



<b>WASTE STREAM</b>	<b>3S12/C</b>	<b>CVCS Resins and Spent Resins (ILW) - Conditioned waste</b>
---------------------	---------------	---

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	TR		
Other ferrous metals.....	~94.4	Ductile Cast iron.	
Iron.....	NE		
Aluminium.....			
Beryllium.....	0		
Cobalt.....	TR		
Copper.....			
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....			
Titanium.....	NE		
Uranium.....	0		
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	TR		

Organics (%wt):                      Organic proprietary polystyrene/divinyl benzene copolymer ion exchange resins will be present. %ages based on resins in storage tanks.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	0		
Paper, cotton.....	0		
Wood.....	0		
Halogenated plastics .....	0		
Total non-halogenated plastics.....	0		
Condensation polymers.....	0		
Others.....	0		
Organic ion exchange materials....	~5.6	Spent organic ion exchange resin comprising mixed anion and cation bead resin based on a styrene divinylbenzene copolymer (DVB-styrene), in approximately a 50:50 (anion:cation) mix.	
Total rubber.....	0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....	0		
Oil or grease .....			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	TR		

Other materials (%wt):                      Based on resins in storage tanks

<b>WASTE STREAM</b>	<b>3S12/C</b>	<b>CVCS Resins and Spent Resins (ILW) - Conditioned waste</b>
---------------------	---------------	---

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....	0		
Glass/Ceramics.....	NE		
Graphite.....	0		
Desiccants/Catalysts.....	0		
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	<0.01		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt):      Other significant anions include Borate (~3%wt).

	(%wt)	Type(s) and comment
Fluoride.....	<0.01	
Chloride.....	<0.01	
Iodide.....	NE	
Cyanide.....	NE	
Carbonate.....	NE	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	NE	
Sulphate.....	<0.01	
Sulphide.....	NE	

Materials of interest for waste acceptance criteria:      There are no materials identified which are likely to pose a fire or other non-radiological hazard.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....	0	

<b>WASTE STREAM</b>	<b>3S12/C</b>	<b>CVCS Resins and Spent Resins (ILW) - Conditioned waste</b>
---------------------	---------------	---

Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....	P	May be present
Soluble solids as bulk chemical compounds.....	0	

Hazardous substances / non hazardous pollutants:      Contains spent ion exchange resin - listed substance code 190806.

	(%wt)	Type(s) and comment
Acrylamide.....	NE	
Benzene.....	NE	
Chlorinated solvents.....	NE	
Formaldehyde.....	NE	
Organometallics.....	NE	
Phenol.....	NE	
Styrene.....	NE	
Tri-butyl phosphate.....	NE	
Other organophosphates.....	NE	
Vinyl chloride.....	NE	
Arsenic.....	NE	
Barium.....	NE	
Boron.....	NE	
Boron (in Boral).....	NE	
Boron (non-Boral).....	NE	
Cadmium.....	NE	
Caesium.....	NE	
Selenium.....	NE	
Chromium.....	NE	
Molybdenum.....	NE	
Thallium.....	NE	
Tin.....	NE	
Vanadium.....	NE	
Mercury compounds.....	NE	
Others.....	NE	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	0	
EEE Type 2.....	0	
EEE Type 3.....	0	
EEE Type 4.....	0	
EEE Type 5.....	0	

<b>WASTE STREAM</b>	<b>3S12/C</b>	<b>CVCS Resins and Spent Resins (ILW) - Conditioned waste</b>
---------------------	---------------	---

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	Complexing agents may be present in trace quantities.
Total complexing agents.....	TR	

Potential for the waste to contain discrete items: No.

**PACKAGING AND CONDITIONING**

Container type:	Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
	500 l RS drum (0mm Pb)	72.0	~0.465	~0.465	144
	500 l RS drum (20mm Pb)	28.0	~0.41	~0.41	64

Container type comment: Campaign 1 used regular unshielded MOSAIK casks (Cast Iron) as will Campaign 2. Campaign 3 may use MOSAIK casks with either 20mm or 40mm lead lining.

