

WASTE STREAM	7V25	Resin from Decontamination Operations ILW
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SITE Dounreay (Vulcan)

SITE OWNER Ministry of Defence

WASTE CUSTODIAN Ministry of Defence

WASTE TYPE ILW; SPD1

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	3.0 m ³
Future arisings -	1.4.2019 - 31.3.2030.....	~0 m ³
Total future arisings:		0 m ³
Total waste volume:		3.0 m ³

Comment on volumes: Ion Exchange (IX) resin was generated historically during decontamination trials and primary circuit operation. Quantities of IX resin discharged from containers of known volumes. Assumptions on zero future arisings based on current site operating procedures.

Uncertainty factors on volumes: Stock (upper): x 1.2 Arisings (upper) x
 Stock (lower): x 0.8 Arisings (lower) x

WASTE SOURCE IX resin generated from treatment systems designed to reduce soluble activity from process liquors.

PHYSICAL CHARACTERISTICS

General description: The organic resins are in the form of loose spherical beads of 0.5-0.75mm diameter and consist of mixed anion/cation resins including Purolite NRW37, Purolite NRW3240, Purolite NRW400, Dowex MR-3 and Amberlite (MB20). They are stored as a water slurry, either in storage tanks or in the original process columns. Due to the chemical process used the resin will also contain an amount of organic chelating agents. The physical and chemical properties are still to be confirmed through sampling. There has been no physical/chemical changes to the waste.

Physical components (%vol): Organic ion exchange resins and water. The %volume ratio will be confirmed following sample analysis.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.1

Comment on density: Estimated value. The waste is stored as a water slurry therefore the bulk density is based on the IX resin and the interstitial water.

CHEMICAL COMPOSITION

General description and components (%wt): IX resin and water plus trace organic chelating agent, EDTA. The chemical properties will be confirmed through the ongoing sampling and analysis programme.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Not yet assessed. Detailed analysis is to be carried out.
 C-14: Not yet assessed. Detailed analysis is to be carried out.
 Cl-36: Not yet assessed. Detailed analysis is to be carried out.
 Se-79: Not yet assessed. Detailed analysis is to be carried out.
 Tc-99: Not yet assessed. Detailed analysis is to be carried out.
 I-129: Not yet assessed. Detailed analysis is to be carried out.
 Ra: Not yet assessed. Detailed analysis is to be carried out.
 Th: Not yet assessed. Detailed analysis is to be carried out.
 U: Not yet assessed. Detailed analysis is to be carried out.
 Np: Not yet assessed. Detailed analysis is to be carried out.
 Pu: Not yet assessed. Detailed analysis is to be carried out.

Metals and alloys (%wt): There are no metals in this waste stream.

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	Stainless steel.....	0	
	Other ferrous metals.....	0	
	Iron.....	0	
	Aluminium.....	0	
	Beryllium.....	0	
	Cobalt.....	0	
	Copper.....	0	
	Lead.....	0	
	Magnox/Magnesium.....	0	
	Nickel.....	0	
	Titanium.....	0	
	Uranium.....	0	
	Zinc.....	0	
	Zircaloy/Zirconium.....	0	
	Other metals.....	0	
Organics (%wt):	Organic material will be present as anionic and cationic ion exchange resin. Not yet characterised.		
	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....	NE	The IX resins are in a water slurry but the water/IX ratio is still to be determined.
	Total rubber.....	0	
	Halogenated rubber	0	
	Non-halogenated rubber.....	0	
	Hydrocarbons.....	0	
	Oil or grease	0	
	Fuel.....	0	
	Asphalt/Tarmac (cont.coal tar)...	0	
	Asphalt/Tarmac (no coal tar)....	0	
	Bitumen.....	0	
	Others.....	0	
	Other organics.....	NE	
Other materials (%wt):	The percentage of interstitial water has not been determined.		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	

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Sand..... 0
 Glass/Ceramics..... 0
 Graphite..... 0
 Desiccants/Catalysts..... 0
 Asbestos..... 0
 Non/low friable..... 0
 Moderately friable..... 0
 Highly friable..... 0

Free aqueous liquids..... NE

The IX resins are in a water slurry but the water/IX ratio is still to be determined

Free non-aqueous liquids..... 0

Powder/Ash..... 0

Inorganic anions (%wt):

There may be inorganic ions associated with this waste stream.

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:

Not yet determined.

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..... 0

Corrosive materials..... 0

Pyrophoric materials..... 0

Generating toxic gases..... 0

Reacting with water..... 0

Active particles..... NE

Soluble solids as bulk chemical compounds..... NE

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non hazardous pollutants:

The resins may contain some chemical elements from the decontamination process.

Acrylamide.....	NE
Benzene.....	NE
Chlorinated solvents.....	NE
Formaldehyde.....	NE
Organometallics.....	NE
Phenol.....	NE
Styrene.....	NE
Tri-butyl phosphate.....	NE
Other organophosphates.....	NE
Vinyl chloride.....	NE
Arsenic.....	NE
Barium.....	NE
Boron.....	NE
Cadmium.....	NE
Caesium.....	NE
Selenium.....	NE
Chromium.....	NE
Molybdenum.....	NE
Thallium.....	NE
Tin.....	NE
Vanadium.....	NE
Mercury compounds.....	NE
Others.....	NE
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	0
EEE Type 2.....	0
EEE Type 3.....	0
EEE Type 4.....	0
EEE Type 5.....	0

Complexing agents (%wt):

Yes	
EDTA.....	~1.6
DPTA.....	0
NTA.....	0
Polycarboxylic acids.....	0
Other organic complexants.....	
Total complexing agents.....	~1.6

PACKAGING AND CONDITIONING

Conditioning method: Not specified.

Plant Name: -

Location: -

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Plant startup date: -
 Total capacity (m³/y incoming waste): -
 Target start date for packaging this stream: -
 Throughput for this stream (m³/y incoming waste): -
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	Not specified	100.0	NE	NE	NE

Likely container type comment: To be determined.

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Not Specified

Other information: -

Conditioned density (t/m³): -

Conditioned density comment: -

Other information on conditioning: Packaging/treatment/conditioning process yet to be confirmed.

Opportunities for alternative disposal routing: Not yet determined

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: The waste arisings are from decontamination trials.

Uncertainty: The specific activity will be verified following sampling & analysis.

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 specific activity will be verified following sampling & analysis.

Other information: A sampling & analysis programme will be carried out to give a full physical, chemical and radiological inventory.

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137					Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g				
Eu 154					Total a	NE		0	
Eu 155					Total b/g	NE		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