WASTE STREAM 3S05 Miscellaneous Contaminated Items

SITE	Sizewell B
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.....	20.4 m³
Future arisings -	1.4.2022 - 31.3.2035.....	22.1 m³
	1.4.2035 - 31.3.2043.....	27.2 m³
Total future arisings:		49.3 m³
Total waste volume:		69.7 m³

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Following planned shutdown in 2035 and defuelling operations, the fuel storage ponds and associated plant will continue in operation for a number of years before plant clear out. The current plan shows this commencing in 2040/1.

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 equipment and material contaminated beyond the limits for LLW.

PHYSICAL CHARACTERISTICS

General description: The waste will be redundant contaminated equipment and material contaminated beyond the limits for LLW.

Physical components (%vol): Metallic items are expected to make up a large quantity of this waste (expected to be >50% but not currently 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 expected to be principally steel and other metallic items. Other components have not been assessed. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: As tritiated water.
C-14: Not expected to be present in any measurable quantity.
Cl-36: Not expected to be present in any measurable quantity.
Se-79: Not assessed.
Tc-99: Not expected to be present in any measurable quantity.
I-129: Not expected to be present in any measurable quantity.
Ra: Not expected to be present in any measurable quantity.
Th: Not expected to be present in any measurable quantity.
U: Trace (value unknown, but not thought to be significant), probably as oxide.
Np: Not expected to be present in any measurable quantity.
Pu: Trace (value unknown, but not thought to be significant), probably as oxide.

Metals and alloys (%wt): The form, size and thickness is not assessed as no particular constituents of this stream have been identified.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~50.0		
Other ferrous metals.....	~50.0		
Iron.....	NE		
Aluminium.....	NE		

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Beryllium	NE
Cobalt	P
Copper	P
Lead	NE
Magnox/Magnesium	NE
Nickel	NE
Titanium	NE
Uranium	NE
Zinc	NE
Zircaloy/Zirconium	NE
Other metals	NE

Organics (%wt): To be further assessed in the light of operating experience. Quantities are expected to be very small if present.

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

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Graphite	0
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): Not assessed. None of the listed inorganic anions are expected to be present at greater than 1% wt concentration.

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

Materials of interest for waste acceptance criteria: No hazardous materials are expected.

	(%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	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	NE	
EEE Type 2	NE	
EEE Type 3	NE	
EEE Type 4	NE	
EEE Type 5	NE	

Complexing agents (%wt): Not yet determined

	(%wt)	Type(s) and comment
EDTA	NE	
DPTA	NE	
NTA	NE	
Polycarboxylic acids	NE	
Other organic complexants	NE	May be present in trace quantities.
Total complexing agents	NE	

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Potential for the waste to contain discrete items: Yes.

PACKAGING AND CONDITIONING

Conditioning method: The waste is expected to be encapsulated without being supercompacted. Decontamination and cutting to reduce volumes may be appropriate for some wastes.

Plant Name: None.

Location: Sizewell B Power Station.

Plant startup date: Not yet determined.

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

Target start date for packaging this stream: -

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

Other information: All the 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	~0.235	0.47	297

Likely container type comment: -

Range in container waste volume: -

Other information on containers: Majority of 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/m^3): ~3.0

Conditioned density comment: Expected to be between 2 and 4 t/m^3. The maximum density of the conditioned waste will be less than 7.5 t/m^3.

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

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

RADIOACTIVITY

Source: Redundant contaminated equipment and materials.

Uncertainty: The values quoted are indicative of the activities that may be expected. Indicative of the order of magnitude.

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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 assessment.
Other information:	Specific activity is a function of station operating history. The values quoted are indicative of the activities that might be expected for such ILW and indicate a split between fission and activation products. Other beta/gamma nuclides of arisings and stocks include (in TBq/m³) Cr51 (3E-3, 8E-6); Co58 (1E-1, 4E-3); Sr89 (3E-4, 6E-6); Y91 (5E-5, 1E-6); Zr95 (8E-4, 3E-5); Nb95 (8E-4, 5E-6); Ru103 (1E-4, 1E-6); I131 (2E-3, 7E-11); Fe59 (1E-3, 2E-5); Co57 (4E-4, 1E-4); Sb124 (9E-4, 3E-5) and Ce141 (1E-4, 5E-7).

