

<b>WASTE STREAM</b>	<b>3M119</b>	<b>Care and Maintenance Preparations: OWPF Secondary Wastes LLW</b>
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**SITE** Heysham 2

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** LLW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2022.....	0 m <sup>3</sup>
Future arisings -	1.4.2022 - 31.3.2031.....	0 m <sup>3</sup>
	1.4.2031 - 31.3.2032.....	52.0 m <sup>3</sup>
	1.4.2032 - 31.3.2033.....	70.0 m <sup>3</sup>
	1.4.2033 - 31.3.2034.....	70.0 m <sup>3</sup>
	1.4.2034 - 31.3.2035.....	70.0 m <sup>3</sup>
	1.4.2035 - 31.3.2036.....	70.0 m <sup>3</sup>
	1.4.2036 - 31.3.2037.....	70.0 m <sup>3</sup>
	1.4.2037 - 31.3.2038.....	109.0 m <sup>3</sup>
	1.4.2038 - 31.3.2039.....	4.0 m <sup>3</sup>
Total future arisings:		515.0 m <sup>3</sup>
Total waste volume:		515.0 m <sup>3</sup>

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Volumes based on Back to Bio Shield strategy. Work is ongoing looking at optimising the strategy which could lead to a change in volume and timings of arisings across Pre C&M wastes (100s) and Final Site Clearance wastes (300s), in future submissions.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.75  
 Stock (lower): x Arisings (lower) x 0.5

**WASTE SOURCE** Wastes arising from contamination and control procedures during plant dismantling from the OWPF.

**PHYSICAL CHARACTERISTICS**

General description: A variety of mixed decommissioning materials, including metals, organics and other mixed materials.

Physical components (%wt): Mild steel (17%), Cellulosics (33%), halogenated plastics (17%), non-halogenated plastics (17%), rubber (8%) Rubble (4%) and Sludge (4%)

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~0.814

Comment on density: Density based on raw volume and weight

**CHEMICAL COMPOSITION**

General description and components (%wt): Mild steel (17%), Cellulosics (33%), halogenated plastics (17%), non-halogenated plastics (17%), rubber (8%) Rubble (4%) and Sludge (4%)

Chemical state: Neutral

Chemical form of radionuclides: H-3: To be Determined  
 C-14: To be Determined  
 Cl-36: To be Determined  
 Se-79: To be Determined  
 Tc-99: To be Determined  
 I-129: To be Determined  
 Ra: To be Determined  
 Th: To be Determined  
 U: To be Determined  
 Np: To be Determined  
 Pu: To be Determined

Metals and alloys (%wt): Not estimated

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	~17.0	Mild steel	
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		
Other metals.....	NE		

Organics (%wt):                      The waste contains cellulose as wood, paper and cloth, non-halogenated plastic, non-halogenated rubber. The waste contains halogenated plastic and halogenated rubber. Organics ~74.74%

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~33.2		
Paper, cotton.....	~32.4		
Wood.....	~0.83		
Halogenated plastics .....	~16.6		
Total non-halogenated plastics.....	~16.6		
Condensation polymers.....	~8.3		
Others.....	~8.3		
Organic ion exchange materials....	~0		
Total rubber.....	~8.3		
Halogenated rubber .....	~4.2		
Non-halogenated rubber.....	~4.2		
Hydrocarbons.....	NE		
Oil or grease .....	NE		
Fuel.....	NE		
Asphalt/Tarmac (cont.coal tar)...	NE		
Asphalt/Tarmac (no coal tar)....	NE		
Bitumen.....	NE		
Others.....	NE		
Other organics.....	NE		

Other materials (%wt):                      -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	NE		
Inorganic sludges and flocs.....	~4.2		
Soil.....	NE		
Brick/Stone/Rubble.....	~4.2		
Cementitious material.....	NE		
Sand.....	NE		
Glass/Ceramics.....	NE		
Graphite.....	NE		
Desiccants/Catalysts.....	NE		
Asbestos.....	NE		
Non/low friable.....	NE		
Moderately friable.....	NE		
Highly friable.....	NE		
Free aqueous liquids.....	NE		
Free non-aqueous liquids.....	NE		
Powder/Ash.....	NE		

Inorganic anions (%wt):            Inorganic anions likely to be below 1% of waste, but not assessed.

