

WASTE STREAM	2C03	Miscellaneous Reactor Components Stored dry
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SITE Chapelcross

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	= 13.0		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		13.0		

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

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

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.20 Arisings (upper): x -
Stock (lower): x 0.80 Arisings (lower): x -

WASTE SOURCE Miscellaneous reactor components arising from reactor defuelling operations.

PHYSICAL CHARACTERISTICS

General description: This waste stream comprises activated reactor components currently stored within the reactors and will arise during defuelling operations. The wet waste component of this waste stream, i.e. Miscellaneous Reactor Components wet, has been moved to waste stream 2C28, and the Reactor Mortuary Miscellaneous component has been moved to waste stream 2C38.

Changes since waste generated: -

Bulk density (t/m³): = 0.30

Comment on density: The density ranges from 0.2 to 0.6 t/m³, with an average density of 0.3 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Steel (11%), Magnox (45%), graphite (44%)

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 11.0	-	
Other ferrous metals.....	P	Nickel and molybdenum are present in boron steel and stainless steel.	
Iron.....	-	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	-	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	= 45.0	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 2.0	-	
Paper, cotton.....	< 1.0	-	
Wood.....	< 1.0	-	
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.....	= 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.....		-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 44.0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	P	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	P	-	

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.....	= 45.0	-
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.....	= 45.0	-
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):

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 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	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

The current proposal is to store the waste as at present until reactor dismantling. All waste is expected to be retrieved and conditioned when the conditioning campaign is undertaken. It is not intended to supercompact the waste, currently assumed to be cement encapsulated in 4m Box.

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

Unknown

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
	4 m box (0 mm concrete shielding)	100.0	16.2	18.9	1	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): = 2.0
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)	NE		
Expected to be Non-NSD HAW managed under Scottish Government's policy	NE		
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: The main sources of activity are activated steels from reactor components containing Co-60.

Uncertainty: The banding and code of the stock activities are best estimate limit values, within a factor of 3 (upper limit) and 100 (lower limit).

Measurement of radioactivities: The activities of the stocks have been estimated from limited information.

Chemical form of radionuclides: H-3: Not determined.
C-14: Not determined.
Cl-36: -
Se-79: Not determined.
Tc-99: Not determined.
I-129: -
Ra: Not present.
Th: Not present.
U: Not present.
Np: Not present.
Pu: Not present.

WASTE STREAM		2C03		Miscellaneous Reactor Components Stored dry					
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		5			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		6			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1.00E-04	B B	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	2.07E-02	B D	2		Pb 210		4		
Co 60	3.76E-02	B D	2		Bi 208		8		
Ni 59	4.00E-04	B D	2		Bi 210m		8		
Ni 63	3.53E-02	B D	2		Po 210		4		
Zn 65			8		Ra 223		8		
Se 79			4		Ra 225		8		
Kr 81			8		Ra 226		4		
Kr 85			8		Ra 228		8		
Rb 87			8		Ac 227		8		
Sr 90			4		Th 227		8		
Zr 93			4		Th 228		8		
Nb 91			8		Th 229		4		
Nb 92			8		Th 230		4		
Nb 93m			4		Th 232		4		
Nb 94			5		Th 234		8		
Mo 93			5		Pa 231		4		
Tc 97			8		Pa 233		8		
Tc 99			5		U 232		8		
Ru 106			5		U 233		8		
Pd 107			5		U 234		8		
Ag 108m			5		U 235		8		
Ag 110m			8		U 236		8		
Cd 109			8		U 238		8		
Cd 113m			8		Np 237		8		
Sn 119m			8		Pu 236		8		
Sn 121m			5		Pu 238		8		
Sn 123			8		Pu 239		8		
Sn 126			5		Pu 240		8		
Sb 125			8		Pu 241		8		
Sb 126			8		Pu 242		8		
Te 125m			8		Am 241		8		
Te 127m			8		Am 242m		8		
I 129			5		Am 243		8		
Cs 134			5		Cm 242		8		
Cs 135			5		Cm 243		8		
Cs 137			5		Cm 244		8		
Ba 133			8		Cm 245		8		
La 137			8		Cm 246		8		
La 138			8		Cm 248		8		
Ce 144			5		Cf 249		8		
Pm 145			8		Cf 250		8		
Pm 147			5		Cf 251		8		
Sm 147			8		Cf 252		8		
Sm 151			5		Unsp a				
Eu 152			5		Unsp b/g				
Eu 154			5		Total a	0	*	0	*
Eu 155			5		Total b/g	9.41E-02	*	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