

WASTE STREAM**3K27****Active Effluent Ion Exchange Material****SITE** Hartlepool**SITE OWNER** EDFE NGL**WASTE CUSTODIAN** EDFE NGL**WASTE TYPE** LLW; SPD1**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	3.0 m ³
Future arisings -	1.4.2019 - 31.3.2024.....	0.5 m ³
	1.4.2024 - 31.3.2026.....	0.4 m ³
	1.4.2026 - 31.3.2027.....	0.5 m ³
Total future arisings:		1.4 m ³
Total waste volume:		4.4 m ³

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

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

WASTE SOURCE Spent ion exchange materials from treatment of radioactive effluent.**PHYSICAL CHARACTERISTICS**

General description: The Ion Exchange material is stored under water in tanks, there is also sludge present in the tank. There are no large items which may require special handling. Particle size range of resin is 0.4 to 0.6 mm.

Physical components (%vol): Ion exchange material, water, some sludge. Volume breakdown not assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Proprietary Ion Exchange materials, water and some sludge.

Chemical state: -

Chemical form of radionuclides: -

Metals and alloys (%wt): None

Stainless steel.....	NE
Other ferrous metals.....	NE
Iron.....	NE
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE
Nickel.....	NE
Titanium.....	NE
Uranium.....	NE
Zinc.....	NE
Zircaloy/Zirconium.....	NE

WASTE STREAM**3K27****Active Effluent Ion Exchange Material**

	Other metals.....	NE
Organics (%wt):	Proprietary organic ion-exchange resins will be present and expected to constitute a large proportion of the waste apart from interstitial water.	
	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....	P
	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):	Sludge expected to be present in reasonably significant quantities.	
	Inorganic ion exchange materials.	NE
	Inorganic sludges and flocs.....	P
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	0
	Glass/Ceramics.....	
	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):	Not assessed, only traces if any.	

WASTE STREAM**3K27****Active Effluent Ion Exchange Material**

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	0
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for waste acceptance criteria:

Ion exchange resins may be combustible when dry.

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.....	0
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
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

WASTE STREAM**3K27****Active Effluent Ion Exchange Material**

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

Possibly in trace quantities.

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	On-site	100.0

Comment on planned treatments:

Alternative treatments to encapsulation, such as incineration, will be considered if appropriate at the time of recovery.

WASTE STREAM**3K27****Active Effluent Ion Exchange Material****Disposal Routes:**

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:

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	100.0	~6.28	< 1

Other information: Conditioning factor of 2.35 assumed.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

Waste will require treatment / conditioning to enable disposal to LLWR.

Waste consigned for disposal to LLWR in year of generation: No.

Potential for the waste to contain discrete items: No

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: -

WASTE STREAM

3K27

Active Effluent Ion Exchange Material

RADIOACTIVITY

Source:	Contamination by activation products will be the main source of activity.
Uncertainty:	Specific activity is a function of station operating history. The estimates are based upon characterisation of tank samples.
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:	Characterisation of tank samples.
Other information:	-

WASTE STREAM

3K27

Active Effluent Ion Exchange Material

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	6.12E-06	CC 2	1.24E-05	DD 2	Gd 153				
Be 10					Ho 163				
C 14	3.44E-07	CC 2	3.44E-07	DD 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	<6.16E-08	C 3	<6.16E-08	D 3	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40	<1.98E-07	C 3	<1.98E-07	D 3	Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54	4.19E-06	CC 2	7.01E-05	DD 2	Pb 205				
Fe 55	3.49E-06	CC 2	2.86E-05	DD 2	Pb 210	<8.91E-08	C 3	<1.35E-07	D 3
Co 60	1.06E-05	CC 2	3.98E-05	DD 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	2.67E-06	CC 2	2.67E-06	DD 2	Po 210				
Zn 65	<7.26E-08	C 3	<1.42E-06	D 3	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	<2.75E-07	C 3	<2.75E-07	D 3
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	5.48E-07	CC 2	7.61E-07	DD 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94	<5.06E-08	C 3	<5.06E-08	D 3	Th 234	<7.04E-08	C 3	<2.11E-06	D 3
Mo 93					Pa 231				
Tc 97					Pa 233	<6.93E-08	C 3	<2.08E-06	D 3
Tc 99					U 232				
Ru 106	<3.08E-07	C 3	<4.56E-06	D 3	U 233				
Pd 107					U 234	1.24E-08	CC 2	1.24E-08	DD 2
Ag 108m					U 235	<2.2E-09	C 3	<2.2E-09	D 3
Ag 110m	<2.64E-08	C 3	<5.02E-07	D 3	U 236				
Cd 109					U 238	8.47E-09	CC 2	8.47E-09	DD 2
Cd 113m					Np 237	<4.4E-08	C 3	<4.4E-08	D 3
Sn 119m					Pu 236				
Sn 121m					Pu 238	4.35E-08	CC 2	4.87E-08	DD 2
Sn 123					Pu 239		6		6
Sn 126					Pu 240	<8.57E-08	C 3	<8.57E-08	D 3
Sb 125	<9.13E-08	C 3	<6.01E-07	D 3	Pu 241	2.85E-06	CC 2	5.27E-06	DD 2
Sb 126					Pu 242	<3.52E-09	C 3	<3.52E-09	D 3
Te 125m					Am 241	1.64E-07	CC 2	1.64E-07	DD 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	3.87E-07	CC 2	3.32E-06	DD 2	Cm 242	1.19E-09	CC 2	2.8E-08	DD 2
Cs 135					Cm 243	8.47E-09	CC 2	1.17E-08	DD 2
Cs 137	1.32E-05	CC 2	1.81E-05	DD 2	Cm 244	8.47E-09	CC 2	1.40E-08	DD 2
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	<4.51E-08	C 3	<7.97E-07	D 3	Cf 249				
Pm 145					Cf 250				
Pm 147	2.22E-07	CC 2	1.56E-06	DD 2	Cf 251				
Sm 147					Cf 252				
Sm 151	<4.62E-08	C 3	<5.13E-08	D 3	Other a	<1E-09	8	<1E-09	8
Eu 152	<2.2E-08	C 3	<4.20E-08	D 3	Other b/g	2.10E-07	CC 2	2.10E-07	DD 2
Eu 154	7.59E-08	CC 2	1.94E-07	DD 2	Total a	6.57E-07	CC 2	6.98E-07	DD 2
Eu 155	3.19E-08	CC 2	1.31E-07	DD 2	Total b/g	4.61E-05	CC 2	1.96E-04	DD 2

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