

WASTE STREAM**3L16****Active Effluent Filtration Sludges****SITE** Heysham 1**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** LLW**WASTE VOLUMES**

Reported

Stocks: At 1.4.2019..... 49.9 m³Future arisings - 1.4.2019 - 31.3.2024..... 17.5 m³1.4.2024 - 31.3.2026..... 4.0 m³1.4.2026 - 31.3.2027..... 2.7 m³Total future arisings: 24.2 m³Total waste volume: 74.1 m³

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Rate of arisings changed to reflect recent operational experience.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 2.0
Stock (lower): x 0.75 Arisings (lower) x 0.5**WASTE SOURCE** Filtration of effluent waters.**PHYSICAL CHARACTERISTICS**

General description: Sludge, sand and pre-coat materials. There are 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): ~1.6

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

Metals and alloys (%wt): Traces of metal as particulate may be present.

Stainless steel..... TR

Other ferrous metals..... TR

Iron..... TR

Aluminium..... TR

Beryllium..... NE

Cobalt..... NE

Copper..... TR

Lead..... TR

Magnox/Magnesium..... 0

Nickel..... NE

Titanium..... NE

Uranium..... NE

Zinc..... TR

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	Zircaloy/Zirconium.....	0
	Other metals.....	NE
Organics (%wt):	Oil and grease may be present.	
	Total cellulose.....	NE
	Paper, cotton.....	NE
	Wood.....	NE
	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.....	NE
	Oil or grease	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	NE
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	~100.0
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	~0
	Glass/Ceramics.....	0
	Graphite.....	0
	Desiccants/Catalysts.....	0
	Asbestos.....	0
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	P
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0
Inorganic anions (%wt):	Only trace quantities expected.	

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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.

Combustible metals.....	0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	0
Biological etc. materials.....	
Biodegradable materials.....	
Putrescible wastes.....	
Non-putrescible wastes.....	0
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	
Reacting with water.....	0
Active particles.....	0
Soluble solids as bulk chemical compounds.....	0

Not expected

Hazardous substances / non hazardous pollutants:

-	
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

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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
 EDTA..... NE
 DPTA..... NE
 NTA..... NE
 Polycarboxylic acids..... NE
 Other organic complexants..... NE
 Total complexing agents..... NE

Expect only trace quantities, if any.

TREATMENT, PACKAGING AND DISPOSAL

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:

Waste is stored pending decommissioning stage 1. However, campaigns to retrieve the waste have occurred in the past with latest treatment by incineration.

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Disposal Route	Stream volume %
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

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
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			

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

Container	Stream volume %	Waste loading m ³	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: -

Potential for the waste to contain discrete items: -

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

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Source:	Contaminated sludge. Contamination by activation products will be the main source of activity.
Uncertainty:	The values quoted were based upon theoretical assessment and limited tank sampling.
Definition of total alpha and total beta/gamma:	Results based on sample gross alpha and beta measurements. Gross alpha as Am-241 and Gross beta as K-40.
Measurement of radioactivities:	Theoretical estimates and limited tank sampling (K40).
Other information:	Other beta/gamma nuclides included (in TBq/m ³) in arisings and stocks are: - S35 (2E-4, 3E-7) Ca45 (7E-4, 8E-6); Cr51 (2E-1, 2E-8); Co58 (9E-3, 4E-6); Zr95 (4E-7, 1E-10); Ru103 (1E-7, 6E-13); Ta182 (4E-3, 2E-5); P32 (1E-6, 3E-19); Fe59 (4E-4, 9E-9); Tb160 (3E-7, 2E-10) and Hf181 (2E-7, 3E-12).

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Active Effluent Filtration Sludges

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	1.63E-03	C C 1	1.63E-03	C C 1	Gd 153				
Be 10					Ho 163				
C 14	3.95E-06	C C 1	3.95E-06	C C 1	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	<4.48E-08	C 1	<4.48E-08	C 1	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	<1.38E-06	C 1	<1.38E-06	C 1	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	3.09E-06	C C 1	3.09E-06	C C 1	Pb 205				
Fe 55	2.56E-05	C C 1	2.56E-05	C C 1	Pb 210	<1.15E-06	C 1	<1.15E-06	C 1
Co 60	4.42E-06	C C 1	4.42E-06	C C 1	Bi 208				
Ni 59					Bi 210m				
Ni 63	9.34E-06	C C 1	9.34E-06	C C 1	Po 210				
Zn 65	<1.92E-07	C 1	<1.92E-07	C 1	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<5.28E-06	C 1	<5.28E-06	C 1
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	4.35E-07	C C 1	4.35E-07	C C 1	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<1.14E-07	C 1	<1.14E-07	C 1	Th 234	<1.39E-06	C 1	<1.39E-06	C 1
Mo 93					Pa 231				
Tc 97					Pa 233	<9.44E-07	C 1	<9.44E-07	C 1
Tc 99					U 232	<3.52E-10	C 1	<3.52E-10	C 1
Ru 106	<7.04E-07	C 1	<7.04E-07	C 1	U 233	<6.88E-10	C 1	<6.88E-10	C 1
Pd 107					U 234	2.98E-08	C C 1	2.98E-08	C C 1
Ag 108m					U 235	1.17E-09	C C 1	1.17E-09	C C 1
Ag 110m	<1.92E-07	C 1	<1.92E-07	C 1	U 236	1.78E-10	C C 1	1.78E-10	C C 1
Cd 109					U 238	2.64E-08	C C 1	2.64E-08	C C 1
Cd 113m					Np 237	<1.01E-06	C 1	<1.01E-06	C 1
Sn 119m					Pu 236				
Sn 121m					Pu 238	7.34E-07	C C 1	7.34E-07	C C 1
Sn 123					Pu 239	7.18E-07	C C 1	7.18E-07	C C 1
Sn 126					Pu 240	7.18E-07	C C 1	7.18E-07	C C 1
Sb 125	<1.02E-06	C 1	<1.02E-06	C 1	Pu 241	4.29E-05	C C 1	4.29E-05	C C 1
Sb 126					Pu 242	<3.68E-09	C 1	<3.68E-09	C 1
Te 125m					Am 241	2.51E-06	C C 1	2.51E-06	C C 1
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	2.72E-06	C C 1	2.72E-06	C C 1	Cm 242	1.06E-07	C C 1	1.06E-07	C C 1
Cs 135					Cm 243	<7.52E-09	C 1	<7.52E-09	C 1
Cs 137	3.13E-04	C C 1	3.13E-04	C C 1	Cm 244	<7.52E-09	C 1	<7.52E-09	C 1
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<8E-07	C 1	<8E-07	C 1	Cf 249				
Pm 145					Cf 250				
Pm 147	7.2E-07	C C 1	7.2E-07	C C 1	Cf 251				
Sm 147					Cf 252				
Sm 151	3.89E-07	C C 1	3.89E-07	C C 1	Other a				
Eu 152	<7.36E-07	C 1	<7.36E-07	C 1	Other b/g	2.36E-05	C C 1	2.36E-05	C C 1
Eu 154	4.16E-07	C C 1	4.16E-07	C C 1	Total a	1.12E-05	C C 1	1.12E-05	C C 1
Eu 155	<5.12E-07	C 1	<5.12E-07	C 1	Total b/g	2.07E-03	C C 1	2.07E-03	C C 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