

<b>WASTE STREAM</b>	<b>2F40</b>	<b>Fuel Support Frames</b>
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**SITE** Sellafield  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Sellafield Limited  
**WASTE TYPE** LLW; SPD1

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	17.7 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		17.7 m <sup>3</sup>

Comment on volumes: Assumes a medium term strategy for decommissioning the Hokkaido Baskets. The total number of support frames (Hokkaido Baskets) is 6. Baskets currently stored inside Excellox 4 flasks undercover at Sellafield. The volume declared is the volume of the support frames however, it is planned to decontaminate and recycle the metal. If this is successful only small amounts of residues will arise for disposal. A study is currently being carried out to consider options for decommissioning the PNTL (Japanese owned flasks on the Sellafield site) which may influence the overall decommissioning strategy for the support frames.

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

**WASTE SOURCE** Transport of LWR fuel assemblies from a reactor site in Japan to a reprocessing plant in France.

**PHYSICAL CHARACTERISTICS**

General description: Open frames used to hold LWR fuel assemblies inside Excellox transport flasks. Frames are large (4.86m long by 0.88m diameter) and heavy (4.4te). The waste has not undergone any changes since it was generated.

Physical components (%vol): Stainless steel fuel support frames (100%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): ~1.49

Comment on density: The density is the mass divided by the envelope volume.

**CHEMICAL COMPOSITION**

General description and components (%wt): Stainless steel (~ 100%), Traffolite (trace). Likely to be 304L Stainless Steel.

Chemical state: Neutral

Chemical form of radionuclides: C-14: Oxides.  
 Tc-99: Oxides.  
 U: Oxides.  
 Pu: Oxides.

Metals and alloys (%wt): Mostly sheet metal.

Stainless steel.....	~100.0	Likely 304L.
Other ferrous metals.....	0	
Iron.....		
Aluminium.....		
Beryllium.....		
Cobalt.....	0	
Copper.....		
Lead.....	0	
Magnox/Magnesium.....	0	
Nickel.....		

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	Titanium.....	
	Uranium.....	
	Zinc.....	0
	Zircaloy/Zirconium.....	0
	Other metals.....	0
Organics (%wt):	Trace amounts of Traffolite (phenolic resin) are present as identification plates on the frames.	
	Total cellulose.....	0
	Paper, cotton.....	0
	Wood.....	0
	Halogenated plastics .....	0
	Total non-halogenated plastics.....	TR
	Condensation polymers.....	TR
	Others.....	0
	Organic ion exchange materials....	0
	Total rubber.....	0
	Halogenated rubber .....	0
	Non-halogenated rubber.....	0
	Hydrocarbons.....	
	Oil or grease .....	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	0
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs.....	0
	Soil.....	0
	Brick/Stone/Rubble.....	0
	Cementitious material.....	0
	Sand.....	
	Glass/Ceramics.....	
	Graphite.....	0
	Desiccants/Catalysts.....	
	Asbestos.....	0
	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):

The listed anions are unlikely to be present.

Fluoride..... 0

Chloride..... 0

Iodide..... 0

Cyanide..... 0

Carbonate..... 0

Nitrate..... 0

Nitrite..... 0

Phosphate..... 0

Sulphate..... 0

Sulphide..... 0

Materials of interest for  
waste acceptance criteria:

No materials likely to pose a fire or other non-radiological hazard have been identified.

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.....

Soluble solids as bulk chemical  
compounds.....Hazardous substances /  
non hazardous pollutants:

-

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

Phenol.....

Styrene.....

Tri-butyl phosphate.....

Other organophosphates.....

Vinyl chloride.....

Arsenic.....

Barium.....

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Boron.....  
 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): No  
     EDTA.....  
     DPTA.....  
     NTA.....  
     Polycarboxylic acids.....  
     Other organic complexants.....  
     Total complexing agents..... 0

**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		100.0

Comment on planned treatments:

Treatment will be via size reduction and decontamination, with an anticipated maximum of 5% of the basket assumed to be disposed of to the LLWR as LLW. The remainder is anticipated to be free release scrap.

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**Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	5.0
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	95.0

**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 <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 2m box (no shielding) 4m box (no shielding) Other	5.0	10	< 1

Other information: -

**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).  
The waste does not have a current WCH.

No WCH currently in place for this waste. It will be developed at the time for disposal of the flasks and frames.

Waste consigned for disposal to LLWR in year of generation: No. The waste is stored inside Excellox 4 transport flasks at present and will be dealt with when the flasks are decommissioned. This is dependent on work load and NDA strategy.

Potential for the waste to contain discrete items: -

**Non-Containerised Waste for In-Vault Grouting:** (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

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Inaccessible voidage: -

Other information: -

**RADIOACTIVITY**

Source: The activity arises from a) corrosion products in the reactor cooling circuit adhering to the fuel and being dislodged and b) contamination from pond water.

Uncertainty: The activity depends on the quality of fuel and the length of time the fuel has been in the frame, and the time since removal of the fuel.

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: Individual nuclide activities have not been determined, but the nuclides listed are based on those present in Multi Element Bottles (MEBs).

Other information: Beta/gamma activity dominant.

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			Nuclide	Mean radioactivity, TBq/m <sup>3</sup>		
	Waste at 1.4.2019	Bands and Code	Future arisings		Waste at 1.4.2019	Bands and Code	Future arisings
H 3				Gd 153			
Be 10				Ho 163			
C 14		6		Ho 166m			
Na 22				Tm 170			
Al 26				Tm 171			
Cl 36				Lu 174			
Ar 39				Lu 176			
Ar 42				Hf 178n			
K 40				Hf 182			
Ca 41				Pt 193			
Mn 53				Tl 204			
Mn 54		6		Pb 205			
Fe 55		6		Pb 210			
Co 60		6		Bi 208			
Ni 59		6		Bi 210m			
Ni 63		6		Po 210			
Zn 65				Ra 223			
Se 79				Ra 225			
Kr 81				Ra 226			
Kr 85				Ra 228			
Rb 87				Ac 227			
Sr 90				Th 227			
Zr 93				Th 228			
Nb 91				Th 229			
Nb 92				Th 230			
Nb 93m				Th 232			
Nb 94				Th 234			
Mo 93				Pa 231			
Tc 97				Pa 233			
Tc 99		6		U 232			
Ru 106				U 233			
Pd 107				U 234		6	
Ag 108m				U 235			
Ag 110m				U 236		6	
Cd 109				U 238		6	
Cd 113m				Np 237			
Sn 119m				Pu 236			
Sn 121m				Pu 238		6	
Sn 123				Pu 239		6	
Sn 126				Pu 240			
Sb 125				Pu 241		6	
Sb 126				Pu 242			
Te 125m				Am 241		6	
Te 127m				Am 242m			
I 129		6		Am 243			
Cs 134				Cm 242			
Cs 135				Cm 243		6	
Cs 137		6		Cm 244			
Ba 133				Cm 245			
La 137				Cm 246			
La 138				Cm 248			
Ce 144				Cf 249			
Pm 145				Cf 250			
Pm 147				Cf 251			
Sm 147				Cf 252			
Sm 151				Other a			
Eu 152				Other b/g			
Eu 154				<b>Total a</b>	<b>NE</b>		<b>0</b>
Eu 155				<b>Total b/g</b>	<b>1.50E-02</b>	<b>B C 2</b>	<b>0</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