

WASTE STREAM	9E962/C	Ion Siv Unit Cartridges
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SITE Oldbury
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	0.2m ³	2.6m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		0.2m ³	2.6m ³
Number of waste packages in stock:	At 1.4.2022.....	2 package(s)	

Comment on volumes: The volume of each cartridge is 0.053 m3. There are 2 cartridges in each MOSAIK (Total of 4 cartridges).

Uncertainty factors on volumes:
 Stock (upper): x 1.1 Arisings (upper) x
 Stock (lower): x 0.9 Arisings (lower) x

WASTE SOURCE Ion Siv Cartridges used to remove Caesium from pond water.

PHYSICAL CHARACTERISTICS

General description: Spent IONSIV cartridges that formed part of the submersible caesium removal unit. Each cartridge will contain about 10 kg of water, less than 10% of this is expected to be free water, the rest is absorbed into the resin beads.

Physical components (%wt): Spent IONSIV Cartridges (100%). The waste is spent IONSIV cartridges, which are composed principally of a stainless steel hollow cylinder containing IONSIV material.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.2

Comment on density: The density of 1.2 t/m³ assumes that each cartridge will contain 10 kg of water, giving a total mass of 66.2 kg for each cartridge.

CHEMICAL COMPOSITION

General description and components (%wt): IONSIV ion exchange material (~53%), stainless steel (~32%), water (~15%) and EPDM seal material (<1%). (EPDM is ethylene diene terpolymer). IonSiv is a crystalline silicotitanate.

Chemical state: Neutral

Chemical form of radionuclides:
 H-3: Any tritium is likely to be present as water.
 Cl-36: The chlorine 36 content is insignificant.
 Pu: The chemical form of plutonium isotopes may be plutonium oxides.

Metals and alloys (%wt): The stainless steel forms a hollow cylinder with dimensions: internal diameter 122mm, external diameter 296mm and height 640mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~32.0	The stainless steel is SS316L; nickel and chromium will be major constituents of the stainless steel cartridge housing.	
Other ferrous metals.....	NE		
Iron.....			
Aluminium.....	NE		
Beryllium.....	TR		
Cobalt.....			

WASTE STREAM	9E962/C	Ion Siv Unit Cartridges
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Copper.....	NE	
Lead.....	NE	
Magnox/Magnesium.....	NE	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	NE	
Zircaloy/Zirconium.....	NE	
Other metals.....	NE	Only the stainless steel content of the waste has been assessed.

Organics (%wt): EPDM seal material (<1%wt) is present in the waste. Halogenated plastics and rubbers are not expected in the waste

	(%wt)	Type(s) and comment	% of total C14 activity
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.....	<1.0		
Halogenated rubber	0		
Non-halogenated rubber.....	<1.0	EPDM seal material	
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	NE		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	~52.0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	0		

WASTE STREAM	9E962/C	Ion Siv Unit Cartridges
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Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	<15.0
Free non-aqueous liquids.....	0
Powder/Ash.....	0

Inorganic anions (%wt): The inorganic anion content of the waste has not been assessed.

	(%wt)	Type(s) and comment
Fluoride.....	NE	
Chloride.....	NE	
Iodide.....	NE	
Cyanide.....	NE	
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.

	(%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.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

WASTE STREAM	9E962/C	Ion Siv Unit Cartridges
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Hazardous substances / none expected
 non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
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): Yes

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

WASTE STREAM	9E962/C	Ion Siv Unit Cartridges
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Potential for the waste to contain discrete items: Yes. Stainless Steel DI that has undergone conditioning/drying using ATCS

PACKAGING AND CONDITIONING

Container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l RS drum (20mm Pb)	100.0	0.106	0.106	2

Container type comment: Type B(M) MOSAIKs. Loading assumes 2 Ion Sivs per container.

Range in container waste volume: -

Other information on containers: Type B(M) MOSAIKs. Loading assumes 2 Ion Sivs per container.

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: -

RADIOACTIVITY

Source: Spent cartridges from the submersible caesium removal unit, used for the removal of caesium isotopes from cooling pond water. Contamination by fission products, actinides and activation products.

Uncertainty: Specific activity is a function of Station operating history. 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: Estimated from available data. Taken from WD-CALC-1923

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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	1.84E-04	BB 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.8E-04	BB 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	8.99E-07	BB 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	1.24E-03	BB 2			Pb 210		8		
Co 60	1.25E-03	BB 2			Bi 208		8		
Ni 59	2.26E-08	BB 2			Bi 210m		8		
Ni 63	5.94E-03	BB 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	8.62E-07	BB 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85	1.48E-03	BB 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	7.60E+00	BB 2			Th 227		8		
Zr 93	4.73E-06	BB 2			Th 228	5.36E-09	BB 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230	2.77E-09	BB 2		
Nb 93m	4.00E-06	BB 2			Th 232		8		
Nb 94		8			Th 234	6.9E-06	BB 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	2.80E-07	BB 2		
Tc 99	3.85E-05	BB 2			U 232	5.20E-09	BB 2		
Ru 106		8			U 233		8		
Pd 107	2.22E-07	BB 2			U 234	6.24E-06	BB 2		
Ag 108m	1.02E-05	BB 2			U 235	1.91E-07	BB 2		
Ag 110m		8			U 236	6.53E-07	BB 2		
Cd 109		8			U 238	6.9E-06	BB 2		
Cd 113m	6.08E-06	BB 2			Np 237	2.8E-07	BB 2		
Sn 119m		8			Pu 236		8		
Sn 121m	3.63E-05	BB 2			Pu 238	8.48E-04	BB 2		
Sn 123		8			Pu 239	9.13E-04	BB 2		
Sn 126	1.73E-06	BB 2			Pu 240	9.33E-04	BB 2		
Sb 125	1.60E-06	BB 2			Pu 241	3.02E-02	BB 2		
Sb 126	2.42E-07	BB 2			Pu 242	1.13E-06	BB 2		
Te 125m	4.00E-07	BB 2			Am 241	4.22E-03	BB 2		
Te 127m		8			Am 242m	9.95E-06	BB 2		
I 129	7.78E-08	BB 2			Am 243	2.15E-06	BB 2		
Cs 134	3.66E-01	BB 2			Cm 242	8.21E-06	BB 2		
Cs 135	2.2E-06	BB 2			Cm 243	9.42E-06	BB 2		
Cs 137	7.39E+01	BB 2			Cm 244	1.07E-04	BB 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	1.76E-08	BB 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	1.55E-09	BB 2			Other a				
Eu 152	1.48E-05	BB 2			Other b/g				
Eu 154	2.88E-04	BB 2			Total a	7.05E-03	BB 2	0	
Eu 155	6.94E-05	BB 2			Total b/g	8.19E+01	BB 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