

<b>WASTE STREAM</b>	<b>9C51</b>	<b>Contaminated Zinc Bromide</b>
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**SITE** Dungeness A  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** LLW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0.1 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		0.1 m <sup>3</sup>
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

**WASTE SOURCE** Zinc bromide from the upper maintenance cell window where remote handling of fuel related plant is undertaken.

**PHYSICAL CHARACTERISTICS**

General description: Zinc bromide solution from the upper maintenance cell window.  
 Physical components (%vol): Aqueous Zinc bromide solution (100%).  
 Sealed sources: The waste does not contain sealed sources.  
 Bulk density (t/m<sup>3</sup>): ~2.5  
 Comment on density: The density of the aqueous zinc bromide solution is 2.5 t/m<sup>3</sup>.

**CHEMICAL COMPOSITION**

General description and components (%wt): Zinc bromide and water. The relative percentage weight for the components is currently not known.  
 Chemical state: -  
 Chemical form of radionuclides: -  
 Metals and alloys (%wt): Zinc will be present as a constituent of zinc bromide.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		
Beryllium.....			
Cobalt.....			
Copper.....	0		
Lead.....	0		
Magnox/Magnesium.....	0		
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	P	Zinc will be present as a constituent of zinc bromide.	

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Zircaloy/Zirconium.....	0		
Other metals.....	0		
Organics (%wt):	-		
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	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.....			
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.....	0		
Desiccants/Catalysts.....			
Asbestos.....	0		
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....	<100.0	Aqueous Zinc bromide solution (100%).	
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

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Inorganic anions (%wt): Bromide will be present since the waste stream is contaminated zinc bromide solution.

	(%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: Zinc bromide.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		

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Other organophosphates.....  
 Vinyl chloride.....  
 Arsenic.....  
 Barium.....  
 Boron..... 0  
   Boron (in Boral).....  
   Boron (non-Boral).....  
 Cadmium.....  
 Caesium.....  
 Selenium.....  
 Chromium.....  
 Molybdenum.....  
 Thallium.....  
 Tin.....  
 Vanadium.....  
 Mercury compounds.....  
 Others.....  
 Electronic Electrical Equipment (EEE)  
   EEE Type 1.....  
   EEE Type 2.....  
   EEE Type 3.....  
   EEE Type 4.....  
   EEE Type 5.....

**Complexing agents (%wt):**

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	NE	

Potential for the waste to contain discrete items:      Yes. In & of itself not a DI

**TREATMENT, PACKAGING AND DISPOSAL**

**WASTE STREAM 9C51 Contaminated Zinc Bromide**

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None	Off-site	100.0

Comment on planned treatments:

-

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0	2.5

Classification codes for waste expected to be consigned to a landfill facility:

-

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

**Opportunities for alternative disposal routing:**

-

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

**Waste Packaging for Disposal:** (Not applicable to this waste stream)

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Container	Stream volume %	Waste loading m <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO			
1/2 Height IP-2 Disposal/Re-usable ISO			
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: -

**Waste Planned for Disposal at the LLW Repository:** (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: Unknown, but possibly contamination from the handling of fuel related plant in the upper maintenance cell.

Uncertainty: -

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: -

Other information: There is a possibility that activity may be out of scope of Regulations.

**WASTE STREAM**

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**Contaminated Zinc Bromide**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			Nuclide	Mean radioactivity, TBq/m <sup>3</sup>		
	Waste at 1.4.2022	Bands and Code	Future arisings		Waste at 1.4.2022	Bands and Code	Future arisings
H 3	9.12E-08	CC 2		Gd 153		8	
Be 10		8		Ho 163		8	
C 14	3.00E-08	CC 2		Ho 166m		8	
Na 22		8		Tm 170		8	
Al 26		8		Tm 171		8	
Cl 36	1E-08	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	2.91E-08	CC 2		Pb 210		8	
Co 60	1.60E-08	CC 2		Bi 208		8	
Ni 59		8		Bi 210m		8	
Ni 63	3.62E-08	CC 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	2.86E-06	CC 2		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		8		Th 234		8	
Mo 93		8		Pa 231		8	
Tc 97		8		Pa 233		8	
Tc 99		8		U 232		8	
Ru 106		8		U 233		8	
Pd 107		8		U 234	1E-09	CC 2	
Ag 108m	<9.77E-09	C 3		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		8		Pu 238	8.98E-09	CC 2	
Sn 123		8		Pu 239	1.00E-08	CC 2	
Sn 126		8		Pu 240	1.00E-08	CC 2	
Sb 125	2.39E-09	CC 2		Pu 241	5.10E-07	CC 2	
Sb 126		8		Pu 242		8	
Te 125m		8		Am 241	3.57E-08	CC 2	
Te 127m		8		Am 242m		8	
I 129		8		Am 243		8	
Cs 134	1.90E-08	CC 2		Cm 242		8	
Cs 135		8		Cm 243		8	
Cs 137	6.52E-06	CC 2		Cm 244	1.76E-09	CC 2	
Ba 133	<3.99E-09	C 3		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	1.27E-08	CC 2		Cf 251		8	
Sm 147		8		Cf 252		8	
Sm 151		8		Other a			
Eu 152	<1.46E-08	C 3		Other b/g			
Eu 154	2.91E-08	CC 2		<b>Total a</b>	<b>6.74E-08</b>	<b>CC 2</b>	<b>0</b>
Eu 155	9.64E-09	CC 2		<b>Total b/g</b>	<b>1.02E-05</b>	<b>CC 2</b>	<b>0</b>

**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