	(%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:            -

	(%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	

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Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Higher activity particles.....	0
Soluble solids as bulk chemical compounds.....	0

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	

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Complexing agents (%wt): Not yet determined

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

Potential for the waste to contain discrete items: No.

**TREATMENT, PACKAGING AND DISPOSAL**

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	~11.3
Incineration	Off-site	~65.4
Solidification		
Decontamination		
Metal treatment	Off-site	~9.9
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None	Off-site	~14.0

Comment on planned treatments:

In line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in HHISOs or immobilisation by encapsulation where necessary, prior to ultimate disposal at the LLW Repository. These treatments will be carried out off-site under contract with companies such as LLWR Ltd, Cyclife, Tradebe Inutec. The percentages are based on the history of consignments across the fleet of EDF Energy Nuclear Generation stations.

**Disposal Routes:**

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	~24.8	
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	~65.4	
Expected to be consigned to a Metal Treatment Facility	~9.9	
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

Classification codes for waste expected to be consigned to a landfill facility: -

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

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Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

**Opportunities for alternative disposal routing:** -

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

**Waste Packaging for Disposal:**

Container	Stream volume %	Waste loading m <sup>3</sup>	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	~24.8	~15.46	9
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: Waste loading is representative of the raw waste following further planned treatments. Supercompaction assumed to reduce volume to 20% of original. Solidification assumed to increase volume to 300% of original. No treatment results in the same volume.

**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 consigned for disposal to LLWR in year of generation: Not yet determined.

**Non-Containerised Waste for In-Vault Grouting:**

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: Contamination of mixed materials from facility area.

Uncertainty: Approximate estimates have been made of the total specific activities.

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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 beta/gamma emitting radionuclides plus 'other beta/gamma' not listed on the datasheet.

Measurement of radioactivities:

Calculations based on operational wastestreams. More detailed characterisation work will be undertaken as the arising of the waste gets closer.

Other information:

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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			7.74E-07	CC 2	Gd 153				
Be 10					Ho 163				
C 14			6.15E-08	CC 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36			1.3E-08	CC 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54			7.89E-07	CC 2	Pb 205				
Fe 55			1.93E-05	CC 2	Pb 210				
Co 60			2.25E-06	CC 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			3.86E-06	CC 2	Po 210				
Zn 65			5.6E-08	CC 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			7.16E-06	CC 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94			1.5E-09	CC 2	Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106			1.55E-07	CC 2	U 233				
Pd 107					U 234		2E-09	CC 2	
Ag 108m			1.5E-09	CC 2	U 235		<		
Ag 110m			3.9E-08	CC 2	U 236		5E-10	CC 2	
Cd 109					U 238		5E-10	CC 2	
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		6.48E-07	CC 2	
Sn 123					Pu 239		3.38E-07	CC 2	
Sn 126					Pu 240		8.04E-07	CC 2	
Sb 125			2.25E-08	CC 2	Pu 241		4.60E-05	CC 2	
Sb 126					Pu 242				
Te 125m					Am 241		1.55E-06	CC 2	
Te 127m					Am 242m				
I 129					Am 243				
Cs 134			5.56E-07	CC 2	Cm 242		1.65E-08	CC 2	
Cs 135					Cm 243		1.5E-09	CC 2	
Cs 137			2.50E-05	CC 2	Cm 244		9E-08	CC 2	
Ba 133			1.45E-08	CC 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144			7.35E-08	CC 2	Cf 249				
Pm 145					Cf 250				
Pm 147			3.35E-06	CC 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Other a				
Eu 152			3.15E-08	CC 2	Other b/g		1.19E-07	CC 2	
Eu 154			9.31E-07	CC 2	<b>Total a</b>	<b>0</b>	<b>3.45E-06</b>	<b>CC 2</b>	
Eu 155			3.45E-07	CC 2	<b>Total b/g</b>	<b>0</b>	<b>1.11E-04</b>	<b>CC 2</b>	

**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