

WASTE STREAM	9G78/C	Sludge (incorporating MSV and RV1 WRATS) - Conditioned Material
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SITE Trawsfynydd

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025		= 105.6	125.2
Future arisings:				0.0
Total future arisings:			0.0	0.0
Total waste volume:			105.6	125.2

Number of waste packages in stock: At 1.4.2025..... 48 packages

Comment on arising rates: -

Additional information on quantities: conditioned volume calculated based on 48 packages x 2.2m³ = 105.6m³. Campaign 3 produced 3 liners and campaign 4 produced 45 liners.

Uncertainty factors on volumes:

Stock (upper):	x 1.00	Arisings (upper):	x -
Stock (lower):	x 1.00	Arisings (lower):	x -

WASTE SOURCE Includes oily/sludge residues from the base of the vault and sludge resulting from routine filtration of liquid effluents and cooling pond water and from special clean-up operations on cooling ponds.

PHYSICAL CHARACTERISTICS

General description: The waste consists of debris washed from persons, corrosion products such as magnesium hydroxide and carbonate detached from fuel elements and extraneous materials such as flakes of paint. There is also some filter sand.

Changes since waste generated: -

Bulk density (t/m³): = 1.9

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Sludge (7 wt%), cementitious grout (62 wt%), package furniture (29 wt%) and bound oil (2 wt%).

Chemical state: Alkali

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 29.0	Stainless steel liners and package furniture are present, Grade 316S11.	
Other ferrous metals.....		-	
Iron.....		-	
Aluminium.....		-	
Beryllium.....		-	
Cobalt.....		-	
Copper.....		-	
Lead.....		-	
Magnox/Magnesium.....		-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....		-	
Zircaloy/Zirconium.....	0	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE	-	
Paper, cotton.....	NE	-	
Wood.....	NE	-	
Halogenated plastics.....	0	-	
Total non-halogenated plastics.....	0	-	
Condensation polymers.....	0	-	
Others.....	0	-	
Organic ion exchange materials.....	= 0.28	Lewatit DN	
Total rubber.....	0	-	
Halogenated rubber.....	0	-	
Non-halogenated rubber.....	0	-	
Hydrocarbons.....	-	-	
Oil or grease.....	= 2.0	Bound oil	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	= 7.0	-	
Soil.....	NE	-	
Brick/Stone/Rubble.....	NE	-	
Cementitious material.....	= 62.0	9:1 BFS/OPC immobilisation matrix.	
Sand.....	-	-	
Glass/Ceramics.....	NE	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	0	-	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	-	-	
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.....	= 0.10	-
Iodide.....	0	-
Cyanide.....	0	-
Carbonate.....	= 3.9	-
Nitrate.....	0	-
Nitrite.....	0	-
Phosphate.....	0	-
Sulphate.....	= 1.3	-
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.....	TR	-
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:

The waste has already been encapsulated in 3m3 drums with a 9:1 BFS/OPC matrix.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

A 9:1 BFS/OPC matrix has been used to encapsulate the waste.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	3 m³ drum	100.0	2.2	2.2	48	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): = 1.9

Conditioned density comment: The density was calculated from the conditioned wasteform mass and volume

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: -

Uncertainty: -

Measurement of radioactivities: The specific activities have been derived using the radionuclide inventory of the main sludge vault and the known wastestream package mass and volume.

Chemical form of radionuclides:

H-3: Most tritium is expected to be present as water but some may be present in the form of other inorganic compounds or as organic compounds.

C-14: Carbon 14 may be present as graphite.

Cl-36: -

Se-79: Not determined.

Tc-99: Not determined.

I-129: -

Ra: Insignificant.

Th: Traces of thorium may be present in its natural form or as insoluble salts.

U: Not determined but may be uranium oxides.

Np: Not determined.

Pu: Not determined but 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	2.74E-02	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	5.47E-03	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36	6.16E-05	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	1.31E-02	C C 2			Pb 210		8		
Co 60	1.54E-02	C C 2			Bi 208		8		
Ni 59	2.72E-05	C C 2			Bi 210m		8		
Ni 63	3.88E-02	C C 2			Po 210		8		
Zn 65					Ra 223		8		
Se 79					Ra 225		8		
Kr 81					Ra 226		8		
Kr 85					Ra 228		8		
Rb 87					Ac 227		8		
Sr 90	2.73E-01	C C 2			Th 227		8		
Zr 93					Th 228		8		
Nb 91					Th 229		8		
Nb 92					Th 230	2.57E-09	C C 2		
Nb 93m					Th 232		8		
Nb 94	5.02E-05	C C 2			Th 234	5.65E-05	C C 2		
Mo 93					Pa 231		8		
Tc 97					Pa 233	3.16E-07	C C 2		
Tc 99	6.08E-04	C C 2			U 232		8		
Ru 106	6.20E-09	C C 2			U 233		8		
Pd 107					U 234	4.63E-05	C C 2		
Ag 108m	2.91E-04	C C 2			U 235	1.10E-06	C C 2		
Ag 110m					U 236	4.09E-06	C C 2		
Cd 109					U 238	5.65E-05	C C 2		
Cd 113m					Np 237	3.21E-07	C C 2		
Sn 119m					Pu 236		8		
Sn 121m					Pu 238	1.95E-02	C C 2		
Sn 123					Pu 239	3.76E-02	C C 2		
Sn 126					Pu 240	3.74E-02	C C 2		
Sb 125	7.20E-07	C C 2			Pu 241	2.83E-01	C C 2		
Sb 126					Pu 242		8		
Te 125m	1.80E-07	C C 2			Am 241	1.64E-01	C C 2		
Te 127m					Am 242m		8		
I 129	9.84E-08	C C 2			Am 243		8		
Cs 134	2.87E-07	C C 2			Cm 242		8		
Cs 135					Cm 243	8.97E-05	C C 2		
Cs 137	4.55E-01	C C 2			Cm 244	9.99E-04	C C 2		
Ba 133	1.59E-04	C C 2			Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248		8		
Ce 144	1.36E-09	C C 2			Cf 249		8		
Pm 145					Cf 250		8		
Pm 147	1.85E-05	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	3.63E-03	C C 2			Unsp a				
Eu 152	4.48E-04	C C 2			Unsp b/g				
Eu 154	2.07E-03	C C 2			Total a	2.60E-01	*	0	*
Eu 155	1.99E-04	C C 2			Total b/g	1.12E+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