WASTE STREAM	2D31	Magnox Fuel Transport 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	= 461.8
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**461.8**

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 Magnox flasks.

Additional information on quantities: The total number of Magnox flasks identified is 42 which includes 9 that were already at Sellafield in 2019 and a further 33 flasks transferred from Magnox Ltd (from waste stream 9Z201). The volume declared for disposal is the volume of the flasks without any size reduction. 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 Magnox flasks.

Uncertainty factors on volumes:

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

WASTE SOURCE Transport flasks that have been used for irradiated Magnox fuel transport.

PHYSICAL CHARACTERISTICS

General description: These are ferritic steel containers internally contaminated with traces of activation and fission products from the spent fuel. These containers are obsolete and are nominally empty. The flasks are painted with CEGB System 6 epoxy paint. The flasks weigh up to 42.77 t each. All flasks have handling trunnions fitted. This is the maximum all up weight of a flask assembly. Actual disposal weight may be less.

Changes since waste generated: The waste is not anticipated to undergo any changes since it was generated as the flasks are presently stored dry and covered at Sellafield. Flasks sometimes undergo chemical decontamination as part of routine maintenance.

Bulk density (t/m^3): = 3.5

Comment on density: The average density of 3.47 t/m^3 refers to the mass of the components divided by the volume as stored prior to disposal.

CHEMICAL COMPOSITION

General description and components (%wt): Flask surfaces are painted with CEGB System 6 epoxy paint and there is a seal made of viton. The chemical components are Iron (approx. 98%) possibly with nickel, vanadium, molybdenum, manganese, niobium and chromium in alloying proportions, Viton (<0.01%), and CEGB System 6 epoxy based paint (~0.1%).

Chemical state: Neutral

Sheet metal proportion / thickness: Approximately 100% of waste is bulk metal in the form of transport flasks.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel	= 4.0	-	
Other ferrous metals	= 95.9	BS 1503, ASTM/A350.	
Iron		-	
Aluminium		-	
Beryllium		-	
Cobalt	= 0	-	
Copper		-	
Lead	= 0	-	
Magnox/Magnesium	TR	-	
Nickel	TR	-	
Titanium		-	
Uranium		-	
Zinc	= 0	-	
Zircaloy/Zirconium	= 0	-	
Other metals	= 0	No "other" metals present.	

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	< 0.01	-	
Halogenated rubber	< 0.01	-	
Non-halogenated rubber	= 0	-	
Hydrocarbons		-	
Oil or grease		-	
Fuel		-	
Asphalt/Tarmac (cont.coal tar)		-	
Asphalt/Tarmac (no coal tar)		-	
Bitumen		-	
Others		-	
Other organics	~ 0.10	-	

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	= 0	-	
Desiccants/Catalysts		-	
Asbestos	= 0	-	
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		There are no organic complexing agents 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
-	-	-	-	-	-

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	= 3.5	
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	= 3.5	

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: Contamination from Magnox fuel cooling pond water.

Uncertainty: The activity values are current best estimates. The waste is expected to be LLW but levels of contamination have to be determined.

Measurement of radioactivities: Estimated from sampling and analysis data.

Chemical form of radionuclides:

H-3: Tritium may be present as water or as other inorganic or organic compounds.
C-14: The carbon 14 content is insignificant.
Cl-36: -
Se-79: The selenium isotope content is insignificant.
Tc-99: The technetium isotope content is insignificant.
I-129: -
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: The chemical form of uranium isotopes has not been determined but may be present as uranium oxides.

Np: The neptunium isotope content is insignificant.
Pu: The chemical form of plutonium isotopes has not been determined but may be present as plutonium oxides.

WASTE STREAM **2D31** **Magnox Fuel Transport 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		6			Gd 153				
Be 10		8			Ho 163				
C 14		8			Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36		8			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41		8			Pt 193				
Mn 53					Tl 204				
Mn 54	1.20E-18	C C 2			Pb 205				
Fe 55		6			Pb 210	7.73E-16	C C 2		
Co 60	6.35E-09	C C 2			Bi 208				
Ni 59		6			Bi 210m				
Ni 63		6			Po 210	7.34E-16	C C 2		
Zn 65		6			Ra 223		5		
Se 79		6			Ra 225	2.62E-12	C C 2		
Kr 81					Ra 226	3.20E-15	C C 2		
Kr 85					Ra 228		5		
Rb 87					Ac 227		5		
Sr 90	1.93E-06	C C 2			Th 227		5		
Zr 93		6			Th 228		5		
Nb 91					Th 229	2.63E-12	C C 2		
Nb 92					Th 230	5.12E-13	C C 2		
Nb 93m		6			Th 232		5		
Nb 94		6			Th 234	2.89E-09	C C 2		
Mo 93		6			Pa 231		5		
Tc 97					Pa 233	5.49E-12	C C 2		
Tc 99		6			U 232				
Ru 106	6.32E-16	C C 2			U 233	9.62E-10	C C 2		
Pd 107		6			U 234	1.92E-09	C C 2		
Ag 108m		6			U 235	8.25E-15	C C 2		
Ag 110m					U 236	8.25E-14	C C 2		
Cd 109					U 238	2.89E-09	C C 2		
Cd 113m					Np 237	5.51E-12	C C 2		
Sn 119m					Pu 236				
Sn 121m		6			Pu 238	3.17E-09	C C 2		
Sn 123					Pu 239	2.89E-07	C C 2		
Sn 126		6			Pu 240	9.60E-08	C C 2		
Sb 125	1.23E-10	C C 2			Pu 241	1.91E-06	C C 2		
Sb 126					Pu 242		6		
Te 125m	3.08E-11	C C 2			Am 241	6.47E-07	C C 2		
Te 127m					Am 242m		6		
I 129		6			Am 243		6		
Cs 134	5.65E-11	C C 2			Cm 242	7.78E-28	C C 2		
Cs 135		6			Cm 243		6		
Cs 137	9.86E-06	C C 2			Cm 244		6		
Ba 133					Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248				
Ce 144	1.24E-18	C C 2			Cf 249				
Pm 145					Cf 250				
Pm 147		6			Cf 251				
Sm 147					Cf 252				
Sm 151		6			Unsp a		8		
Eu 152		6			Unsp b/g				
Eu 154	6.50E-09	C C 2			**Total a**	**1.04E-06**	*	**0**	*
Eu 155		6			**Total b/g**	**1.37E-05**	*	**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