

WASTE STREAM**9J03/C****Conditioned Ion Exchange Resin / sludge**

SITE Hunterston A
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: Yes

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	193.6 m ³	229.7 m ³
Total future arisings:		0 m ³	0 m ³
Total waste volume:		193.6 m ³	229.7 m ³
Number of waste packages in stock:	At 1.4.2022.....	88 package(s)	
Comment on volumes:	-		
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper)	x
	Stock (lower): x 0.9	Arisings (lower)	x

WASTE SOURCE Pond water treatment plant.

PHYSICAL CHARACTERISTICS

General description: The waste consists of conditioned ion exchange resin types Lewatit DN (in a granular form) and IRN-74 and sludge.
 Physical components (%wt): Resin (11%), Sludge (68%), Grout (21%)
 Sealed sources: The waste does not contain sealed sources.
 Bulk density (t/m³): ~1.8
 Comment on density: The conditioned density range is approximately 1.6 to 1.9 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Resin (11%) consisting of Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82%) and IRN-74 - methylene sulphonic acid (18%). Sludge (68%) and grout (21%).
 Chemical state: Alkali
 Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined but may be present as water or as other inorganic or organic compounds.
 C-14: The chemical form of carbon 14 has not been determined.
 Cl-36: The chemical form of chlorine 36 has not been determined.
 Se-79: The chemical form of selenium has not been determined.
 Tc-99: The chemical form of technetium has not been determined.
 Ra: The radium isotope content is insignificant.
 Th: The thorium isotope content is insignificant.
 U: The chemical form of uranium isotopes has not been determined but may be present as uranium oxides.
 Np: The chemical form of neptunium has not been determined.
 Pu: The chemical form of plutonium isotopes has not been determined but may be present as plutonium oxides.
 Metals and alloys (%wt): There is no sheet metal.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	TR		
Iron.....			
Aluminium.....	TR		
Beryllium.....	0		

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Cobalt.....		
Copper.....	TR	
Lead.....	0	
Magnox/Magnesium.....	TR	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	TR	
Zircaloy/Zirconium.....	0	
Other metals.....	TR	Possibly trace amounts of nickel, molybdenum, sodium, calcium and potassium.

Organics (%wt): The only organic materials in the waste are ion exchange resins, Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82% wt) and IRN-74 - methylene sulphonic acid (18% wt). Some water might be bound with the resins. There are no halogenated plastics or rubbers present 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....	11.0	Lewatit DN - phenolsulphonic acid - formaldehyde condensate, strong cation resin (82%) and IRN-74 - methylene sulphonic acid (18%).	
Total rubber.....	0		
Halogenated rubber	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	0		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	68.0		
Soil.....	0		

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Brick/Stone/Rubble.....	0	
Cementitious material.....	21.0	Grout
Sand.....		
Glass/Ceramics.....	0	
Graphite.....	0	
Desiccants/Catalysts.....		
Asbestos.....	0	
Non/low friable.....		
Moderately friable.....		
Highly friable.....		
Free aqueous liquids.....	P	
Free non-aqueous liquids.....	0	
Powder/Ash.....	0	

Inorganic anions (%wt): The waste is expected to contain only trace quantities of inorganic ions (<100 ppm).

	(%wt)	Type(s) and comment
Fluoride.....	TR	
Chloride.....	~0.01	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	0	
Nitrate.....	TR	
Nitrite.....	TR	
Phosphate.....	0	
Sulphate.....	TR	
Sulphide.....	0	

Materials of interest for waste acceptance criteria: The waste contains no hazardous materials.

	(%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: 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): No

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

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Total complexing agents..... 0

Potential for the waste to contain discrete items: No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

PACKAGING AND CONDITIONING

Container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	3m ³ drum	100.0	2.2	2.2	88

Container type comment:

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Range in container waste volume:

No significant variability is expected.

Other information on containers:

The container material is stainless steel.