Range in container waste volume: Use of 40mm lead lined casks for Campaign 3 will reduce payload to 0.382m³.

Other information on containers: -

Conditioned density (t/m³): ~4.6

Conditioned density comment: Density based on drained wasteform with 27% interstitial voidage in 1.32m3 casks.

Other information on conditioning: -

**RADIOACTIVITY**

Source: Spent ion exchange resin arising from the treatment of liquids. Contamination will be by fission and activation products, and trace quantities of actinides.

Uncertainty: The activity values quoted for existing waste is based on characterisation results. Activity of future arisings based on possible future contamination of resins with fission products. Waste that is processed during campaign 3 will be of higher activity than the previous campaigns.

Definition of total alpha and total beta/gamma: The majority listed stock alpha specific activities are all upper limits, therefore the total alpha activity will be less than the sum of the listed activities.

Measurement of radioactivities: Theoretical assessment. Some activity data comes from limited tank sampling activities.

Other information: -

**WASTE STREAM**

**3S12/C**

**CVCS Resins and Spent Resins (ILW) - Conditioned waste**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	1.96E-03	CC 2	1.58E-02	CC 2	Gd 153			2.20E-06	CC 2
Be 10			3.01E-09	CC 2	Ho 163			1.07E-07	CC 2
C 14	4.24E-02	CC 2	3.69E-02	CC 2	Ho 166m			1.57E-05	CC 2
Na 22		4		4	Tm 170			5.78E-06	CC 2
Al 26		4		4	Tm 171			5.05E-04	CC 2
Cl 36			7.92E-08	CC 2	Lu 174			8.19E-07	CC 2
Ar 39			3.28E-05	CC 2	Lu 176			1.02E-13	CC 2
Ar 42			1.88E-10	CC 2	Hf 178n			1.81E-05	CC 2
K 40			4.81E-11	CC 2	Hf 182			1.99E-10	CC 2
Ca 41			9.04E-08	CC 2	Pt 193			3.57E-07	CC 2
Mn 53			1.01E-12	CC 2	Tl 204			1.15E-04	CC 2
Mn 54	7.57E-05	CC 2	3.49E-02	CC 2	Pb 205			2.39E-12	CC 2
Fe 55	2.35E-02	CC 2	2.32E-01	CC 2	Pb 210			5.30E-10	CC 2
Co 60	4.27E-02	CC 2	4.28E-01	CC 2	Bi 208			1.21E-11	CC 2
Ni 59			6.17E-07	CC 2	Bi 210m			1.66E-12	CC 2
Ni 63	3.1E-01	CC 2	2.53E-01	CC 2	Po 210			1.54E-09	CC 2
Zn 65	<2.11E-08	C 3	1.47E-03	CC 2	Ra 223			1.57E-10	CC 2
Se 79			3.27E-08	CC 2	Ra 225			2.40E-07	CC 2
Kr 81			1.01E-07	CC 2	Ra 226			1.83E-09	CC 2
Kr 85	<1.82E-06	C 3	9.53E-03	CC 2	Ra 228			2.31E-07	CC 2
