

WASTE STREAM	9G38	Miscellaneous Activated Components
--------------	------	------------------------------------

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	= 21.0		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		21.0		

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

Comment on arising rates: There will be no further arisings for this stream.

Additional information on quantities: This waste will be retained on site as at present to Reactor Dismantling and Site Clearance.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x -
Stock (lower):	x 0.80	Arisings (lower):	x -

WASTE SOURCE Redundant or defective components removed from the reactor core or pile cap.

PHYSICAL CHARACTERISTICS

General description: Redundant or defective components such as control rods and fuel charge chutes removed from the reactor. The possibility of large items which may need special handling is not assessed.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.0

Comment on density: The assumption of 1 t/m³ as the average bulk density may be subject to revision.

CHEMICAL COMPOSITION

General description and components (%wt): Principally irradiated steel components (~90%) removed from the reactor.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	P	Grade BS970 EN58.	100.0
Other ferrous metals.....	~ 90.0	Boron steel, other mild steel likely present.	
Iron.....	-	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	< 0.25	Greatest measured value from the various components.	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	TR	Silver and niobium.	

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.....	= 0	-	
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.....	NE	-	

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.....		-	
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.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

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.....		-
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.....	< 0.60	Greatest measured value from the various components.
Molybdenum.....		
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....		-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
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	On-site	100.0
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 current proposal is that the waste in tubes accessed from Pile Cap will remain as currently stored until Reactor Demolition. All of that waste will be processed during that conditioning campaign. The waste is not expected to be supercompacted. It will be placed in baskets in the waste packages and is assumed to be encapsulated.

Conditioning plants:

Plant Name	Location
RDC Encap TRW	Trawsfynydd

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

The waste in 4m boxes is assumed to be encapsulated.

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	4 m box (0 mm concrete shielding)	100.0	16.2	18.9	2	-

Range in container waste loading: Not yet determined. No significant variability is expected.

Other information on packaging and conditioning:

The container material is expected to be stainless steel. The waste in 4m boxes will be in baskets placed in the waste packages. Baskets of different ILW wastes may be in the same waste package. The conditioning matrix would be likely to be BFS/OPC and the conditioned waste density about 3 t/m3.

Conditioned density (t/m³):

~ 3.0

Conditioned density comment:

The density of the encapsulated waste in the 4m boxes is assumed to be 3.0 t/m3.

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:

Irradiated components removed from the reactor. Absorber bars and control rods are likely to be components of high activity, the majority of their activity coming from activation products.

Uncertainty:

Specific activity is a function of operating history. The values quoted are indicative of the activities that might be expected.

Measurement of radioactivities:

Estimates are based upon theoretical assessments.

Chemical form of radionuclides:

H-3: The chemical form of tritium has not been determined.
 C-14: The chemical form of carbon 14 has not been determined but may be present as graphite.
 Cl-36: The chemical form of chlorine 36 has not been determined.
 Se-79: The selenium content is insignificant.
 Tc-99: The chemical form of technetium has not been determined.
 I-129: -
 Ra: The radium isotope content is insignificant.
 Th: The thorium isotope content is insignificant.
 U: The chemical form of uranium isotopes is not assessed but may be uranium oxides.
 Np: The neptunium content is insignificant.
 Pu: The chemical form of plutonium isotopes has not been determined but may be present as plutonium oxides.

WASTE STREAM		9G38		Miscellaneous Activated Components					
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	< 1.29E+00	D 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-02	C D 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	3.00E-05	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	4.42E-02	C D 2			Pb 210		8		
Co 60	2.79E-01	C D 2			Bi 208		8		
Ni 59	4.00E-02	C D 2			Bi 210m		8		
Ni 63	2.70E+00	C D 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	< 3.50E-05	D 3			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94	4.00E-05	C D 2			Th 234	< 7.00E-09	D 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	< 1.00E-08	D 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	< 6.12E-09	D 3		
Ag 108m	< 3.90E-05	D 3			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	< 7.00E-09	D 3		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	< 2.66E-06	D 3		
Sn 123		8			Pu 239	< 3.00E-06	D 3		
Sn 126		8			Pu 240	< 4.00E-06	D 3		
Sb 125		8			Pu 241	< 9.72E-05	D 3		
Sb 126		8			Pu 242	< 2.00E-09	D 3		
Te 125m		8			Am 241	< 1.31E-05	D 3		
Te 127m		8			Am 242m	< 1.86E-08	D 3		
I 129		8			Am 243	< 5.99E-09	D 3		
Cs 134		8			Cm 242	< 1.53E-08	D 3		
Cs 135		8			Cm 243	< 3.54E-09	D 3		
Cs 137	< 4.96E-05	D 3			Cm 244	< 2.82E-08	D 3		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	< 1.71E-09	D 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	< 8.02E-07	D 3			Unsp a				
Eu 152	9.27E-06	C D 2			Unsp b/g				
Eu 154	5.95E-06	C D 2			Total a	2.28E-05	*	0	*
Eu 155		8			Total b/g	4.38E+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