WASTE STREAM	2F35	Tn 17 and NTL 11 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	= 236.5
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**236.5**

OR

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

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

Comment on arising rates: Assumes a medium term strategy for decommissioning the NTL flasks.

Additional information on quantities: The total number of flasks identified is 10. 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 Japanese owned flasks on the Sellafield site, which may influence the overall decommissioning strategy for the other flasks.

Uncertainty factors on volumes:

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

WASTE SOURCE Flasks become contaminated when used for the transport of irradiated fuel from European reactors.

PHYSICAL CHARACTERISTICS

General description: Steel and lead containers internally contaminated with fission and activation products and with some actinides possibly present. Flasks weigh between 63.5 and 71.3 tonnes.

Changes since waste generated: The waste has not undergone any changes since it was generated and is stored dry and inside a building. Flasks sometimes undergo chemical decontamination as part of routine maintenance.

Bulk density (t/m^3): = 2.9

Comment on density: Density ranges from 2.65 to 3.2 te/m^3. The weighted average density is 2.92 te/m^3.

CHEMICAL COMPOSITION

General description and components (%wt): Stainless steel (2.85%), other ferrous metals (38.9%), lead (53.63%), resin (2.85%), cement (0.32%) and copper (1.45%).

Chemical state: Neutral

Sheet metal proportion / thickness: Excellox flasks - 100% bulk metal. French flasks - 96% bulk metal. Ferritic metal typically 305 & 100 mm thick. Stainless steel is 5 & 27 mm thick. Lead in rings are 152 mm thick. This waste stream comprises various flasks with different specifications. Some flask specifications are as follows: Lid and base forging spec. BS 1503-224-28A-4T-50. Plate spec. BS 1501-224. Lead BS 3909/2 - 4% antimony content lead alloy. Lead liner spec. BS 1449-321-512. TN type flasks are ASTM A350 forgings. Other material 304L stainless steel sheet.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel	= 2.9	304L sheet.	
Other ferrous metals	= 38.9	BS 1503-224-28A-4T-50, BS 1501-224, ASTM A350.	
Iron		-	
Aluminium		-	
Beryllium		-	
Cobalt	= 0	-	
Copper	= 1.5	-	
Lead	= 53.6	BS 3909/2 - 4% antimony content lead alloy. Lead liner spec. BS 1449-321-512.	
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	= 2.9	resin	

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	= 0.32	-	
Sand		-	
Glass/Ceramics		-	
Graphite	= 0	-	
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	= 0	-
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		-
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	2	-

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	~ 2.7	
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	~ 2.7	

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 arising from contact with spent fuel or cross contamination from items that have been in contact with spent fuel.

Uncertainty: Three out of seven NTL11 flasks are clean. The other four range from around 4Bq/g to 1292 Bq/g. The radioactivity above is based on an NTL11 flask that has an activity of 673 Bq/g or 0.00174 TBq/m³. Calculation based on using isotopic breakdown of fuel contained in NTL11 flasks. Needs to be confirmed by SQEP. The indicative characterisation was based on isotopic breakdown of fuel. The radionuclides for TN17 flask is unknown.

Measurement of radioactivities: Via fingerprints and isotopic breakdown of fuel (via FIS2000 database).

Chemical form of radionuclides:

H-3: Trace quantities likely to be present in some part of the waste, but chemical composition unknown.

C-14: Trace quantities likely to be present in some part of the waste, but chemical composition unknown.

Cl-36: -
Se-79: Unknown if present.
Tc-99: Trace quantities likely to be present in some part of the waste, but chemical composition unknown.

I-129: -
Ra: Not anticipated to be present.
Th: Unknown if present.
U: Not anticipated to be present.
Np: Unknown if present.
Pu: Trace quantities likely to be present in some part of the waste, but chemical composition unknown.

WASTE STREAM **2F35** **Tn 17 and NTL 11 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		8			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					Pb 210				
Co 60		8			Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85		8			Ra 228				
Rb 87					Ac 227				
Sr 90		7			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		8			U 232				
Ru 106		7			U 233				
Pd 107					U 234				
Ag 108m		8			U 235				
Ag 110m		8			U 236		8		
Cd 109					U 238				
Cd 113m					Np 237		8		
Sn 119m					Pu 236				
Sn 121m					Pu 238		8		
Sn 123					Pu 239		8		
Sn 126					Pu 240		8		
Sb 125		8			Pu 241		7		
Sb 126					Pu 242		8		
Te 125m					Am 241		8		
Te 127m					Am 242m		8		
I 129		8			Am 243				
Cs 134		7			Cm 242				
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		7			Cf 249				
Pm 145					Cf 250				
Pm 147		7			Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152		8			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