WASTE STREAM 9J59 Ion Siv Cartridges

SITE Hunterston A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0.1 m³
Future arisings -	1.4.2022 - 31.3.2023.....	0.1 m³
Total future arisings:		0.1 m³
Total waste volume:		0.2 m³

Comment on volumes: The MAETP plant was commissioned in 2009. The station ceased generation on 31/03/1990, with defuelling completed on 08/02/1995. The volume of each cartridge is 0.044 m3.

Uncertainty factors on volumes:

Stock (upper):	x 1.2	Arisings (upper)	x 1.5
Stock (lower):	x 0.8	Arisings (lower)	x 0.8

WASTE SOURCE Filtration of cartridge cooling pond water.

PHYSICAL CHARACTERISTICS

General description: Spent IONSIV cartridge that forms part of the Modular Active Effluent Treatment Plant. The size of the cartridge will not influence the choice of treatment process or disposal container.

Physical components (%wt): Spent IONSIV Cartridge (100%).

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): The waste 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.
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.

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.....		

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	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.		
	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 (EPDM is ethylene diene terpolymer).
	Hydrocarbons		
	Oil or grease		
	Fuel		
	Asphalt/Tarmac (cont.coal tar)		
	Asphalt/Tarmac (no coal tar)		
	Bitumen		
	Others		
	Other organics	NE	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	~53.0	IONSIV material (crystalline silicotitanate)
	Inorganic sludges and flocs	0	
	Soil	0	
	Brick/Stone/Rubble	0	
	Cementitious material	0	
	Sand		
	Glass/Ceramics	0	
	Graphite	0	
	Desiccants/Catalysts		
	Asbestos	0	
	Non/low friable		

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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.

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: -

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
Active particles.....	
Soluble solids as bulk chemical compounds.....	

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

Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	

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	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):	Yes
	EDTA.....
	DPTA.....
	NTA.....
	Polycarboxylic acids……
	Other organic complexants.....
	Total complexing agents..... TR

PACKAGING AND CONDITIONING

Conditioning method:	The waste is expected to be conditioned in a cast iron drum. The drummed waste will be over packed in a 3m3 box. A strategy decision needs to be taken as to whether the 3m3 box will be grouted.
Plant Name:	Unknown
Location:	Hunterston A Power Station
Plant startup date:	-
Total capacity (m^3/y incoming waste):	-
Target start date for packaging this stream:	-
Throughput for this stream (m^3/y incoming waste):	<1.0
Other information:	It is assumed that 1 cartridge will be packaged into each drum, each drum will then be placed into a 3m3 box.

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Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
3m^3 box (round corners)	100.0	0.044	2.7	4

Likely container type comment:	-
Range in container waste volume:	No significant variability is expected.
Other information on containers:	The drum is cast iron and the 3m box is stainless steel.
Likely conditioning matrix:	Polymer
Other information:	Work is in progress to determine the most appropriate matrix. Currently a polymer conditioning matrix is anticipated.
Conditioned density (t/m^3):	NE
Conditioned density comment:	Conditioned density is not estimated.
Other information on conditioning:	It is expected that a purpose-built cast iron drum with a 205 mm wall thickness will be used. One cartridge will be packaged into one drum.
Opportunities for alternative disposal routing:	

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source:	A spent cartridge from the Modular Active Effluent Treatment Plant (MAETP), used for the removal of caesium isotopes from Cartridge 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:	The activities were estimated from the fingerprint for the Cartridge Cooling Pond water sludge from waste stream 9J951 with a total activity of 0.6 TBq for the Cartridge Cooling Pond water.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	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		6		6	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14		8		8	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	7.25E-02	C C 2	5.63E-02	C C 2	Pb 210		8		8
Co 60	4.14E-03	C C 2	3.63E-03	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	9.08E-02	C C 2	8.87E-02	C C 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	2.7E-08	C C 2	3.44E-08	C C 2
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	1.11E-07	C C 2	1.38E-07	C C 2
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236	1.78E-09	8	2.37E-09	8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237	2.77E-08	C C 2	3.52E-08	C C 2
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	9.69E-03	C C 2	9.61E-03	C C 2
Sn 123		8		8	Pu 239	2E-02	C C 2	2E-02	C C 2
Sn 126		8		8	Pu 240	2E-02	C C 2	2E-02	C C 2
Sb 125	7.34E-05	C C 2	5.71E-05	C C 2	Pu 241	4.13E-01	C C 2	3.93E-01	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m	<1.84E-05	C 3	<1.43E-05	C 3	Am 241	2.27E-02	C C 2	2.33E-02	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	1.3E-04	C C 2	9.32E-05	C C 2	Cm 242	2E-07	C C 2	4.22E-08	C C 2
Cs 135		8		8	Cm 243	9.12E-04	C C 2	8.91E-04	C C 2
Cs 137	1.82E+00	C C 2	1.78E+00	C C 2	Cm 244	8.58E-04	C C 2	8.25E-04	C C 2
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152		8		8	Other b/g				
Eu 154	3.62E-03	C C 2	3.34E-03	C C 2	**Total a**	**7.42E-02**	**C C 2**	**7.46E-02**	**C C 2**
Eu 155	1.13E-03	C C 2	9.76E-04	C C 2	**Total b/g**	**2.41E+00**	**C C 2**	**2.33E+00**	**C C 2**

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