

<b>WASTE STREAM</b>	<b>3K32</b>	<b>WET (POND) CARBONACEOUS DEBRIS</b>
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**SITE** Hartlepool

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** ILW; SPD1

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	~0.6 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2024.....	~0.2 m <sup>3</sup>
	1.4.2024 - 31.3.2028.....	~0.4 m <sup>3</sup>
Total future arisings:		0.6 m <sup>3</sup>
Total waste volume:		1.2 m <sup>3</sup>
Comment on volumes:	Arising rate of 0.1m3/year conservatively assumed for operational period plus four years of defueling.	
Uncertainty factors on volumes:	Stock (upper): x 1.75	Arisings (upper) x 1.75
	Stock (lower): x 0.25	Arisings (lower) x 0.25

**WASTE SOURCE** Two main sources: (1) Carbon deposition onto internal reactor surfaces; and (2) Superficial damage to graphite fuel sleeves.

**PHYSICAL CHARACTERISTICS**

**General description:** Two sources give rise to two different waste populations: (1) Finer dust-like debris expected to have arisen from fuel assembly carbon deposition that has subsequently been washed into the ponds; and (2) Larger graphite fragments understood to have fragmented from graphite fuel sleeves during the discharge of irradiated fuel elements into the ponds.

**Physical components (%vol):** Not yet determined

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

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

**Comment on density:** Bulk density not yet determined. Bulk density of 1t/m3 assumed to convert specific activities (measured in units Bq/g by radiochemical analysis) to units TBq/m3.

**CHEMICAL COMPOSITION**

**General description and components (%wt):** Not yet determined

**Chemical state:** -

**Chemical form of radionuclides:**  
 H-3: Not yet determined  
 C-14: Not yet determined  
 Cl-36: Not yet determined  
 Se-79: Not yet determined  
 Tc-99: Not yet determined  
 I-129: Not yet determined  
 Ra: Not yet determined  
 Th: Not yet determined  
 U: Not yet determined  
 Np: Not yet determined  
 Pu: Not yet determined

**Metals and alloys (%wt):** Not yet determined

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

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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):                      Not yet determined

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	NE		
Paper, cotton.....	NE		
Wood.....	NE		
Halogenated plastics .....	NE		
Total non-halogenated plastics.....	NE		
Condensation polymers.....	NE		
Others.....	NE		
Organic ion exchange materials....	NE		
Total rubber.....	NE		
Halogenated rubber .....	NE		
Non-halogenated rubber.....	NE		
Hydrocarbons.....	NE		
Oil or grease .....	NE		
Fuel.....	NE		
Asphalt/Tarmac (cont.coal tar)...	NE		
Asphalt/Tarmac (no coal tar)....	NE		
Bitumen.....	NE		
Others.....	NE		
Other organics.....	NE		

Other materials (%wt):                      Not yet determined

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

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

Inorganic anions (%wt):           Not yet determined

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

Materials of interest for waste acceptance criteria:           Not yet determined

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

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Hazardous substances / Not yet determined  
 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	
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	NE	
EEE Type 2.....	NE	
EEE Type 3.....	NE	
EEE Type 4.....	NE	
EEE Type 5.....	NE	

Complexing agents (%wt): Not yet determined

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

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Potential for the waste to contain discrete items: Not yet determined.

**PACKAGING AND CONDITIONING**

Conditioning method: Not yet determined

Plant Name: -

Location: Hartlepool Power Station

Plant startup date: Not yet determined

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

Target start date for packaging this stream: -

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

Other information: -

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	Other(To be determined)	NE	NE	NE	

Likely container type comment: To be determined

Range in container waste volume: To be determined

Other information on containers: -

Likely conditioning matrix: Other

Other information: To be determined

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

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: Not yet determined

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

**RADIOACTIVITY**

Source: Metal activation and nuclear fission products.

Uncertainty: Specific activity data was available for a total of five samples from three different areas of the cooling ponds. The average specific activity of these five samples was determined by weighting the volume of waste present in each area of the cooling ponds. There is high uncertainty in specific activity data due to the small number of samples that have been retrieved to date and the range of specific activities presented by them.

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'.

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Measurement of  
radioactivities:

Measured by radiochemical analysis.

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	7.29E-01	CC 2	7.29E-01	CC 2	Gd 153				
Be 10					Ho 163				
C 14	2.84E-02	CC 2	2.84E-02	CC 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	3.64E-06	CC 2	3.64E-06	CC 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	1.15E-01	CC 2	1.15E-01	CC 2	Pb 205				
Fe 55	3.81E-01	CC 2	3.81E-01	CC 2	Pb 210				
Co 60	5.58E-02	CC 2	5.58E-02	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	3.03E-02	CC 2	3.03E-02	CC 2	Po 210				
Zn 65	2.75E-04	CC 2	2.75E-04	CC 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	2.74E-04	CC 2	2.74E-04	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	1.65E-04	CC 2	1.65E-04	CC 2
Sn 123					Pu 239	3.11E-04	CC 2	3.11E-04	CC 2
Sn 126					Pu 240	3.11E-04	CC 2	3.11E-04	CC 2
Sb 125					Pu 241	7.93E-03	CC 2	7.93E-03	CC 2
Sb 126					Pu 242				
Te 125m					Am 241	5.94E-04	CC 2	5.94E-04	CC 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	8.29E-04	CC 2	8.29E-04	CC 2	Cm 242	1.96E-06	CC 2	1.96E-06	CC 2
Cs 135					Cm 243	2.15E-05	CC 2	2.15E-05	CC 2
Cs 137	8.08E-03	CC 2	8.08E-03	CC 2	Cm 244	2.15E-05	CC 2	2.15E-05	CC 2
Ba 133	1.01E-04	CC 2	1.01E-04	CC 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	9.99E-05	CC 2	9.99E-05	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151	4.18E-05	CC 2	4.18E-05	CC 2	Other a		8		8
Eu 152					Other b/g	1.24E-04	CC 2	1.24E-04	CC 2
Eu 154	3.71E-04	CC 2	3.71E-04	CC 2	<b>Total a</b>	<b>1.43E-03</b>	<b>CC 2</b>	<b>1.43E-03</b>	<b>CC 2</b>
Eu 155	2.44E-04	CC 2	2.44E-04	CC 2	<b>Total b/g</b>	<b>1.36E+00</b>	<b>CC 2</b>	<b>1.36E+00</b>	<b>CC 2</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