Conditioned density (t/m³):

~1.8

Conditioned density comment:

The conditioned density range is approximately 1.6 to 1.9 t/m³.

Other information on conditioning:

Wet ILW recovery and encapsulation plant used to conditioned Waste.

RADIOACTIVITY

Source:

The waste arises from 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:

Activities have been taken from CALC 1064 issue 2 and decayed to 01/04/2022

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	5.25E-05	CC 1			Gd 153		8		
Be 10	1.27E-08	CC 2			Ho 163	2.29E-08	CC 2		
C 14	9.61E-06	CC 1			Ho 166m	7.05E-06	CC 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	8.45E-08	CC 1			Lu 174		8		
Ar 39	7.11E-06	CC 2			Lu 176		8		
Ar 42		8			Hf 178n	7.21E-06	CC 2		
K 40		8			Hf 182		8		
Ca 41	1.55E-06	CC 1			Pt 193	4.64E-06	CC 2		
Mn 53		8			Tl 204	5.58E-07	CC 2		
Mn 54		8			Pb 205		8		
Fe 55	5.51E-06	CC 1			Pb 210		8		
Co 60	1.85E-05	CC 1			Bi 208		8		
Ni 59	3.22E-07	CC 1			Bi 210m		8		
Ni 63	4.60E-05	CC 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	2.9E-08	CC 2			Ra 225		8		
Kr 81	1.07E-07	CC 2			Ra 226		8		
Kr 85	3.81E-04	CC 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	8.35E-03	CC 1			Th 227		8		
Zr 93	1.25E-06	CC 2			Th 228	1.09E-08	CC 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	3.79E-06	CC 2			Th 232		8		
Nb 94	7.18E-07	CC 2			Th 234	1.03E-06	CC 2		
Mo 93	2.28E-08	CC 2			Pa 231		8		
Tc 97		8			Pa 233	1.12E-07	CC 2		
Tc 99	1.53E-05	CC 1			U 232	1.06E-08	CC 2		
Ru 106		8			U 233	1.65E-08	CC 2		
Pd 107	8.78E-08	CC 2			U 234	8.74E-07	CC 1		
Ag 108m	3.98E-07	CC 2			U 235	3.47E-08	CC 1		
Ag 110m		8			U 236	1.28E-07	CC 2		
Cd 109		8			U 238	1.03E-06	CC 1		
Cd 113m	2.20E-06	CC 2			Np 237	1.12E-07	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m	1.20E-05	CC 2			Pu 238	4.86E-04	CC 1		
Sn 123		8			Pu 239	5.26E-04	CC 1		
Sn 126	3.00E-07	CC 2			Pu 240	5.21E-04	CC 1		
Sb 125	1.28E-07	CC 2			Pu 241	9.44E-03	CC 1		
Sb 126	4.19E-08	CC 2			Pu 242	9.41E-07	CC 2		
Te 125m	3.20E-08	CC 2			Am 241	2.62E-03	CC 1		
Te 127m		8			Am 242m	2.83E-06	CC 2		
I 129	2.27E-07	CC 1			Am 243	3.50E-06	CC 2		
Cs 134	6.59E-08	CC 1			Cm 242	2.33E-06	CC 1		
Cs 135	1.00E-06	CC 2			Cm 243	3.46E-06	CC 1		
Cs 137	1.20E-01	CC 1			Cm 244	3.95E-05	CC 1		
Ba 133	7.77E-07	CC 2			Cm 245	5.13E-09	CC 2		
La 137	1.35E-09	CC 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145	1.72E-08	CC 2			Cf 250		8		
Pm 147	5.55E-06	CC 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	7.28E-04	CC 1			Other a				
Eu 152	7.53E-08	CC 2			Other b/g				
Eu 154	5.44E-05	CC 1			Total a	4.20E-03	CC 2	0	
Eu 155	9.20E-06	CC 1			Total b/g	1.39E-01	CC 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