

WASTE STREAM	9A83	Miscellaneous Contaminated Items
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SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

Stocks:	At 1.4.2022.....	Reported 0.1 m ³
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Total future arisings:	0 m ³
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Total waste volume:	0.1 m ³
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Comment on volumes: Station operation ceased in March 1989. Accumulation of waste in this stream was in 1988. There will be no further arisings of this waste stream.

Uncertainty factors on volumes:	Stock (upper):	x 1.1	Arisings (upper)	x
	Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Miscellaneous contaminated items from Berkeley Power Station.

PHYSICAL CHARACTERISTICS

General description: The waste comprises miscellaneous items from the Berkeley Power Station, including graphite pieces, splitter material, tacky rags, broken tools and dusts. The waste is containerised in 5 litre and 0.5 litre paint tins. The tins will form part of this waste stream also. There are no large items that may require special handling.

Physical components (%vol): The waste is expected to be ~50% mild steel (the cans), ~20% graphite material, ~15% plastics and ~15% dusts.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.64

Comment on density: Calculated from total mass and volume of this waste.

CHEMICAL COMPOSITION

General description and components (%wt): The waste is expected to be mild steel (the cans), graphite material, plastics and dusts. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium may be present as water, in the form of other inorganic compounds or organic compounds, or as tritium gas incorporated in metal.

C-14: Chemical form of carbon 14 has not been determined but may be graphite.

Cl-36: The chemical form of chlorine 36 in these wastes is not known.

U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.

Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): A small proportion of the metal will be the sheet metal (thickness probably about 1mm) of the cans containing the waste.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	~50.0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		
Cobalt.....			
Copper.....	0		

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Lead.....	0	
Magnox/Magnesium.....	0	
Nickel.....		
Titanium.....		
Uranium.....		
Zinc.....	0	
Zircaloy/Zirconium.....	0	
Other metals.....	NE	"Other" metals have not been assessed.

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.....	~15.0		
Condensation polymers.....	0		
Others.....	15.0		
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.....	TR		

Other materials (%wt): Graphite material is expected to be present in the waste

	(%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.....	~20.0		
Desiccants/Catalysts.....			
Asbestos.....	0		

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Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	TR
Powder/Ash.....	~15.0

Inorganic anions (%wt): Inorganic anion content is expected to be negligible.

	(%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: There are no identified materials likely to represent a fire or other non-radiological hazard.

	(%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: None expected.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		

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Plant Name: -
 Location: Berkeley Site
 Plant startup date: -
 Total capacity (m³/y incoming waste): -
 Target start date for packaging this stream: -
 Throughput for this stream (m³/y incoming waste): -
 Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages

Likely container type comment: -
 Range in container waste volume: -
 Other information on containers: -
 Likely conditioning matrix:
 Other information: -
 Conditioned density (t/m³): -
 Conditioned density comment: -
 Other information on conditioning: -
 Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

RADIOACTIVITY

Source: The radioactivity may have arisen both from activation and contamination while the material was used in the reactor area.

Uncertainty: The values quoted are indicative of the expected activities.

Definition of total alpha and total beta/gamma: Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.

Measurement of radioactivities: The specific activities were derived by estimation based upon available information.

Other information: Specific activity is a function of Station operating history. Although this waste was originally classified as LLW, (since the activity is below the upper limit for LLW), it will be processed as ILW and so has been declared as ILW for this inventory.

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.29E-03	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	9.99E-06	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	7E-07	CC 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	1.97E-05	CC 2			Pb 210		8		
Co 60	6.95E-05	CC 2			Bi 208		8		
Ni 59	1E-06	CC 2			Bi 210m		8		
Ni 63	8.10E-05	CC 2			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79	1.21E-08	CC 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	4.89E-03	CC 2			Th 227		8		
Zr 93	6E-07	CC 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	3.85E-07	CC 2			Th 232		8		
Nb 94		8			Th 234	3E-07	CC 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	4.16E-08	CC 2		
Tc 99	3E-06	CC 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	3.09E-07	CC 2		
Ag 108m	<2.94E-06	C 3			U 235	7E-09	CC 2		
Ag 110m		8			U 236	4.00E-08	CC 2		
Cd 109		8			U 238	3E-07	CC 2		
Cd 113m		8			Np 237	4.16E-08	CC 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.78E-04	CC 2		
Sn 123		8			Pu 239	1.00E-04	CC 2		
Sn 126	4.35E-08	CC 2			Pu 240	2.00E-04	CC 2		
Sb 125		8			Pu 241	1.46E-03	CC 2		
Sb 126	<6.09E-09	C 3			Pu 242	1E-07	CC 2		
Te 125m		8			Am 241	3.44E-04	CC 2		
Te 127m		8			Am 242m	8.36E-07	CC 2		
I 129	6E-09	CC 2			Am 243	3.00E-07	CC 2		
Cs 134	2.60E-08	CC 2			Cm 242	6.90E-07	CC 2		
Cs 135	1E-07	CC 2			Cm 243	2.13E-07	CC 2		
Cs 137	4.95E-03	CC 2			Cm 244	1.69E-06	CC 2		
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	9.46E-07	CC 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	2.66E-05	CC 2			Other a				
Eu 152	1.39E-07	CC 2			Other b/g				
Eu 154	1.50E-05	CC 2			Total a	8.25E-04	CC 2	0	
Eu 155	8.35E-07	CC 2			Total b/g	1.28E-02	CC 2	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 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