

WASTE STREAM	9G16/C	Sludge - 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

	At 1.4.2025	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			~ 61.6	73.1
Future arisings:					0.0
					0.0
Total future arisings:				0.0	0.0
Total waste volume:				61.6	73.1

Number of waste packages in stock: At 1.4.2025..... 28 packages

Comment on arising rates: -

Additional information on quantities: There are 28 drums.

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

WASTE SOURCE Sludge retrieved from the main sludge vault and solidified in the solidification plant at Trawsfynydd.

PHYSICAL CHARACTERISTICS

General description: Conditioned sludge in 3m3 stainless steel drum waste packages.

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: Neutral

Sheet metal proportion / thickness: Stainless steel liners are present.

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.....	= 0		
Beryllium.....	0		
Cobalt.....	-		
Copper.....	= 0		
Lead.....	= 0		
Magnox/Magnesium.....	= 0		
Nickel.....	-		
Titanium.....	-		
Uranium.....	-		
Zinc.....	= 0		
Zircaloy/Zirconium.....	= 0		
Other metals.....	NE	Not fully assessed.	

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.....		-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....		-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....		-	
Others.....		-	
Other organics.....	= 2.0	Bound oil	

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.....	NE	-	
Free non-aqueous liquids.....	NE	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	= 0	-
Chloride.....	NE	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	NE	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	NE	-
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.....	NE	-
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:

-

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	28	-

Range in container waste loading: The waste loading per package is not expected to vary significantly.

Other information on packaging and conditioning: The container material is stainless steel. The waste has been conditioned.

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: Contaminated sludge. Contamination by fission products, actinides and activation products.

Uncertainty: Specific activity is a function of Station operating history.

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 may be present as graphite.

Cl-36: The chemical form of chlorine 36 has not been assessed.

Se-79: The chemical form of selenium has not been determined.

Tc-99: The chemical form of technetium has not been determined.

I-129: -

Ra: The radium isotope content is insignificant.

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

U: The chemical form of uranium isotopes has not been determined but may be 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 plutonium oxides.

WASTE STREAM		9G16/C		Sludge - Conditioned Material					
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	8.53E-04	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	3.11E-04	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36	7.12E-07	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	3.92E-06	C C 2			Pb 210		8		
Co 60	1.31E-04	C C 2			Bi 208		8		
Ni 59	9.85E-06	C C 2			Bi 210m		8		
Ni 63	3.89E-04	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	2.35E-02	C C 2			Th 227		8		
Zr 93					Th 228		8		
Nb 91					Th 229		8		
Nb 92					Th 230		8		
Nb 93m					Th 232		8		
Nb 94	7.94E-08	C C 2			Th 234	9.15E-06	C C 2		
Mo 93					Pa 231		8		
Tc 97					Pa 233	1.01E-07	C C 2		
Tc 99	4.30E-05	C C 2			U 232		8		
Ru 106					U 233		8		
Pd 107					U 234	7.05E-06	C C 2		
Ag 108m	2.87E-06	C C 2			U 235	3.82E-08	C C 2		
Ag 110m					U 236	2.04E-07	C C 2		
Cd 109					U 238	9.15E-06	C C 2		
Cd 113m					Np 237	1.02E-07	C C 2		
Sn 119m					Pu 236		8		
Sn 121m					Pu 238	2.76E-03	C C 2		
Sn 123					Pu 239	5.12E-03	C C 2		
Sn 126					Pu 240	6.66E-03	C C 2		
Sb 125	1.85E-07	C C 2			Pu 241	6.60E-02	C C 2		
Sb 126					Pu 242		8		
Te 125m	4.63E-08	C C 2			Am 241	2.17E-02	C C 2		
Te 127m					Am 242m		8		
I 129	2.17E-09	C C 2			Am 243		8		
Cs 134	1.33E-08	C C 2			Cm 242		8		
Cs 135					Cm 243	8.72E-06	C C 2		
Cs 137	1.39E-02	C C 2			Cm 244	1.55E-04	C C 2		
Ba 133	4.82E-07	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	7.15E-06	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	1.31E-03	C C 2			Unsp a				
Eu 152	3.45E-06	C C 2			Unsp b/g				
Eu 154	2.69E-04	C C 2			Total a	3.65E-02	*	0	*
Eu 155	2.12E-05	C C 2			Total b/g	1.07E-01	*	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