

WASTE STREAM	9J46	Miscellaneous Activated Components R2
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SITE Hunterston A

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	= 0.6		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		0.6		

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

Comment on arising rates: -

Additional information on quantities: No further arisings.

Uncertainty factors on volumes:

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

WASTE SOURCE The source of the waste is in-core components.

PHYSICAL CHARACTERISTICS

General description: The waste consists of redundant control rods and associated equipment such as distance tubes. Control rods are approximately 200 kg each and are 7.08 m long (120 mm maximum diameter).

Changes since waste generated: -

Bulk density (t/m³): ~ 2.5

Comment on density: Bulk density is raw as stored and is estimated.

CHEMICAL COMPOSITION

General description and components (%wt): The waste consists principally of stainless steel, with other unspecified metals.

Chemical state: Neutral

Sheet metal proportion / thickness: Control rods are 7 m long x 0.12 m max diameter.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 90.0	The waste contains steel and other metals. Alloying proportions of tin, nickel, niobium and molybdenum may be present. Control rods contain boron steel inserts.	
Other ferrous metals.....	NE	-	
Iron.....		-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....		-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	TR	-	
Nickel.....		-	
Titanium.....		-	
Uranium.....		-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	TR	-	
Other metals.....	NE	"Other" metals have not been identified.	

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.....	TR	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
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.....	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	-
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.....		-
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):

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. Baskets of different ILW wastes may be in the same package. The waste is not expected to be supercompacted. It will be placed in baskets in a 4m ILW stainless steel box and is now assumed to be encapsulated.

Conditioning plants:

Plant Name	Location
RDC Encap HNA	Hunterston A

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

The waste is assumed to be encapsulated. The matrix is likely to be BFS/OPC.

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: This waste will only occupy one box.

Other information on packaging and conditioning:

The container material is likely to be stainless steel. Appropriate plant will be provided at the Station in accordance with Company strategy. Wastes will be in baskets placed in the waste packages. Baskets of different ILW wastes may be in the same packages. The matrix is likely to be BFS/OPC. The density of the encapsulated waste would probably be about 3t/m³.

Conditioned density (t/m³):

~ 3.0

Conditioned density comment:

This density assumes that the waste will be encapsulated.

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:

Activation of steel, principally due to Fe55 and Co-60.

Uncertainty:

Specific activity is a function of Station 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 but may be present as water or as other inorganic compounds or as organic compounds.
 C-14: Carbon 14 will be present as graphite.
 Cl-36: The chemical form of chlorine 36 content 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 has not been determined 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 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	< 1.29E+00	C 3			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-02	C C 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 C 2			Pb 210		8		
Co 60	2.79E-01	C C 1			Bi 208		8		
Ni 59	4.00E-02	C C 2			Bi 210m		8		
Ni 63	2.70E+00	C C 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	C 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 C 2			Th 234	< 7.00E-09	C 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	< 1.00E-08	C 3			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m	3.90E-05	C C 2			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	< 7.00E-09	C 3		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	< 2.66E-06	C 3		
Sn 123		8			Pu 239	< 3.00E-06	C 3		
Sn 126		8			Pu 240	< 4.00E-06	C 3		
Sb 125		8			Pu 241	< 2.91E-05	C 3		
Sb 126		8			Pu 242	< 2.00E-09	C 3		
Te 125m		8			Am 241	< 8.82E-06	C 3		
Te 127m		8			Am 242m	< 1.85E-08	C 3		
I 129		8			Am 243	< 6.00E-09	C 3		
Cs 134		8			Cm 242	< 1.53E-08	C 3		
Cs 135		8			Cm 243	< 3.54E-09	C 3		
Cs 137	< 4.96E-05	C 3			Cm 244	< 2.82E-08	C 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	C 3			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	< 8.01E-07	C 3			Unsp a				
Eu 152	9.26E-06	C C 2			Unsp b/g				
Eu 154	5.95E-06	C C 2			Total a	1.85E-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