WASTE STREAM	2F17	Excellox Flasks

SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	= 1223.4
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**1223.4**

OR

Conditioned (m^3)	Packaged (m^3)

Number of waste packages in stock: At 1.4.2025…… - packages

Comment on arising rates: -

Additional information on quantities: The total number of Excellox flasks identified is 84. The flasks are presently stored both dry inside buildings and outdoors with covers on at Sellafield. They are currently considered to be redundant and unlicensible. The volume declared is the volume of the flasks, 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 Excellox flasks.

Uncertainty factors on volumes:

Stock (upper):	x 1.50	Arisings (upper):	x -
Stock (lower):	x 0.50	Arisings (lower):	x -

WASTE SOURCE Fuel flasks, used in the transport of spent LWR fuel from Japanese and European reactor sites to Sellafield.

PHYSICAL CHARACTERISTICS

General description: These are steel containers internally contaminated with traces of activation and fission products from spent fuel. These containers are nominally empty and were previously used for the transport of spent LWR fuel. They comprise cylindrical Excellox flasks and they are painted with CEGB System 6 epoxy paint. Flasks weigh between 38.5 and 83.1 tonnes each.

Changes since waste generated: The waste is not anticipated to undergo any changes since it was generated. The flasks are presently stored both dry inside buildings and outdoors with covers on at Sellafield. Flasks sometimes undergo chemical decontamination as part of routine maintenance.

Bulk density (t/m^3): = 3.7

Comment on density: The density ranges from 2.21 to 4.77 te/m^3. The weighted average density is 3.68 te/m^3.

CHEMICAL COMPOSITION

General description and components (%wt): Ferritic steel (52%), lead (43%) and stainless steel (5%). The majority of the flasks are painted with CEGB System 6 epoxy paint.

Chemical state: Neutral

Sheet metal proportion / thickness: 100% bulk metal as fabrications or lead castings. Ferritic steel is typically 100 mm and 200 mm thick. Stainless steel is typically 15 mm thick. The lead is in rings up to 1245 & 1320 mm OD, 839 & 890 mm ID and 180 mm thickness.
Early flasks are to the standards - body plate (BS1501-grade 224/400B/LT50), forging (BS1503 - grade 224/430E/LT50), stainless steel (BS1501-304-S12 & BS970-304-S12 max 0.03% carbon). Later flasks are to standards - mild steel (BS1501(1980)24/400E/LT50), lead (BS3909/2), stainless steel (BS1501-304-S12). Nickel and niobium are present in stainless steel and carbon steel in alloying proportions.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel	= 5.0	BS1501-304-S12, BS970-304-S12, BS1501-304-S12.	
Other ferrous metals	= 52.0	BS1501-grade 224/400B/LT50, BS1503 - grade 224/430E/LT50, BS1501(1980)24/400E/LT50.	
Iron		-	
Aluminium		-	
Beryllium		-	
Cobalt	= 0	-	
Copper		-	
Lead	= 43.0	BS3909/2.	
Magnox/Magnesium	= 0	-	
Nickel		-	
Titanium		-	
Uranium		-	
Zinc	= 0	-	
Zircaloy/Zirconium	= 0	-	
Other metals	= 0	-	

Organics (%wt):

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

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	= 0	-	
Inorganic sludges and flocs	= 0	-	
Soil	= 0	-	
Brick/Stone/Rubble	= 0	-	
Cementitious material	= 0	-	
Sand		-	
Glass/Ceramics		-	
Graphite	TR	-	
Desiccants/Catalysts		-	
Asbestos	TR	-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids	0	-	
Free non-aqueous liquids	0	-	
Powder/Ash	0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
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:

	(%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		-
Reacting with water	= 0	-
Higher activity particles		-
Soluble solids as bulk chemical compounds		-

Hazardous substances / non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide		-
Benzene		-
Chlorinated solvents		-
Formaldehyde		-
Organometallics		-
Phenol		-
Styrene		-
Tri-butyl phosphate		-
Other organophosphates		-
Vinyl chloride		-
Arsenic		-
Barium		-
Boron		-
Boron (in Boral)		-
Boron (non-Boral)		-
Cadmium		-
Caesium		-
Selenium		-
Chromium		-
Molybdenum		-
Thallium		-
Tin		-
Vanadium		-
Mercury compounds		-
Others		-

Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA		-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		No complexing agents are present.
Total complexing agents	= 0	-

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
EEE Type 2		-
EEE Type 3		-
EEE Type 4		-
EEE Type 5		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	Off-site	100.0

Comments on planned treatments: Treatment will be via size reduction and decontamination, with an anticipated maximum of 5% of the flask assumed to then be disposed of to the LLWR as LLW. The remainder is anticipated to be consigned as out of scope metal.

Conditioning method: -

Conditioning plants:

Plant Name	Location

Likely conditioning matrix: -

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	5.0	10.0	18.3	7	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland) Expected to be Non-NSD HAW managed under Scottish Government's policy Expected to be disposed to LLW Vaults NRS Dounreay Expected to be consigned to the Geological Disposal Facility Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be disposed On-Site Expected to be managed by In-Situ Disposal Expected to be consigned to an Incineration Facility	~ 5.0	~ 3.7	
Expected to be consigned to a Metal Treatment Facility Expected to be Out of Scope Expected to be recycled / reused Disposal route not known	~ 95.0	~ 3.7	

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

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Fission and activation product contamination with some actinides possibly present.

Uncertainty: Used 2x32 fingerprint. Activity needs checked by SQEP. Activity based on radionuclides for one EXL6 flask with 1.45E-1 Bq/g activity and 4.73E-7 TBq/m³. The EXL6 flasks activity ranges between 1.45E-1 to 1.70E-2 Bq/g. Based on 2X32 fingerprint since flasks went through thorp receipt and storage.

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: Unknown if present.
C-14: The chemical form of Carbon has not been determined.
Cl-36: -
Se-79: Unknown if present.
Tc-99: The chemical form of Technetium has not been determined.
I-129: -
Ra: Unknown if present.
Th: Unknown if present.
U: The chemical form of Uranium has not been determined.
Np: The chemical form of Neptunium has not been determined.
Pu: The chemical form of Plutonium has not been determined.

WASTE STREAM **2F17** **Excellox Flasks**

Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3		7			Gd 153				
Be 10					Ho 163				
C 14		8			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		8			Pb 205				
Fe 55		7			Pb 210				
Co 60		7			Bi 208				
Ni 59					Bi 210m				
Ni 63		7			Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90		8			Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94		8			Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99		8			U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238		8		
Sn 123					Pu 239		8		
Sn 126					Pu 240		8		
Sb 125					Pu 241		7		
Sb 126					Pu 242		8		
Te 125m					Am 241		8		
Te 127m					Am 242m				
I 129					Am 243				
Cs 134		8			Cm 242		8		
Cs 135					Cm 243		8		
Cs 137		7			Cm 244		8		
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144		8			Cf 249				
Pm 145					Cf 250				
Pm 147		7			Cf 251				
Sm 147					Cf 252				
Sm 151		8			Unsp a				
Eu 152					Unsp b/g				
Eu 154		8			**Total a**	**0**	*	**0**	*
Eu 155		8			**Total b/g**	**0**	*	**0**	*

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 the 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
* Total calculated from the 114 declared radionuclides