te 127m		8			Am 242m	9.57E-08	CC 2		
I 129	<2E-08	C 3			Am 243	4.00E-08	CC 2		
Cs 134	1.95E-07	CC 2			Cm 242	7.89E-08	CC 2		
Cs 135	4E-07	CC 2			Cm 243	1.62E-08	CC 2		
Cs 137	1.63E-02	CC 2			Cm 244	2.84E-07	CC 2		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	8.33E-09	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	5.60E-06	CC 2			Other a				
Eu 152	1.26E-07	CC 2			Other b/g				
Eu 154	<2.43E-08	C 3			Total a	1.50E-05	CC 2	0	
Eu 155	<8.33E-09	C 3			Total b/g	1.75E-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