Rb 87			1.14E-10	CC 2	Ac 227			1.57E-10	CC 2
Sr 90	1.04E-03	CC 2	8.91E-03	CC 2	Th 227			1.54E-10	CC 2
Zr 93			9.09E-06	CC 2	Th 228	<5.61E-07	C 3	4.38E-07	CC 2
Nb 91			5.92E-09	CC 2	Th 229	<2.81E-07	C 3	2.40E-07	CC 2
Nb 92			6.25E-12	CC 2	Th 230	<2.81E-07	C 3	2.40E-07	CC 2
Nb 93m			4.02E-04	CC 2	Th 232	<3.51E-07	C 3	3.01E-07	CC 2
Nb 94			7.07E-06	CC 2	Th 234			6.91E-07	CC 2
Mo 93			1.57E-07	CC 2	Pa 231			3.87E-10	CC 2
Tc 97			5.88E-13	CC 2	Pa 233			1.72E-06	CC 2
Tc 99			6.69E-05	CC 2	U 232	<2.81E-07	C 3	2.09E-07	CC 2
Ru 106	<5.12E-05	C 3	7.35E-03	CC 2	U 233	9.12E-07	CC 2	5.74E-10	CC 2
Pd 107			7.14E-07	CC 2	U 234			1.14E-06	CC 2
Ag 108m			4.28E-07	CC 2	U 235			3.60E-08	CC 2
Ag 110m			7.07E-04	CC 2	U 236	<5.61E-07	C 3	4.74E-07	CC 2
Cd 109	<7.72E-08	C 3	1.31E-05	CC 2	U 238	<7.72E-07	C 3	6.91E-07	CC 2
Cd 113m	<3.51E-05	C 3	7.32E-05	CC 2	Np 237			1.72E-06	CC 2
Sn 119m			1.25E-06	CC 2	Pu 236			1.18E-08	CC 2
Sn 121m			1.20E-04	CC 2	Pu 238	8.98E-06	CC 2	9.28E-05	CC 2
Sn 123			3.49E-06	CC 2	Pu 239		6	3.64E-05	CC 2
Sn 126			1.06E-06	CC 2	Pu 240	<6.32E-07	C 3	3.65E-05	CC 2
Sb 125	<4.21E-08	C 3	3.13E-02	CC 2	Pu 241	<5.26E-05	C 3	5.52E-03	CC 2
Sb 126			3.41E-07	CC 2	Pu 242	<3.16E-07	C 3	3.83E-07	CC 2
Te 125m			7.84E-03	CC 2	Am 241	<4.91E-07	C 3	1.76E-04	CC 2
Te 127m			2.06E-05	CC 2	Am 242m	<6.32E-08	C 3	6.37E-07	CC 2
I 129	<1.75E-07	C 3	2.32E-07	CC 2	Am 243	<4.91E-08	C 3	2.28E-06	CC 2
Cs 134	1.48E-02	CC 2	2.95E-02	CC 2	Cm 242	<4.91E-08	C 3	1.92E-06	CC 2
Cs 135			2.55E-06	CC 2	Cm 243			1.07E-07	CC 2
Cs 137	3.25E-01	CC 2	3.87E-01	CC 2	Cm 244	<1.40E-08	C 3	1.40E-05	CC 2
Ba 133			1.35E-05	CC 2	Cm 245			3.63E-06	CC 2
La 137			1.54E-08	CC 2	Cm 246	<7.02E-09	C 3	1.02E-06	CC 2
La 138			2.25E-14	CC 2	Cm 248			4.74E-11	CC 2
Ce 144	<2.81E-08	C 3	3.61E-03	CC 2	Cf 249			4.97E-10	CC 2
Pm 145			5.15E-08	CC 2	Cf 250			3.05E-09	CC 2
Pm 147	<1.05E-05	C 2	3.02E-02	CC 2	Cf 251			4.71E-11	CC 2
Sm 147			1.59E-11	CC 2	Cf 252			1.28E-09	CC 2
Sm 151			1.46E-03	CC 2	Other a		8		8
Eu 152			1.51E-06	CC 2	Other b/g	<7.02E-04	C 3		6
Eu 154	<3.51E-08	C 3	1.26E-02	CC 2	<b>Total a</b>	<b>&lt;1.48E-05</b>	<b>C 3</b>	<b>3.70E-04</b>	<b>CC 2</b>
Eu 155	<1.40E-08	C 3	3.10E-03	CC 2	<b>Total b/g</b>	<b>7.62E-01</b>	<b>CC 2</b>	<b>1.54E+00</b>	<b>CC 2</b>

**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