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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	2E-04	C C 2	2E-04	C C 2	Gd 153				
Be 10		8		8	Ho 163				
C 14	1E-05	C 3	1E-05	C 3	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36		6		6	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	4E-04	C C 2	2E-02	C C 2	Pb 205				
Fe 55	5E-03	C C 2	2E-02	C C 2	Pb 210		8		8
Co 60	7E-03	C C 2	2E-02	C C 2	Bi 208				
Ni 59	2E-06	C C 2	2E-06	C C 2	Bi 210m				
Ni 63	2E-04	C C 2	2E-04	C C 2	Po 210		8		8
Zn 65	4E-06	C C 2	1E-03	C C 2	Ra 223				
Se 79	6.9E-10	C C 2	6.9E-10	C C 2	Ra 225				
Kr 81					Ra 226		8		8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90	2E-04	C C 2	2E-04	C C 2	Th 227				
Zr 93	1E-08	C C 2	1E-08	C C 2	Th 228				
Nb 91					Th 229		8		8
Nb 92					Th 230		8		8
Nb 93m		8			Th 232		8		8
Nb 94	2E-07	C C 2	2E-07	C C 2	Th 234				
Mo 93	2E-07	C C 2	2E-07	C C 2	Pa 231		8		8
Tc 97					Pa 233				
Tc 99		8			U 232				
Ru 106	6E-05	C C 2	2E-03	C C 2	U 233		8		8
Pd 107		8			U 234		8		8
Ag 108m		8			U 235		8		8
Ag 110m	3E-06	C C 2	5E-04	C C 2	U 236		8		8
Cd 109					U 238		8		8
Cd 113m					Np 237		8		8
Sn 119m					Pu 236				
Sn 121m		8		8	Pu 238	1E-06	C C 2	1E-06	C C 2
Sn 123					Pu 239	5E-07	C C 2	5E-07	C C 2
Sn 126		8		8	Pu 240	5E-07	C C 2	5E-07	C C 2
Sb 125	5E-04	C C 2	2E-03	C C 2	Pu 241	8E-05	C C 2	1E-04	C C 2
Sb 126			7E-03	C C 2	Pu 242	2E-09	C C 2	2E-09	C C 2
Te 125m	5E-04	C C 2	2E-05	C C 2	Am 241	1E-06	C C 2	2E-07	C C 2
Te 127m					Am 242m	9E-09	C C 2	9E-09	C C 2
I 129		8		8	Am 243	3E-08	C C 2	3E-08	C C 2
Cs 134	2E-03	C C 2	1E-02	C C 2	Cm 242	1E-08	C C 2	3E-06	C C 2
Cs 135	4E-08	C C 2	4E-08	C C 2	Cm 243	2E-09	C C 2	2E-09	C C 2
Cs 137	8E-03	C C 2	1E-02	C C 2	Cm 244	3E-07	C C 2	3E-07	C C 2
Ba 133					Cm 245		8		8
La 137					Cm 246		8		8
La 138					Cm 248				
Ce 144	2E-05	C C 2	2E-03	C C 2	Cf 249				
Pm 145					Cf 250				
Pm 147	5E-05	C C 2	2E-04	C C 2	Cf 251				
Sm 147					Cf 252				
Sm 151	3E-07	C C 2	3E-07	C C 2	Other a		8		8
Eu 152	3E-09	C C 2	5E-09	C C 2	Other b/g	4.44E-03	C C 2	1.09E-01	C C 2
Eu 154	2E-05	C C 2	2E-05	C C 2	**Total a**	**3.34E-06**	**C C 2**	**5.53E-06**	**C C 2**
Eu 155	5E-06	C C 2	1E-05	C C 2	**Total b/g**	**2.87E-02**	**C C 2**	**2.04E-01**	**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