

WASTE STREAM	9E56/C	Ion Siv Unit Cartridges & Post Filters
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SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	At 1.4.2025	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			= 0.8	5.3
Future arisings:					0.0
					0.0
Total future arisings:				0.0	0.0
Total waste volume:				0.8	5.3

Number of waste packages in stock: At 1.4.2025..... 4 packages

Comment on arising rates: -

Additional information on quantities: Cartridge volume 0.05m3, filter volume 0.057m3. Total of 14 cartridges and 2 x post filters.

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x -
Stock (lower): x 1.00 Arisings (lower): x -

WASTE SOURCE Filtration of cooling pond water.

PHYSICAL CHARACTERISTICS

General description: 14 spent IONSIV cartridges (and two post filters) that formed part of the submersible caesium removal unit.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.1

Comment on density: The average density of the waste stream is 1.12 t/m3 . (The density of a cartridge is given as 1.2 t/m3. when taking into account the Mosaiks with pre filters [density of 0.57t/m3] this reduces the mean density across the waste stream to 1.12t/m3)

CHEMICAL COMPOSITION

General description and components (%wt): The waste is primarily spent IONSIV cartridges, which are composed principally of a stainless steel hollow cylinder containing IONSIV material, there are also two post filters. IONSIV ion exchange material (~49%), stainless steel (~35.5%), water (~13.7%), EPDM seal material (<1%) and Sludge (<1%). IONSIV is a crystalline silicotitanate. (EPDM is ethylene diene terpolymer).

Chemical state: Neutral

Sheet metal proportion / thickness: The stainless steel forms a hollow cylinder with dimensions: internal diameter 122mm, external diameter 296mm and height 640mm.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 35.6	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.....	-	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	-	

Organics (%wt):

	(%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.....	~ 49.1	IONSIV IE-911	
Inorganic sludges and flocs.....	~ 0.63	Sludge	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	< 13.7	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%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:

	(%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.....	-	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments:

Conditioning method: Waste has been packaged into 4 MOSAIKs and dried.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

Further information on the conditioning matrix:

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	500 l RS drum (0mm Pb)	100.0	0.20	0.20	4	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): NE
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Spent cartridges and post filters 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.

Measurement of radioactivities: -

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: -
- Ra: The radium isotope content is insignificant.
- Th: The thorium isotope content is insignificant.
- U: The uranium isotope content is insignificant.
- Np: The neptunium isotope content is insignificant.
- Pu: The chemical form of plutonium isotopes may be plutonium oxides.

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	4.37E-05	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	3.35E-05	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36	3.72E-08	C C 2			Lu 174		8		
Ar 39					Lu 176		8		
Ar 42					Hf 178n		8		
K 40					Hf 182		8		
Ca 41					Pt 193		8		
Mn 53					Tl 204		8		
Mn 54					Pb 205		8		
Fe 55	3.78E-06	C C 2			Pb 210		8		
Co 60	4.73E-06	C C 2			Bi 208		8		
Ni 59					Bi 210m		8		
Ni 63	2.41E-05	C C 2			Po 210		8		
Zn 65					Ra 223		8		
Se 79					Ra 225		8		
Kr 81					Ra 226		8		
Kr 85	6.67E-06	C C 2			Ra 228		8		
Rb 87					Ac 227		8		
Sr 90	8.20E-01	C C 2			Th 227		8		
Zr 93	4.02E-09	C C 2			Th 228		8		
Nb 91					Th 229		8		
Nb 92					Th 230		8		
Nb 93m	2.29E-09	C C 2			Th 232		8		
Nb 94					Th 234	1.22E-08	C C 2		
Mo 93					Pa 231		8		
Tc 97					Pa 233	2.23E-07	C C 2		
Tc 99	3.33E-08	C C 2			U 232		8		
Ru 106	3.09E-09	C C 2			U 233		8		
Pd 107					U 234	1.15E-08	C C 2		
Ag 108m	2.33E-08	C C 2			U 235		8		
Ag 110m					U 236	1.29E-09	C C 2		
Cd 109					U 238	1.22E-08	C C 2		
Cd 113m	1.84E-08	C C 2			Np 237	2.23E-07	C C 2		
Sn 119m					Pu 236		8		
Sn 121m	4.38E-08	C C 2			Pu 238	8.12E-06	C C 2		
Sn 123					Pu 239	1.29E-05	C C 2		
Sn 126	1.47E-09	C C 2			Pu 240	1.28E-05	C C 2		
Sb 125	2.44E-07	C C 2			Pu 241	2.66E-04	C C 2		
Sb 126					Pu 242	9.74E-08	C C 2		
Te 125m	6.12E-08	C C 2			Am 241	4.24E-05	C C 2		
Te 127m					Am 242m	7.42E-09	C C 2		
I 129					Am 243	1.83E-09	C C 2		
Cs 134	5.88E-03	C C 2			Cm 242	6.12E-09	C C 2		
Cs 135	1.64E-09	C C 2			Cm 243	5.26E-07	C C 2		
Cs 137	8.02E+00	C C 2			Cm 244	4.55E-08	C C 2		
Ba 133	4.69E-08	C C 2			Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248		8		
Ce 144					Cf 249		8		
Pm 145					Cf 250		8		
Pm 147	4.84E-06	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	3.49E-06	C C 2			Unsp a				
Eu 152	1.30E-07	C C 2			Unsp b/g				
Eu 154	2.14E-06	C C 2			Total a	7.71E-05	*	0	*
Eu 155	5.70E-07	C C 2			Total b/g	8.84E+00	*	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 the 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
* Total calculated from the 114 declared radionuclides