

WASTE STREAM	2D33	Fuel Handling Plant Sludges
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SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	~ 33.0			
Total future arisings:	0.0			
Total waste volume:	33.0			

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

Comment on arising rates: Based on estimated receipts of Uranium Bit Bins (UBBs). Note, nearly all UBB skips have been imported into FHP. As UBBs have been generated these are referred to as stocks for the purpose of the UKRWI (i.e. no sludge arisings from new sources are foreseen).

Additional information on quantities: It is approximated that where sludge is present, the skip holds 50% fuel and 50% sludge, giving 0.5m³ sludge per skip. However the sludge volume could vary from very little to the majority of the skip contents. A total of 66 consolidated UBB skips is foreseen as the upper bound.

Uncertainty factors on volumes: Stock (upper): x 2.00 Arisings (upper): x -
Stock (lower): x 0.10 Arisings (lower): x -

WASTE SOURCE Importing of Magnox Uranium Bit Bin skips with sludge.

PHYSICAL CHARACTERISTICS

General description: Magnox sludge from fuel handling plant consisting of a slurry of fine particles and some larger particles. No special handling requirements.

Changes since waste generated: -

Bulk density (t/m³): = 0.60

Comment on density: The density is an estimated typical raw sludge density.

CHEMICAL COMPOSITION

General description and components (%wt): Magnox sludge (100%).

Chemical state: Alkali

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	< 5.0	-	
Nickel.....	= 0	-	
Titanium.....	0	-	
Uranium.....	= 5.0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 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	-	
Halogenated rubber.....	= 0	-	
Non-halogenated rubber.....	= 0	-	
Hydrocarbons.....	= 0	-	
Oil or grease.....	= 0	-	
Fuel.....	= 0	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	= 0	-	
Others.....	= 0	-	
Other organics.....	= 0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 90.0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 0	-	
Non/low friable.....	= 0	-	
Moderately friable.....	= 0	-	
Highly friable.....	= 0	-	
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.....	TR	-
Chloride.....	TR	-
Iodide.....	TR	-
Cyanide.....	NE	-
Carbonate.....	P	-
Nitrate.....	TR	-
Nitrite.....	TR	-
Phosphate.....	TR	-
Sulphate.....	TR	-
Sulphide.....	TR	-

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.....	= 0	-
Soluble solids as bulk chemical compounds.....	= 0	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	= 0	-
Benzene.....	= 0	-
Chlorinated solvents.....	= 0	-
Formaldehyde.....	= 0	-
Organometallics.....	= 0	-
Phenol.....	= 0	-
Styrene.....	= 0	-
Tri-butyl phosphate.....	= 0	-
Other organophosphates.....	= 0	-
Vinyl chloride.....	= 0	-
Arsenic.....	= 0	-
Barium.....	= 0	-
Boron.....	= 0	-
Boron (in Boral).....	= 0	-
Boron (non-Boral).....	= 0	-
Cadmium.....	= 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	= 0	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	= 0	-

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		= 100.0
None		

Comments on planned treatments:

-

Conditioning method:

Conditioning plans are yet to be established, the sludge is likely to be routed to SIXEP and SWP for treatment. Any fuel based sludge is likely to be routed to BEP or BUFT.

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 (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	Sellafield 3 m³ box	100.0	0.80	2.7	42	-

Range in container waste loading:

Other information on packaging and conditioning: -

Conditioned density (t/m³): NE
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	= 100.0		
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			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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: Magnox sludge containing uranium and mixed fission products.

Uncertainty: -

Measurement of radioactivities: Major radionuclides are measured by analysis of samples (1996) taken from storage tanks.

Chemical form of radionuclides:

- H-3: -
- C-14: -
- Cl-36: -
- Se-79: -
- Tc-99: -
- I-129: -
- Ra: -
- Th: -
- U: U234, U235, U236, U238. Present as metal and oxides.
- Np: -
- Pu: Pu238, Pu239, Pu240, Pu241, Pu242. Present as metal and oxide.

WASTE STREAM 2D33 Fuel Handling Plant Sludges									
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36	1.20E-04	B B 2			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Ti 204				
Mn 54					Pb 205				
Fe 55					Pb 210	4.32E-11	B B 1		
Co 60	9.89E-03	B B 1			Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210	4.14E-11	B B 1		
Zn 65					Ra 223	1.23E-09	B B 1		
Se 79	3.57E-05	B B 2			Ra 225	1.87E-12	B B 2		
Kr 81					Ra 226	1.62E-10	B B 1		
Kr 85					Ra 228	3.16E-14	B B 1		
Rb 87					Ac 227	1.25E-09	B B 1		
Sr 90	2.78E+01	B B 1			Th 227	1.22E-09	B B 1		
Zr 93	1.30E-03	B B 2			Th 228	2.46E-14	B B 1		
Nb 91					Th 229	1.89E-12	B B 2		
Nb 92					Th 230	3.94E-08	B B 1		
Nb 93m	2.81E-04	B B 2			Th 232	5.98E-14	B B 1		
Nb 94					Th 234	1.52E-03	B B 1		
Mo 93					Pa 231	5.64E-09	B B 1		
Tc 97					Pa 233	7.68E-05	B B 2		
Tc 99	7.42E-03	B B 1			U 232				
Ru 106	1.93E-03	B B 2			U 233	2.39E-09	B B 2		
Pd 107					U 234	6.05E-04	B B 1		
Ag 108m					U 235	3.77E-05	B B 1		
Ag 110m					U 236	1.76E-04	B B 1		
Cd 109					U 238	1.56E-03	B B 1		
Cd 113m					Np 237	7.88E-05	B B 2		
Sn 119m					Pu 236				
Sn 121m					Pu 238	3.91E-01	B B 1		
Sn 123					Pu 239	5.86E-01	B B 1		
Sn 126					Pu 240	7.68E-01	B B 1		
Sb 125					Pu 241	2.59E+01	B B 1		
Sb 126					Pu 242	6.84E-04	B B 1		
Te 125m					Am 241	1.68E+00	B B 1		
Te 127m					Am 242m				
I 129	2.01E-05	B B 2			Am 243				
Cs 134	3.94E-02	B B 1			Cm 242				
Cs 135	1.18E-04	B B 2			Cm 243				
Cs 137	5.76E+00	B B 1			Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144	1.48E-04	B B 2			Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152					Unsp b/g				
Eu 154	2.64E-01	B B 1			Total a	3.43E+00	*	0	*
Eu 155	1.26E-01	B B 1			Total b/g	5.99E+01	*	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