WASTE STREAM 9D17 PWTP Fine Filters (ILW)

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.....	7.4 m³
Future arisings -	1.4.2022 - 31.3.2024.....	1.0 m³
Total future arisings:		1.0 m³
Total waste volume:		8.4 m³

Comment on volumes: Value for stocks inferred from number of ILW Fine Filters identified during 2020-21 segregation campaign (492) and assuming volume of each filter is ~15 litres. Volume of future arisings is indicative figure only.

Uncertainty factors on volumes:

Stock (upper):	x 1.2	Arisings (upper)	x 1.2
Stock (lower):	x 0.8	Arisings (lower)	x 0.8

WASTE SOURCE Cartridge filter elements from filtration of process liquors.

PHYSICAL CHARACTERISTICS

General description: Cartridge filter elements ~85 cm long, ~15 cm OD and ~9.5 cm ID. Principal construction material filter media is fibreglass held in a steel frame. Unused filter weight is ~2 kg. Typical weight after use, including retaining water and radioactive particulate is ~5kg. Stored in mild steel drums.

Physical components (%wt): Fibreglass (~21% wt), plastic (<0.5% wt), stainless steel (<0.5% wt), rubber (~0.1% wt), steel frame (~52 wt), drum (~26% wt).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.3

Comment on density: The bulk density of a wet drained filter is about 0.32 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt): Fibreglass (~21% wt), plastic (<0.5% wt), stainless steel (<0.5% wt), rubber (~0.1% wt), steel frame (~50 wt), drum (~26% wt), cotton (2%)

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Most tritium is expected to be present as water.
C-14: The chemical form of carbon 14 may be graphite.
Cl-36: The chemical form of chlorine 36 may be chloride.
Se-79: The selenium content is insignificant.
Tc-99: The technetium content is insignificant.
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: Chemical form of uranium isotopes may be uranium oxides.
Np: The chemical form of neptunium has not been determined.
Pu: Chemical form of plutonium isotopes may be plutonium oxides.

Metals and alloys (%wt): 26% of the waste is 200 litre mild steel drums with a typical wall thickness of 1-2 mm.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~0.50	Nickel and chromium present in stainless steel.	
Other ferrous metals.....	~76.0		
Iron.....			
Aluminium.....	0		
Beryllium.....	0		

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

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

Organics (%wt): Traces of resin fines may be present on the filters. Rubbers are expected in small quantities but it has not been determined if these are halogenated.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	2.0		
Paper, cotton	2.0		
Wood	0		
Halogenated plastics	0		
Total non-halogenated plastics	<0.50		
Condensation polymers	<0.50		
Others	0		
Organic ion exchange materials	TR		
Total rubber	~0.10		
Halogenated rubber	~0.10		
Non-halogenated rubber	NE		
Hydrocarbons			
Oil or grease			
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	0		

Other materials (%wt): Other materials may include Fibreglass (~21% wt).

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	TR		
Inorganic sludges and flocs	0		
Soil	0		
Brick/Stone/Rubble	0		
Cementitious material	0		
Sand			
Glass/Ceramics	~21.0	Fibre glass	
Graphite	0		

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

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

Inorganic anions (%wt): Traces of salts from drying out of the held moisture will be present. Silicate will be present in the filter medium.

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

Materials of interest for waste acceptance criteria: No materials likely to pose a fire or other non-radiological hazard have been identified.

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

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

Hazardous substances / non hazardous pollutants: None expected

	(%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): Yes

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

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

Potential for the waste to contain discrete items: Not yet determined. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

PACKAGING AND CONDITIONING

Conditioning method: Assuming all of the almost 500 filters are emplaced optimally within the DAR3 Type 1 basket design size (Internal dimensions: 1300 mm x 990 mm x 708 mm (l x w x h)), the number that can be loaded into one basket was estimated as 45 (increasing to 136 if compacted). Based upon the ability to package two baskets in each CB, ~5½ CBs are required for the almost 500 uncompacted filters.

Plant Name: -

Location: Hinkley Point A Site

Plant startup date: -

Total capacity (m^3/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m^3/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
6m^3 concrete box (SD)	100.0	1.53	5.8	6

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/m^3): -

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
Disposal at a Geological Disposal Facility	Disposal at LLWR	NE	2023	High	Some filters have already been diverted to LLW stream 9D89 and disposed of to LLWR. Discussions are underway to divert more filters to LLWR away from GDF.

RADIOACTIVITY

Source: Activity source is fission products, activation products and actinides.

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

Uncertainty:	Specific activity is a function of operating history. The values quoted are indicative of the activities that may be expected.
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:	Data taken from PROG-HPA-SIPA-0007. Note, data for stocks derived by scaling measured Co-60 and Cs-137 activities to that for 9D72. Arisings assumed to be same as stocks given time elapsed since ceasing generation. Th-234 set equal to U-238 activity as assumed to be in secular equilibrium with parent.
Other information:	-

WASTE STREAM 9D17 PWTP Fine Filters (ILW)

Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	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	4.25E-04	C C 2	4.25E-04	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.6E-04	C C 2	2.6E-04	C C 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	<3.57E-06	C 3	<3.57E-06	C 3	Pb 210		8		8
Co 60	1.11E-04	C C 2	1.11E-04	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	3.97E-04	C C 2	3.97E-04	C C 2	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	3.35E-03	C C 2	3.35E-03	C C 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234	8.87E-07	C C 2	8.87E-07	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99	5.59E-05	C C 2	5.59E-05	C C 2	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	7.84E-07	C C 2	7.84E-07	C C 2
Ag 108m		8		8	U 235	2.37E-08	C C 2	2.37E-08	C C 2
Ag 110m		8		8	U 236	9.48E-08	C C 2	9.48E-08	C C 2
Cd 109		8		8	U 238	8.87E-07	C C 2	8.87E-07	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	1.87E-04	C C 2	1.87E-04	C C 2
Sn 123		8		8	Pu 239	2.4E-04	C C 2	2.4E-04	C C 2
Sn 126		8		8	Pu 240	2.4E-04	C C 2	2.4E-04	C C 2
Sb 125		8		8	Pu 241	4.05E-03	C C 2	4.05E-03	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	1.25E-03	C C 2	1.25E-03	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	8.94E-07	C C 2	8.94E-07	C C 2	Cm 242	4.07E-09	C C 2	4.07E-09	C C 2
Cs 135		8		8	Cm 243	1.8E-07	C C 2	1.8E-07	C C 2
Cs 137	5.14E-03	C C 2	5.14E-03	C C 2	Cm 244	1.15E-05	C C 2	1.15E-05	C C 2
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	3.39E-06	C C 2	3.39E-06	C C 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151	9.74E-05	C C 2	9.74E-05	C C 2	Other a				
Eu 152		8		8	Other b/g				
Eu 154	1.65E-04	C C 2	1.65E-04	C C 2	**Total a**	**1.93E-03**	**C C 2**	**1.93E-03**	**C C 2**
Eu 155	2.51E-05	C C 2	2.51E-05	C C 2	**Total b/g**	**1.41E-02**	**C C 2**	**1.41E-02**	**C C 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