

WASTE STREAM	4B21	Miscellaneous Activated Components - Debris Vault 4
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SITE Hunterston B

SITE OWNER EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE CUSTODIAN EDF Energy Nuclear Generation Ltd (EDFE NGL)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	= 0.4			
Total future arisings:	0.0			
Total waste volume:	0.4			

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

Comment on arising rates: Stock volume updated to 0.43 m³ following station assessment. Future arisings no longer expected as defueling is complete and site has been declared fuel free.

Additional information on quantities: -

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper): x -
Stock (lower): x 0.75 Arisings (lower): x -

WASTE SOURCE Operations carried out in the manipulator cell.

PHYSICAL CHARACTERISTICS

General description: The waste includes flux measuring instruments and associated cable, control rod chains and shock absorbers.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.30

Comment on density: Estimated as 0.3 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): The material breakdown is not currently assessed.

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	-	
Other ferrous metals.....	P	-	
Iron.....	NE	-	
Aluminium.....	NE	-	
Beryllium.....	NE	-	
Cobalt.....	NE	-	
Copper.....	NE	-	
Lead.....	NE	-	
Magnox/Magnesium.....	NE	-	
Nickel.....	NE	-	
Titanium.....	NE	-	
Uranium.....	NE	-	
Zinc.....	NE	-	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	NE	-	

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.....	NE	-	
Oil or grease.....	NE	-	
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.....	= 0	-	
Glass/Ceramics.....	-	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....	= 0	-	
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.....	= 0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....	P	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	NE	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	NE	-
Barium.....	NE	-
Boron.....	NE	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	NE	-
Caesium.....	NE	-
Selenium.....	NE	-
Chromium.....	NE	-
Molybdenum.....	NE	-
Thallium.....	NE	-
Tin.....	NE	-
Vanadium.....	NE	-
Mercury compounds.....	NE	-
Others.....	NE	-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	There may be traces of complexing agents (decontamination chemicals).
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
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 waste will be conditioned to satisfy the disposal requirements which are effective at the time of retrieval/conditioning. It is currently assumed that the waste will be placed in 'baskets' in the waste packages and will be encapsulated."

Conditioning plants:

Plant Name	Location
Hunterston B Waste Management Centre (WMC)	Hunterston B

Likely conditioning matrix:

-

Further information on the conditioning matrix:

Conditioning matrix will be BFS/OPC. Mix ratios are yet to be established.

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 (100 mm concrete shielding)	100.0	12.2	14.3	1	-

Range in container waste loading:

Other information on packaging and conditioning:

Waste will be retained on site pending Final Site Clearance, to let nuclides such as Co-60 undergo considerable radioactive decay. Baskets of different Final Site Clearance ILW wastes may be in the same waste package.

Conditioned density (t/m³):
Conditioned density comment:

~ 3.0
The density of the encapsulated waste is expected to be approximately 3 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:

Source of activity is activation with possible contamination by fission products and actinides.

Uncertainty:

Needs further assessment.

Measurement of radioactivities:

Theoretical estimates. "Other beta/gamma nuclides of arisings and stocks (in TBq/m³) include Cr51 (1E+2, 2E-2) and Co58 (5E+1, 2E-1)."

Chemical form of radionuclides:

H-3: Diffused into materials.
C-14: Incorporated into metal components and activated graphite.
Cl-36: Not Assessed.
Se-79: Not Assessed.
Tc-99: Not Assessed.
I-129: Not Assessed.
Ra: Not expected to be significant.
Th: Not Assessed.
U: Not Assessed.
Np: Not Assessed.
Pu: Not Assessed.

WASTE STREAM			4B21		Miscellaneous Activated Components - Debris Vault 4				
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	1.50E-01	C C 2	2.30E-01	C C 2	Gd 153				
Be 10	1.70E-11	C C 2	2.40E-13	C C 2	Ho 163				
C 14	2.50E-02	C C 2	1.60E-02	C C 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	2.00E-05	C C 2	1.20E-05	C C 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	1.40E-01	C C 2	1.00E+01	C C 2	Pb 205				
Fe 55	3.70E+01	C C 2	4.40E+02	C C 2	Pb 210				
Co 60	7.30E+01	C C 2	2.90E+02	C C 2	Bi 208				
Ni 59	3.70E-01	C C 2	2.30E-01	C C 2	Bi 210m				
Ni 63	4.30E+01	C C 2	3.00E+01	C C 2	Po 210				
Zn 65					Ra 223				
Se 79	7.24E-07	C C 2	4.48E-07	C C 2	Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	1.40E-02	C C 2	1.20E-03	C C 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232	1.90E-09	C C 2	1.10E-09	C C 2
Nb 94	8.90E-03	C C 2	5.60E-03	C C 2	Th 234				
Mo 93	4.90E-03	C C 2	3.10E-03	C C 2	Pa 231	4.20E-08	C C 2	2.50E-08	C C 2
Tc 97					Pa 233				
Tc 99	2.20E-04	C C 2	1.40E-04	C C 2	U 232				
Ru 106					U 233	3.00E-06	C C 2	1.80E-06	C C 2
Pd 107					U 234	1.60E-07	C C 2	9.40E-08	C C 2
Ag 108m					U 235	6.10E-11	C C 2	3.60E-11	C C 2
Ag 110m					U 236	1.20E-09	C C 2	6.60E-10	C C 2
Cd 109					U 238	5.80E-09	C C 2	3.40E-09	C C 2
Cd 113m					Np 237	1.30E-09	C C 2	6.30E-10	C C 2
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.80E-06	C C 2	2.40E-06	C C 2
Sn 123					Pu 239	2.30E-05	C C 2	1.40E-05	C C 2
Sn 126					Pu 240	2.00E-05	C C 2	1.20E-05	C C 2
Sb 125					Pu 241	1.00E-03	C C 2	9.70E-04	C C 2
Sb 126					Pu 242	5.50E-08	C C 2	3.30E-08	C C 2
Te 125m					Am 241	1.00E-04	C C 2	5.80E-05	C C 2
Te 127m					Am 242m	4.80E-07	C C 2	3.00E-07	C C 2
I 129	1.40E-09	C C 2	7.80E-10	C C 2	Am 243	1.90E-07	C C 2	1.10E-07	C C 2
Cs 134					Cm 242				
Cs 135	4.70E-08	C C 2	2.80E-08	C C 2	Cm 243				
Cs 137	2.80E-03	C C 2	2.10E-03	C C 2	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a		6		6
Eu 152					Unsp b/g	2.20E-01	C C 2	1.50E+02	C C 2
Eu 154					Total a	1.50E-04	*	8.85E-05	*
Eu 155					Total b/g	1.54E+02	*	9.20E+02	*

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