

WASTE STREAM	9B17/C	Miscellaneous Contaminated Items
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SITE Bradwell

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:				= 27.4	65.2
Future arisings:					0.0
					0.0
Total future arisings:				0.0	0.0
Total waste volume:				27.4	65.2

Number of waste packages in stock: At 1.4.2025..... 12 packages

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:

Stock (upper):	x 1.00	Arisings (upper):	x -
Stock (lower):	x 1.00	Arisings (lower):	x -

WASTE SOURCE Waste produced from various care and maintenance activities for Bradwell site packaged into 12 packages. Consists of various miscellaneous contaminated items (MCI) and redundant equipment and material mostly from equipment associated with the fuel handling route and the reactor primary gas circuits.

PHYSICAL CHARACTERISTICS

General description: The waste is redundant equipment, filters and miscellaneous contaminated items co-packaged together.

Changes since waste generated: -

Bulk density (t/m³): = 0.31

Comment on density: Average of density from all package records, obtained by dividing waste mass by waste volume in each package.

CHEMICAL COMPOSITION

General description and components (%wt): Mixed metallic waste including steel (~30%), gravel (~18%), sludge (~14%), FED (~11%), sand (~12%), filters (~9%) and pumps (~5%). Plastic will be present, for example as Hoover bags. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....	= 43.2	Including redundant pumps, filter pots and catch pans.	
Iron.....			
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....			
Copper.....	NE		
Lead.....	NE		
Magnox/Magnesium.....	= 10.8	Predominantly Vault 4B FED	
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	NE		
Zircaloy/Zirconium.....	NE		
Other metals.....	NE		

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE	-	
Paper, cotton.....	NE	-	
Wood.....	NE	-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	NE 2.2	-	
Condensation polymers.....	NE	-	
Others.....	= 2.2	Hoover bags	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	NE	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
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.....	= 13.6	Includes ADAP sludge.	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 18.4	Gravel	
Cementitious material.....	= 0	-	
Sand.....	= 11.6	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....		-	
Asbestos.....	NE	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	P	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	< 1.0	-
Chloride.....	< 1.0	-
Iodide.....	< 1.0	-
Cyanide.....	= 0	-
Carbonate.....	< 1.0	-
Nitrate.....	< 1.0	-
Nitrite.....	< 1.0	-
Phosphate.....	< 1.0	-
Sulphate.....	< 1.0	-
Sulphide.....	< 1.0	-

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.....	NE	-
Biodegradable materials.....	0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....		-
Corrosive materials.....	NE	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	NE	-
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:

Now packaged into 12 DCIC Type VI. Conditioned and dried using AVDS.

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 RS box	100.0	2.3	2.3	12	-

Range in container waste loading: -

Other information on packaging and conditioning: The container material is cast iron.

Conditioned density (t/m³): = 0.31

Conditioned density comment: Average of density from all package records, obtained by dividing waste mass by waste volume in each package.

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: The waste usually arises from the irradiated fuel handling, active filtration systems and pond operations. Components that have been associated with fuel pond operations and waste from the primary gas circuits are likely to be of high activity.

Uncertainty: Specific activities of all 12 waste packages were determined using gamma spectroscopy and fingerprints. The above values (Tbq/m³) are calculated by summing the activity of each package and dividing by the total volume of the waste stream.

Measurement of radioactivities: Specific activities of all 12 waste packages were measured and derived using gamma spectroscopy and the application of fingerprints and decayed.

Chemical form of radionuclides: H-3: Any tritium is expected to be present as water but some may be in the form of other inorganic compounds or organic compounds.
C-14: Chemical form of carbon 14 is not determined.
Cl-36: Chemical form of chlorine 36 is not determined.
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: 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: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

WASTE STREAM		9B17/C		Miscellaneous Contaminated Items					
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	5.41E-03	C C 2			Gd 153		8		
Be 10		8			Ho 163	1.80E-08	C C 2		
C 14	3.78E-04	C C 2			Ho 166m	3.62E-07	C C 2		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171	1.04E-08	C C 2		
Cl 36	2.64E-05	C C 2			Lu 174		8		
Ar 39	6.30E-06	C C 2			Lu 176		8		
Ar 42	1.61E-10	C C 2			Hf 178n	5.43E-07	C C 2		
K 40	1.23E-08	C C 2			Hf 182		8		
Ca 41	1.72E-04	C C 2			Pt 193	1.00E-03	C C 2		
Mn 53		8			Tl 204	1.86E-07	C C 2		
Mn 54	5.26E-08	C C 2			Pb 205		8		
Fe 55	3.88E-04	C C 2			Pb 210		8		
Co 60	1.13E-03	C C 2			Bi 208		8		
Ni 59	2.05E-05	C C 2			Bi 210m		8		
Ni 63	1.44E-03	C C 2			Po 210		8		
Zn 65	5.36E-09	C C 2			Ra 223		8		
Se 79	1.23E-09	C C 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85	4.36E-07	C C 2			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	7.37E-04	C C 2			Th 227		8		
Zr 93	1.90E-06	C C 2			Th 228	1.72E-09	C C 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	5.55E-04	C C 2			Th 232		8		
Nb 94	2.03E-06	C C 2			Th 234	6.15E-07	C C 2		
Mo 93	4.19E-07	C C 2			Pa 231		8		
Tc 97		8			Pa 233	3.68E-08	C C 2		
Tc 99	1.27E-05	C C 2			U 232	1.68E-09	C C 2		
Ru 106	1.73E-08	C C 2			U 233	3.45E-09	C C 2		
Pd 107	2.99E-09	C C 2			U 234	7.32E-07	C C 2		
Ag 108m	7.19E-05	C C 2			U 235	1.99E-08	C C 2		
Ag 110m		8			U 236	7.82E-08	C C 2		
Cd 109	1.29E-05	C C 2			U 238	6.11E-07	C C 2		
Cd 113m	1.35E-07	C C 2			Np 237	3.68E-08	C C 2		
Sn 119m		8			Pu 236		8		
Sn 121m	4.82E-06	C C 2			Pu 238	7.37E-05	C C 2		
Sn 123		8			Pu 239	1.26E-04	C C 2		
Sn 126	1.11E-08	C C 2			Pu 240	1.36E-04	C C 2		
Sb 125	3.24E-07	C C 2			Pu 241	1.86E-03	C C 2		
Sb 126	1.74E-09	C C 2			Pu 242	1.47E-07	C C 2		
Te 125m	8.26E-08	C C 2			Am 241	5.30E-04	C C 2		
Te 127m		8			Am 242m	9.24E-07	C C 2		
I 129	1.13E-06	C C 2			Am 243	2.75E-07	C C 2		
Cs 134	1.13E-05	C C 2			Cm 242	7.73E-07	C C 2		
Cs 135	3.76E-08	C C 2			Cm 243	1.04E-07	C C 2		
Cs 137	2.08E-03	C C 2			Cm 244	1.66E-06	C C 2		
Ba 133	9.67E-05	C C 2			Cm 245		8		
La 137	1.30E-08	C C 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144	2.28E-09	C C 2			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	2.64E-06	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	3.33E-05	C C 2			Unsp a				
Eu 152	4.42E-06	C C 2			Unsp b/g				
Eu 154	6.09E-06	C C 2			Total a	8.70E-04	*	0	*
Eu 155	2.99E-05	C C 2			Total b/g	1.55E-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