

<b>WASTE STREAM</b>	<b>9D22/1</b>	<b>Sludge</b>
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**SITE** Hinkley Point A  
**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** ILW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	18.2 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		18.2 m <sup>3</sup>
Comment on volumes:	The retrieval of ST3 contents has currently produced 13 DCIC ministores (interim storage prior to final conditioning).	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

**WASTE SOURCE** The sludge originates from routine filtration of liquid effluents and cooling pond water and from special clean-up operations on cooling ponds.

**PHYSICAL CHARACTERISTICS**

**General description:** The waste consists of debris washed from persons, floors and clothing, corrosion products such as magnesium hydroxide and carbonate detached from fuel elements and extraneous materials such as flakes of paint. Also there is some filter sand and small quantities of ion exchange material. The Sludge material from ST3 is stored wet in DCIC ministores. There are no large items that may require special handling.

**Physical components (%wt):** Sand, sludge and other materials (~36% wt), water (60% wt). The oil content was ~4%wt and others <1%wt of the waste.

**Sealed sources:** The waste does not contain sealed sources.

**Bulk density (t/m<sup>3</sup>):** 1.2

**Comment on density:** The bulk density of the waste ranges from 0.8 to 1.5 t/m<sup>3</sup>, with an average of about 1.2 t/m<sup>3</sup>.

**CHEMICAL COMPOSITION**

**General description and components (%wt):** Water (~60% wt). Sand and sludge (~36% wt) which includes magnesium hydroxide and carbonates at ~4% wt of the waste. Small quantities of ion exchange material are also present. The oil content was ~4%wt and others <1%wt of the waste.

**Chemical state:** Alkali

**Chemical form of radionuclides:**  
 H-3: Most tritium is expected to be present as water but some may be present in the form of other inorganic or organic compounds.  
 C-14: Carbon 14 may be present as graphite.  
 Cl-36: The chlorine 36 content is insignificant.  
 Ra: The radium isotope content is insignificant.  
 U: The chemical form of uranium isotopes has not been determined but will probably be uranium oxides.  
 Np: The chemical form of neptunium has not been determined.  
 Pu: The chemical form of plutonium isotopes has not been determined but will probably be plutonium oxides.

**Metals and alloys (%wt):** No sheet or bulk metal present. Some unreacted Magnox may be present.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	0		
Iron.....			
Aluminium.....	0		

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Beryllium.....	0
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	TR
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	0
Zircaloy/Zirconium.....	0
Other metals.....	0

There are no "other" metals.

Organics (%wt):                      Oil (~4%wt) is present together with ion exchange material (<1 wt%). There are no halogenated plastics or rubbers present.

	(%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....	<1.0		
Total rubber.....	0		
Halogenated rubber .....	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....	4.0		
Oil or grease .....	~4.0		
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....			

Other materials (%wt):                      -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	TR		
Inorganic sludges and flocs.....	~36.0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		

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Graphite.....	0
Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	60.0
Free non-aqueous liquids.....	TR
Powder/Ash.....	0

Inorganic anions (%wt):           Silicates and alumino-silicates may be present.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	TR	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	~1.0	
Nitrate.....	NE	
Nitrite.....	NE	
Phosphate.....	~1.0	
Sulphate.....	~1.0	
Sulphide.....	0	

Materials of interest for waste acceptance criteria:           The waste is unlikely to present a fire hazard but this requires confirmation since Magnox may be present and will ignite under appropriate conditions. There might be trace quantities of biological material.

	(%wt)	Type(s) and comment
Combustible metals.....	TR	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	TR	
Biodegradable materials.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	TR	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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Hazardous substances /      None expected  
 non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
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):      No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids.....		
Other organic complexants.....		
Total complexing agents.....	0	

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Potential for the waste to contain discrete items: No. In & of itself not a DI; assumed not likely to contain any "rogue" items that could be.

**PACKAGING AND CONDITIONING**

Conditioning method: solidified in to a 3m3 box

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m<sup>3</sup>/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m<sup>3</sup>/y incoming waste): -

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	3m <sup>3</sup> box (round corners)	100.0	1.5	2.9	13

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: -

Other information: -

Conditioned density (t/m<sup>3</sup>): -

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: Contaminated sludge. Contamination by fission products, actinides and activation products.

Uncertainty: Specific activity is a function of Station operating history.

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 values quoted were derived by extrapolation from available measurement data.

Other information: -

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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	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	3.97E-04	CC 1			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.82E-04	CC 1			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36		8			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40	<7.4E-05	D 3			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	4.66E-06	CC 1			Pb 210	<7.23E-04	D 3		
Co 60	1.46E-05	CC 1			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	3.91E-04	CC 1			Po 210	<7.28E-04	D 3		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226	<4.78E-04	D 3		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	9.35E-02	CC 1			Th 227		8		
Zr 93		8			Th 228	6.80E-08	CC 1		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234	<3.43E-05	D 3		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	<3.20E-04	D 3		
Tc 99	8.52E-05	CC 1			U 232	6.66E-08	CC 1		
Ru 106	<2.05E-08	D 3			U 233	<9.47E-08	D 3		
Pd 107		8			U 234	3.22E-05	CC 1		
Ag 108m		8			U 235	7.83E-07	CC 1		
Ag 110m		8			U 236	3.21E-06	CC 1		
Cd 109		8			U 238	3.43E-05	CC 1		
Cd 113m		8			Np 237	<3.20E-04	D 3		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	2.14E-02	CC 1		
Sn 123		8			Pu 239	4.12E-02	CC 1		
Sn 126		8			Pu 240	5.47E-02	CC 1		
Sb 125	<6.18E-06	D 3			Pu 241	3.48E-01	CC 1		
Sb 126		8			Pu 242	<2.69E-03	D 3		
Te 125m	<1.55E-06	D 3			Am 241	1.77E-01	CC 1		
Te 127m		8			Am 242m		8		
I 129	<4.32E-06	D 3			Am 243		8		
Cs 134	<2.46E-07	D 3			Cm 242		8		
Cs 135		8			Cm 243	1.82E-04	CC 1		
Cs 137	3.14E-02	CC 1			Cm 244	3.52E-03	CC 1		
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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	<5.35E-05	D 3			Other b/g				
Eu 154	1.63E-03	CC 1			<b>Total a</b>	<b>3.02E-01</b>	<b>CC 1</b>	<b>0</b>	
Eu 155	8.39E-05	CC 1			<b>Total b/g</b>	<b>4.77E-01</b>	<b>CC 1</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