WASTE STREAM 3M03 Miscellaneous Contaminated Items

SITE	Heysham 2
SITE OWNER	EDFE NGL
WASTE CUSTODIAN	EDFE NGL
WASTE TYPE	ILW; SPD1

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	7.1 m³
Future arisings -	1.4.2019 - 31.3.2030.....	3.3 m³
	1.4.2030 - 31.3.2032.....	4.0 m³
Total future arisings:		7.3 m³
Total waste volume:		14.4 m³

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 Redundant contaminated plant items and other materials contaminated beyond the limits for LLW. The waste may arise from all major plant areas.

PHYSICAL CHARACTERISTICS

General description: Expected to be primarily metallic items such as filters. Will also include ILW vacuum cleaner waste.

Physical components (%vol): >50% Steel. Breakdown not fully assessed

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1.5

Comment on density: As cut for packaging. Density is expected to lie between 1t/m³ and 2t/m³

CHEMICAL COMPOSITION

General description and components (%wt): The waste is principally steel but may include other components . Organic material may be present in small quantities e.g. traces of oil. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Contamination from tritiated water
C-14: Graphite
Cl-36: To Be determined
Se-79: To Be determined
Tc-99: To Be determined
I-129: To Be determined
Ra: Not expected to be significant
Th: Not expected to be significant
U: To Be determined
Np: To Be determined
Pu: To Be determined

Metals and alloys (%wt): -

Stainless steel.....	P
Other ferrous metals.....	P
Iron.....	P
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	0

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	Nickel	NE
	Titanium	NE
	Uranium	NE
	Zinc	NE
	Zircaloy/Zirconium	0
	Other metals	NE
Organics (%wt):	There may be traces of oil. Note that items may be wrapped in plastic or sprayed with latex.	
	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	0
	Total rubber	NE
	Halogenated rubber	NE
	Non-halogenated rubber	NE
	Hydrocarbons	NE
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	TR
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs	0
	Soil	0
	Brick/Stone/Rubble	0
	Cementitious material	0
	Sand	0
	Glass/Ceramics	
	Graphite	0
	Desiccants/Catalysts	0
	Asbestos	NE
	Non/low friable	
	Moderately friable	
	Highly friable	
	Free aqueous liquids	0
	Free non-aqueous liquids	0
	Powder/Ash	0

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Inorganic anions (%wt): None of the listed inorganic anions are expected to be present at greater than 1%.

Fluoride	<1.0
Chloride	<1.0
Iodide	<1.0
Cyanide	NE
Carbonate	<1.0
Nitrate	<1.0
Nitrite	NE
Phosphate	<1.0
Sulphate	<1.0
Sulphide	<1.0

Materials of interest for waste acceptance criteria: The possible presence of materials likely to represent a fire or other non-radiological hazard has not been fully assessed.

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

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	
	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	May be present in trace quantities.
	Total complexing agents	NE	

PACKAGING AND CONDITIONING

Conditioning method:	The waste is expected to be encapsulated without being supercompacted.
Plant Name:	None.
Location:	Heysham 2 Power Station.
Plant startup date:	Probably between 2030 and 2038.
Total capacity (m^3/y incoming waste):	~500.0
Target start date for packaging this stream:	-
Throughput for this stream (m^3/y incoming waste):	~
Other information:	All waste 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	~0.23	0.47	63

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Likely container type comment:	-
Range in container waste volume:	-
Other information on containers:	Waste will be packaged in 500L drums with a conditioning factor of ~2.0
Likely conditioning matrix:	BFS/OPC
Other information:	PFA/OPC is another matrix that may be adopted.
Conditioned density (t/m³):	~3.0
Conditioned density comment:	Expected to be between 2 and 4 t/m³. The maximum density of the conditioned waste will be less than 7.5 t/m³.
Other information on conditioning:	Appropriate plant will be provided at the Station in accordance with EDF Energy strategy. Decontamination followed by cutting to reduce volumes may be appropriate for some wastes.
Opportunities for alternative disposal routing:	No

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source:	Redundant contaminated plant items and materials, contaminated beyond the limits for LLW.
Uncertainty:	The values quoted are indicative of the activities that might 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:	Theoretical estimates and limited measurements.
Other information:	Specific activity is a function of station operating history. Figures were derived by estimation based upon available information. Other beta/gamma nuclides of arisings and stocks (in TBq/m³) may include S35 (2E-2, 3E-6); Ca45 (8E-4, 8E-6); Cr51 (1E-3, 1E-15); Co58 (2E-4, 4E-9); Sr89 (6E-9, 2E-15); Y91 (5E-8, 1E-13); Zr95 (2E-4, 1E-9); Nb95 (1E-4, 4E-14); Ru103 (3E-4, 1E-12); Ta182 (7E-3, 9E-6); Sc46 (2E-5, 2E-9); Fe59 (4E-5, 2E-12); Se75 (6E-4, 1E-6) and Sb124 (2E-5, 7E-11).

