

<b>WASTE STREAM</b>	<b>9D50</b>	<b>Ion Siv Unit Cartridges</b>
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**SITE** Hinkley Point A  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0.3m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		0.3m <sup>3</sup>
Comment on volumes:	Each IONSIV cartridge has a volume of 0.053 m3. There are six of these in total = 0.32m3.	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

**WASTE SOURCE** IONSIV cartridges produced as a result of filtration of cooling pond water.

**PHYSICAL CHARACTERISTICS**

**General description:** Spent Ionsiv Cartridges formed part of the Submersible Caesium Removal Unit. The size of the cartridges will not influence the choice of treatment process or disposal container. 6 Ionsiv Cartridges are now being held in individual vented storage containers (a vented drum). The drums containing the Cartridges have been relocated from the Main R1 Pond to the R1 Magnox Vault.

**Physical components (%wt):** Spent IONSIV Cartridges (100%). IONSIV ion exchange material (~53%), stainless steel (~32%), water (~15%) and EPDM seal material (<1%).

**Sealed sources:** The waste does not contain sealed sources.

**Bulk density (t/m<sup>3</sup>):** ~1.2

**Comment on density:** The density of 1.2 t/m<sup>3</sup> 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):** The waste is spent IONSIV cartridges, which are composed principally of a stainless steel hollow cylinder containing IONSIV material. IONSIV ion exchange material (~53%), stainless steel (~32%), water (~15%) and EPDM seal material (<1%). IONSIV is a crystalline silicotitanate. (EPDM is ethylene diene terpolymer).

**Chemical state:** Neutral

**Chemical form of radionuclides:** H-3: Any tritium is likely to be present as water.  
 C-14: The carbon 14 content is insignificant.  
 Cl-36: The chlorine 36 content is insignificant.  
 Se-79: The selenium content is insignificant.  
 Tc-99: The technetium content is insignificant.  
 I-129: The iodine 129 content is insignificant.  
 Ra: The radium isotope content is insignificant.  
 Th: The thorium isotope content is insignificant.  
 U: The uranium isotope content is insignificant.  
 Np: The neptunium 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		

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Iron.....	
Aluminium.....	NE
Beryllium.....	TR
Cobalt.....	
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		
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..	~53.0	IONSIV is a crystalline silicotitanate.	
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		

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Cementitious material.....	0
Sand.....	
Glass/Ceramics.....	0
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:           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.

	(%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.....		

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Soluble solids as bulk chemical compounds.....

Hazardous substances / non hazardous pollutants:      If any, present in trace quantities only.

	(%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.....		

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Total complexing agents..... TR

Potential for the waste to contain discrete items:      Yes. Stainless Steel so DI by definition

**PACKAGING AND CONDITIONING**

Conditioning method: -  
 Plant Name: -  
 Location: Hinkley Point A Site  
 Plant startup date: -  
 Total capacity (m<sup>3</sup>/y incoming waste): -  
 Target start date for packaging this stream: -  
 Throughput for this stream (m<sup>3</sup>/y incoming waste): -  
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	500 l RS drum (0mm Pb)	100.0	0.16	0.49	2

Likely container type comment: -  
 Range in container waste volume: -  
 Other information on containers: -  
 Likely conditioning matrix:  
 Other information: -  
 Conditioned density (t/m<sup>3</sup>): -  
 Conditioned density comment: -  
 Other information on conditioning: -  
 Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

**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.

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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:

Data taken from M/EF/HPA/REP/0011/19 - Issue 1

Other information:

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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	4.78E-05	BB 2		8	Gd 153				8
Be 10				8	Ho 163				8
C 14	4.53E-05	BB 2		8	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	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	9.30E-07	BB 2		8	Pb 210				8
Co 60	1.40E-05	BB 2		8	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63	1.15E-04	BB 2		8	Po 210				8
Zn 65				8	Ra 223				8
Se 79	3.59E-08	BB 2		8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85	2.41E-04	BB 2		8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90	4.55E-01	BB 2		8	Th 227				8
Zr 93	1.97E-07	BB 2		8	Th 228	1.05E-07	BB 2		8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m	1.26E-07	BB 2		8	Th 232				8
Nb 94				8	Th 234	2.11E-06	CC 2		8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233	3.38E-08	BB 2		8
Tc 99	1.73E-05	BB 2		8	U 232	1.04E-07	BB 2		8
Ru 106	7.77E-09	BB 2		8	U 233				8
Pd 107	9.25E-09	BB 2		8	U 234	1.78E-06	CC 2		8
Ag 108m				8	U 235	5.63E-08	CC 2		8
Ag 110m				8	U 236	2.03E-07	BB 2		8
Cd 109				8	U 238	2.11E-06	CC 2		8
Cd 113m	7.17E-07	BB 2		8	Np 237	3.41E-08	BB 2		8
Sn 119m				8	Pu 236				8
Sn 121m	2.02E-06	BB 2		8	Pu 238	8.24E-04	BB 2		8
Sn 123				8	Pu 239	1.19E-03	BB 2		8
Sn 126	7.2E-08	BB 2		8	Pu 240	1.21E-03	BB 2		8
Sb 125	3.88E-06	BB 2		8	Pu 241	1.16E-02	BB 2		8
Sb 126	1.01E-08	BB 2		8	Pu 242	4.72E-08	BB 2		8
Te 125m	9.72E-07	BB 2		8	Am 241	6.24E-03	BB 2		8
Te 127m				8	Am 242m	4.61E-07	BB 2		8
I 129	3.24E-09	BB 2		8	Am 243	8.95E-08	BB 2		8
Cs 134	3.36E-02	BB 2		8	Cm 242	3.81E-07	BB 2		8
Cs 135	9.16E-08	BB 2		8	Cm 243	2.80E-06	BB 2		8
Cs 137	4.33E+00	BB 2		8	Cm 244	3.90E-05	BB 2		8
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	1.58E-09	CC 2		8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151	8.14E-05	BB 2		8	Other a				
Eu 152	5.89E-07	BB 2		8	Other b/g				
Eu 154	3.71E-05	BB 2		8	<b>Total a</b>	<b>9.51E-03</b>	<b>BB 2</b>	<b>0</b>	
Eu 155	1.22E-05	BB 2		8	<b>Total b/g</b>	<b>4.83E+00</b>	<b>BB 2</b>	<b>0</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