

WASTE STREAM	3L02	Pond Water Filtration Sludge
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SITE Heysham 1

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.....	3.6 m ³
Future arisings -	1.4.2022 - 31.3.2024.....	0.5 m ³
	1.4.2024 - 31.3.2026.....	0.8 m ³
	1.4.2026 - 31.3.2027.....	0.3 m ³
Total future arisings:		1.6 m ³
Total waste volume:		5.2 m ³

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5
 Stock (lower): x 0.75 Arisings (lower) x 0.5

WASTE SOURCE Filtration of pond waters.

PHYSICAL CHARACTERISTICS

General description: Sludge, sand and any filter precoat material that may be used. There will be no large items that may require special handling.

Physical components (%vol): Sludge, sand including filter aid material, spent abrasive material (100% vol). No other items identified. The breakdown of the components constituting the sludge has not been assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): A wide variety of materials including filter precoat material and sand.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritiated water
 C-14: Graphite
 Cl-36: Not assessed
 Se-79: Not assessed
 Tc-99: Not assessed
 I-129: Not assessed
 Ra: Not assessed
 Th: Not assessed
 U: Not assessed
 Np: Not assessed
 Pu: Not assessed

Metals and alloys (%wt): -

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

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

Organics (%wt): Oil and grease may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE		
Paper, cotton.....			
Wood.....			
Halogenated plastics	TR		
Total non-halogenated plastics.....	TR		
Condensation polymers.....	TR		
Others.....	TR		
Organic ion exchange materials....	0		
Total rubber.....	0		
Halogenated rubber	0		
Non-halogenated rubber.....	0		
Hydrocarbons.....	0		
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.....	~100.0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....	NE		
Glass/Ceramics.....	0		
Graphite.....	0		

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

Inorganic anions (%wt): Only trace quantities expected.

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

Materials of interest for waste acceptance criteria: Expect only trace quantities if any.

	(%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.....		
Non-putrescible wastes.....	0	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....	P	May be present
Soluble solids as bulk chemical compounds.....	0	

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Hazardous substances /
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.....	0	
EEE Type 2.....	0	
EEE Type 3.....	0	
EEE Type 4.....	0	
EEE Type 5.....	0	

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA.....	NE	
DPTA.....	NE	
NTA.....	NE	
Polycarboxylic acids.....	NE	
Other organic complexants.....	NE	Expect only trace quantities, if any.
Total complexing agents.....	NE	

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Potential for the waste to contain discrete items: No.

PACKAGING AND CONDITIONING

Conditioning method: The waste will be encapsulated. Another approach being kept under review is (i) to dry the sludge (ii) to supercompact drums of dry sludge (iii) to grout the supercompacted drums in an "enhanced" drum.

Plant Name: None.

Location: Heysham 1 Power Station.

Plant startup date: Probably between 2029 and 2034.

Total capacity (m³/y incoming waste): ~175.0

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): ~

Other information: All waste in a tank will be retrieved when a conditioning campaign is undertaken. There may be more than one campaign.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
	500 l drum	100.0	~0.33	0.47	16

Likely container type comment: -

Range in container waste volume: -

Other information on containers: The container material is expected to be stainless steel.

Likely conditioning matrix: BFS/OPC

Other information: A 9:1 BFS/OPC matrix is expected to be used.

Conditioned density (t/m³): ~1.7

Conditioned density comment: The density range varies from 1.68 to 1.84 t/m³.

Other information on conditioning: Appropriate plant to be provided at the Station in accordance with EDF Energy strategy.

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Contaminated sludge. Contamination by activation products will be the main source of activity.

Uncertainty: The values quoted were based upon theoretical assessments and limited tank sampling.

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:

Theoretical assessment plus some limited measurements of waste.

Other information:

Other beta/gamma arisings and stock nuclides include (in TBq/m³) Cr51 (1E+2, 2E-2); Co58 (5E+0, 2E-2); Sr89 (1E-7, 1E-10); Y91 (1E-6, 2E-9) Zr95 (4E-4, 1E-6); Nb95 (1E-3, 5E-7); Ru103 (4E-9, 3E-12); Ta182 (2E+0, 1E-2) Fe59 (2E-1, 2E-4) and Sb124 (6E-2, 1E-4).

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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	1.79E-02	cc 1	1.79E-02	cc 1	Gd 153				
Be 10					Ho 163				
C 14	1.48E-03	cc 1	1.48E-03	cc 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	4.94E-05	cc 1	4.94E-05	cc 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	1.48E-03	cc 1	1.48E-03	cc 1	Pb 205				
Fe 55	1.62E-01	cc 1	1.62E-01	cc 1	Pb 210				
Co 60	6.66E-03	cc 1	6.66E-03	cc 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	2.32E-02	cc 1	2.32E-02	cc 1	Po 210				
Zn 65	1.31E-04	cc 1	1.31E-04	cc 1	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	8.62E-05	cc 1	8.62E-05	cc 1	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	7.29E-04	cc 1	7.29E-04	cc 1	U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.53E-04	cc 1	7.53E-04	cc 1
Sn 123					Pu 239	1.42E-03	cc 1	1.42E-03	cc 1
Sn 126					Pu 240	1.42E-03	cc 1	1.42E-03	cc 1
Sb 125					Pu 241	6.55E-02	cc 1	6.55E-02	cc 1
Sb 126					Pu 242				
Te 125m					Am 241	3.04E-03	cc 1	3.04E-03	cc 1
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	6.05E-05	cc 1	6.05E-05	cc 1	Cm 242				
Cs 135					Cm 243	3.09E-05	cc 1	3.09E-05	cc 1
Cs 137	1.96E-02	cc 1	1.96E-02	cc 1	Cm 244	3.09E-05	cc 1	3.09E-05	cc 1
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147	2.37E-04	cc 1	2.37E-04	cc 1	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152					Other b/g	3.59E-04	Cc 1	3.59E-04	Cc 1
Eu 154	1.96E-04	cc 1	1.96E-04	cc 1	Total a	6.69E-03	cc 1	6.69E-03	CC 1
Eu 155	4.08E-05	cc 1	4.08E-05	cc 1	Total b/g	3.00E-01	cc 1	3.00E-01	cc 1

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