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	7E-03	D D 2	9E-03	D D 2	Gd 153				
Be 10		8		8	Ho 163				
C 14	6E-04	D D 2	6E-04	D D 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	<1E-04	D 3	<1E-04	D 3	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41		8		8	Pt 193				
Mn 53					Tl 204				
Mn 54	3E-05	D D 2	3E-03	D D 2	Pb 205				
Fe 55	9E-03	D D 2	4E-02	D D 2	Pb 210		8		8
Co 60	5E-03	D D 2	1E-02	D D 2	Bi 208				
Ni 59	<1E-04	D 3	<1E-04	D 3	Bi 210m				
Ni 63	3E-03	D D 2	3E-03	D D 2	Po 210		8		8
Zn 65	4E-07	D D 2	3E-04	D D 2	Ra 223				
Se 79	6.9E-10	D D 2	6.9E-10	D D 2	Ra 225				
Kr 81					Ra 226		8		8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	4E-04	D D 2	4E-04	D D 2	Th 227				
Zr 93	3E-08	D D 2	3E-08	D D 2	Th 228				
Nb 91					Th 229		8		8
Nb 92					Th 230		8		8
Nb 93m	9E-09	D D 2	3E-09	D D 2	Th 232		8		8
Nb 94	<4E-06	D 3	<4E-06	D 3	Th 234				
Mo 93		8		8	Pa 231		8		8
Tc 97					Pa 233				
Tc 99	1E-07	D D 2	1E-07	D D 2	U 232				
Ru 106	1E-05	D D 2	1E-03	D D 2	U 233		8		8
Pd 107		8		8	U 234	6E-08	D D 2	6E-08	D D 2
Ag 108m	<8E-06	D 3	<8E-06	D 3	U 235	1E-09	D D 2	1E-09	D D 2
Ag 110m	5E-07	D D 2	2E-04	D D 2	U 236	1E-08	D D 2	1E-08	D D 2
Cd 109					U 238	2E-08	D D 2	2E-08	D D 2
Cd 113m					Np 237	9E-09	D D 2	9E-09	D D 2
Sn 119m					Pu 236				
Sn 121m		8		8	Pu 238	4E-06	D D 2	4E-06	D D 2
Sn 123					Pu 239	5E-06	D D 2	5E-06	D D 2
Sn 126	2.61E-09	D D 2	2.61E-09	D D 2	Pu 240	8E-06	D D 2	8E-06	D D 2
Sb 125	1E-06	D D 2	6E-06	D D 2	Pu 241	3E-04	D D 2	4E-04	D D 2
Sb 126					Pu 242	<5E-08	D 3	<5E-08	D 3
Te 125m					Am 241	2E-05	D D 2	2E-05	D D 2
Te 127m					Am 242m	3E-07	D D 2	3E-07	D D 2
I 129		8		8	Am 243	2E-07	D D 2	2E-07	D D 2
Cs 134	7E-05	D D 2	6E-04	D D 2	Cm 242	2E-07	D D 2	1E-06	D D 2
Cs 135	5E-09	D D 2	5E-09	D D 2	Cm 243	2E-08	D D 2	2E-08	D D 2
Cs 137	8E-04	D D 2	1E-03	D D 2	Cm 244	7E-07	D D 2	9E-07	D D 2
Ba 133	2E-05	D D 2	2E-05	D D 2	Cm 245		8		8
La 137					Cm 246		8		8
La 138					Cm 248				
Ce 144	4E-09	D D 2	9E-07	D D 2	Cf 249				
Pm 145					Cf 250				
Pm 147	<2E-04	D 3	<8E-04	D 3	Cf 251				
Sm 147	5E-15	D D 2			Cf 252				
Sm 151	<1E-06	D 3	<1E-06	D 3	Other a		8		8
Eu 152	2E-06	D D 2	2E-06	D D 2	Other b/g	2E-05	D D 2	3E-02	D D 2
Eu 154	2E-06	D D 2	4E-06	D D 2	**Total a**	**3.83E-05**	**D D 2**	**3.93E-05**	**D D 2**
Eu 155	3E-06	D D 2	7E-06	D D 2	**Total b/g**	**2.67E-02**	**D D 2**	**1.01E-01**	**D D 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