

WASTE STREAM	7V28	Resin from Decontamination Operations LLW
--------------	------	---

SITE NRTE Vulcan

SITE OWNER Ministry of Defence (MOD)

WASTE CUSTODIAN Ministry of Defence (MOD)

WASTE TYPE LLW

WASTE VOLUMES

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

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

Comment on arising rates: Ion Exchange (IX) resin is only generated during periods of extended maintenance or decontamination operations, which are performed on infrequent occasions. Current site operating procedures require that IX resin in pond water treatment systems is changed before it exceeds LLW disposal criteria.

Additional information on quantities: Quantities of IX resin discharged from containers of known volumes. Assumptions on future arisings based on historical operations.

Uncertainty factors on volumes: Stock (upper): x 1.10 Arisings (upper): x -
Stock (lower): x 0.90 Arisings (lower): x -

WASTE SOURCE IX resin from pond water treatment operations.

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).

Changes since waste generated: There has been no physical/chemical processes or changes to the waste.

Bulk density (t/m³): ~ 0.70

Comment on density: Based on the ion exchange resin from the sampling datasheets.

CHEMICAL COMPOSITION

General description and components (%wt): 100% Ion Exchange resin. The resins are in the form of loose spherical beads and consist of mixed anion/cation resins including Purolite NRW37, Purolite NRW3240, Purolite NRW400, Dowex MR-3 and Amberlite (MB20).

Chemical state: Neutral

Sheet metal proportion / thickness: There are no metals in this waste stream.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
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):

	(%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...	= 100.0	Purolite NRW37, Purolite NRW3240, Purolite NRW400, Dowex MR-3 and Amberlite (MB20)	
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...	= 0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials...	0	-	
Inorganic sludges and flocs...	0	-	
Soil...	0	-	
Brick/Stone/Rubble...	0	-	
Cementitious material...	0	-	
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...	0	-	
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...	0	-
Chloride...	0	-
Iodide...	0	-
Cyanide...	0	-
Carbonate...	0	-
Nitrate...	0	-
Nitrite...	0	-
Phosphate...	0	-
Sulphate...	0	-
Sulphide...	0	-

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...	0	-
Corrosive materials...	0	-
Pyrophoric materials...	0	-
Generating toxic gases...	0	-
Reacting with water...	0	-
Higher activity particles...	0	-
Soluble solids as bulk chemical compounds...	0	-

Hazardous substances / non hazardous pollutants:

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

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....	= 0	-
NTA.....	= 0	-
Polycarboxylic acids.....	= 0	-
Other organic complexants.....	= 0	-
Total complexing agents.....	= 0	-

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		= 100.0
None		

Comments on planned treatments:

No decisions made on decommissioning process until site handover in 2028, at which point NDA / NRS Dounreay will take ownership.

Conditioning method:

No decisions made on conditioning process until site handover in 2028, at which point NDA / NRS Dounreay will take ownership.

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
	Not yet determined	100.0	-	-	-	-

Range in container waste loading:

Other information on packaging and conditioning: The waste package option is still to be determined.

Conditioned density (t/m³): -
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)			
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	= 100.0	NE	

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

Opportunities for alternative disposal routing: Not yet determined

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

RADIOACTIVITY

Source: Spent ion exchange resin.

Uncertainty: This will be refined following further sampling.

Measurement of radioactivities: From sampling and theoretical modelling

Chemical form of radionuclides:

- H-3: In liquid form
- C-14: As a carbonate
- Cl-36: NE
- Se-79: NE
- Tc-99: NE
- I-129: NE
- Ra: Not detected
- Th: Not detected
- U: Ionic solution
- Np: Not detected
- Pu: Ionic solution

WASTE STREAM 7V28 Resin from Decontamination Operations LLW									
Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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	3.34E-07	D D 2	3.09E-07	D D 2	Gd 153				
Be 10					Ho 163				
C 14	1.07E-04	D D 2	1.07E-04	D D 2	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					Ti 204				
Mn 54	8.25E-09	D D 2	1.65E-08	D D 2	Pb 205				
Fe 55	6.28E-06	D D 2	5.30E-06	D D 2	Pb 210				
Co 60	2.16E-04	D D 2	1.50E-04	D D 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	5.25E-05	D D 2	5.33E-05	D D 2	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	1.21E-06	D D 2	1.34E-06	D D 2	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	8.04E-11	D D 5	8.04E-11	D D 5
Ru 106					U 233	1.00E-10	D D 5	1.00E-10	D D 5
Pd 107					U 234	1.00E-10	D D 5	1.00E-10	D D 5
Ag 108m	6.86E-06	D D 2	3.72E-06	D D 2	U 235	2.00E-10	D D 5	2.00E-10	D D 5
Ag 110m					U 236	2.00E-10	D D 5	2.00E-10	D D 5
Cd 109					U 238	7.11E-10	D D 5	7.11E-10	D D 5
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	2.84E-08	D D 5	5.39E-08	D D 5
Sn 123					Pu 239	4.00E-10	D D 5	4.00E-10	D D 5
Sn 126					Pu 240	4.00E-10	D D 5	4.00E-10	D D 5
Sb 125	4.64E-08	D D 2	4.50E-08	D D 2	Pu 241	9.94E-08	D D 5	1.07E-07	D D 5
Sb 126					Pu 242	1.72E-09	D D 5	1.72E-09	D D 5
Te 125m					Am 241	9.53E-10	D D 5	1.37E-09	D D 5
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	2.31E-08	D D 2	1.75E-08	D D 2	Cm 242	4.65E-10	D D 5	4.65E-10	D D 5
Cs 135					Cm 243	5.00E-10	D D 5	5.00E-10	D D 5
Cs 137	5.05E-07	D D 2	5.96E-07	D D 2	Cm 244	5.00E-10	D D 5	5.00E-10	D D 5
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					Unsp a				
Eu 152					Unsp b/g				
Eu 154	8.88E-08	D D 2	1.41E-07	D D 2	Total a	3.47E-08	*	6.06E-08	*
Eu 155	5.87E-08	D D 2	7.71E-08	D D 2	Total b/g	3.91E-04	*	3.22E-04	*

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