WASTE STREAM 9E961/C Ion Siv Unit Cartridges & Pre Filters

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.....	0.8 m³	5.3 m³
Total future arisings:		0 m³	0 m³
Total waste volume:		0.8 m³	5.3 m³
Number of waste packages in stock:	At 1.4.2022.....	4 package(s)	

Comment on volumes: The volume of each cartridge/filter is 0.053 m3. There are 3 x cartridges and 1 x pre filter per MOSAIK (Total of 12 cartridges and 4 x pre filters).

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 and pre filters used to remove caesium from pond water.

PHYSICAL CHARACTERISTICS

General description: Spent IONSIV cartridges and pre filters 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. There are also some pre-filters.

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

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		

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Cobalt		
Copper	NE	
Lead	NE	
Magnox/Magnesium	NE	
Nickel		
Titanium		
Uranium	NE	
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 cellulosics	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		

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Graphite	0
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		

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Hazardous substances / non hazardous pollutants: none expected

	(%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	

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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 (0mm Pb)	100.0	0.212	0.212	4

Container type comment: 4 x MOSAIKs Type B(M) no shielding

Range in container waste volume: -

Other information on containers: 4 x MOSAIKs Type B(M) no shielding. There are 3 x cartridges and 1 x pre filter per MOSAIK (Total of 12 cartridges and 4 x pre filters).

Conditioned density (t/m^3): -

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/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	7.21E-03	B B 2			Gd 153		8		
Be 10	3.21E-09	B B 2			Ho 163		8		
C 14	3.7E-02	B B 2			Ho 166m	5.22E-09	B B 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	7.04E-05	B B 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	9.62E-02	B B 2			Pb 210		8		
Co 60	2.57E-04	B B 2			Bi 208		8		
Ni 59	1.34E-07	B B 2			Bi 210m		8		
Ni 63	4.62E-01	B B 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	5.1E-06	B B 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85	8.27E-03	B B 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	1.04E+00	B B 2			Th 227		8		
Zr 93	2.8E-05	B B 2			Th 228	2.17E-09	B B 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230	1.23E-08	B B 2		
Nb 93m	2.39E-05	B B 2			Th 232		8		
Nb 94	1.29E-09	B B 2			Th 234	1.89E-06	B B 2		
Mo 93		8			Pa 231	1.07E-09	B B 2		
Tc 97		8			Pa 233	1.83E-06	B B 2		
Tc 99	1.06E-04	B B 2			U 232	1.88E-09	B B 2		
Ru 106		8			U 233		8		
Pd 107	1.31E-06	B B 2			U 234	2.24E-06	B B 2		
Ag 108m	7.94E-04	B B 2			U 235	6.28E-08	B B 2		
Ag 110m		8			U 236	2.25E-07	B B 2		
Cd 109		8			U 238	1.89E-06	B B 2		
Cd 113m	3.45E-05	B B 2			Np 237	1.84E-06	B B 2		
Sn 119m		8			Pu 236		8		
Sn 121m	2.13E-04	B B 2			Pu 238	5.51E-03	B B 2		
Sn 123		8			Pu 239	4.74E-03	B B 2		
Sn 126	1.02E-05	B B 2			Pu 240	4.86E-03	B B 2		
Sb 125	1.81E-04	B B 2			Pu 241	1.54E-01	B B 2		
Sb 126	1.43E-06	B B 2			Pu 242	6.78E-06	B B 2		
Te 125m	4.52E-05	B B 2			Am 241	1.58E-02	B B 2		
Te 127m		8			Am 242m	5.88E-05	B B 2		
I 129	4.62E-07	B B 2			Am 243	1.27E-05	B B 2		
Cs 134	3.98E-02	B B 2			Cm 242	4.85E-05	B B 2		
Cs 135	1.3E-05	B B 2			Cm 243	3.09E-05	B B 2		
Cs 137	9.98E+00	B B 2			Cm 244	3.48E-04	B B 2		
Ba 133	1.72E-08	B B 2			Cm 245	5.47E-09	B B 2		
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	2.75E-05	B B 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	5.38E-03	B B 2			Other a				
Eu 152	8.75E-06	B B 2			Other b/g				
Eu 154	1.42E-03	B B 2			**Total a**	**3.13E-02**	**B B 2**	**0**	
Eu 155	2.70E-04	B B 2			**Total b/g**	**1.18E+01**	**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