WASTE STREAM	2X59	Disposal of solid LLW from PIE Laboratory

SITE Sellafield

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Ltd

WASTE TYPE LLW

WASTE VOLUMES

		Reported (m^3)	OR	Conditioned (m^3)	Packaged (m^3)
Stocks:	At 1.4.2025	= 0			
Future arisings:	1.4.2025 - 31.3.2026	= 4.9			
	1.4.2026 - 31.3.2027	= 2.8			
	1.4.2027 - 31.3.2028	= 2.8			
	1.4.2028 - 31.3.2029	= 2.8			
	1.4.2029 - 31.3.2030	= 2.8			
	1.4.2030 - 31.3.2031	= 2.8			
	1.4.2031 - 31.3.2032	= 2.8			
	1.4.2032 - 31.3.2033	= 2.8			
	1.4.2033 - 31.3.2034	= 2.8			
	1.4.2034 - 31.3.2035	= 2.8			
	1.4.2035 - 31.3.2036	= 2.8			
	1.4.2036 - 31.3.2037	= 2.8			
	1.4.2037 - 31.3.2038	= 2.8			
	1.4.2038 - 31.3.2039	= 2.8			
	1.4.2039 - 31.3.2040	= 2.8			
	1.4.2040 - 31.3.2041	= 2.8			
	1.4.2041 - 31.3.2042	= 2.8			
	1.4.2042 - 31.3.2043	= 2.8			
	1.4.2043 - 31.3.2044	= 2.8			
	1.4.2044 - 31.3.2045	= 2.8			
	1.4.2045 - 31.3.2046	= 2.8			
	1.4.2046 - 31.3.2047	= 2.8			
	1.4.2047 - 31.3.2048	= 2.8			
	1.4.2048 - 31.3.2049	= 2.8			
	1.4.2049 - 31.3.2050	= 2.8			
	1.4.2050 - 31.3.2051	= 2.8			
	1.4.2051 - 31.3.2052	= 2.8			
	1.4.2052 - 31.3.2053	= 2.8			
	1.4.2053 - 31.3.2054	= 2.8			
	1.4.2054 - 31.3.2055	= 2.8			
Total future arisings:		**85.4**			
Total waste volume:		**85.4**			

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

Comment on arising rates: Arisings are based on 5 years of forecasts, with the final year extrapolated to the end of the lifetime of the waste stream.

Additional information on quantities: Uncertainty information is notional.

Uncertainty factors on volumes:

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

WASTE SOURCE Waste arises as a result of care and maintenance of the PIE laboratory within MDF.

PHYSICAL CHARACTERISTICS

General description: The waste is mostly metallic waste associated with redundant plant items.

Changes since waste generated: The waste has not undergone any changes since it was generated.

Bulk density (t/m^3): = 0.22

Comment on density: The total bulk density has been calculated based on the 5 year forecast and relevant waste characterisation document.

CHEMICAL COMPOSITION

General description and components (%wt): Metals (73.8%), Concrete/Rubble (1%), Wood (1%), Rubber (1%), Halogenated Plastics (9.8%), Non-Halogenated Plastics (9.8%), Hydrocarbons (1%), Other Organics (0.5%), Asbestos (1.7%) and Other (0.4%).

Chemical state: Neutral

Sheet metal proportion / thickness: Metal thickness not specified.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel	= 19.5	-	
Other ferrous metals	= 48.8	-	
Iron	= 0.49	-	
Aluminium	= 0.98	-	
Beryllium		-	
Cobalt		-	
Copper	= 0.49	-	
Lead	= 0.98	-	
Magnox/Magnesium		-	
Nickel		-	
Titanium		-	
Uranium		-	
Zinc	= 0.98	-	
Zircaloy/Zirconium		-	
Other metals	= 1.6	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	= 1.0	-	
Paper, cotton		-	
Wood	= 1.0	-	
Halogenated plastics	= 9.8	-	
Total non-halogenated plastics	= 9.8	-	
Condensation polymers		-	
Others		-	
Organic ion exchange materials		-	
Total rubber	= 1.0	-	
Halogenated rubber		-	
Non-halogenated rubber		-	
Hydrocarbons	= 0.98	-	
Oil or grease	= 0.98	-	
Fuel		-	
Asphalt/Tarmac (cont.coal tar)		-	
Asphalt/Tarmac (no coal tar)		-	
Bitumen		-	
Others		-	
Other organics	= 0.65	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials		-	
Inorganic sludges and flocs		-	
Soil		-	
Brick/Stone/Rubble	= 1.0	-	
Cementitious material		-	
Sand		-	
Glass/Ceramics	= 0.12	-	
Graphite		-	
Desiccants/Catalysts	= 0.24	-	
Asbestos	= 1.7	-	
Non/low friable	= 1.2	-	
Moderately friable	= 0.24	-	
Highly friable	= 0.24	-	
Free aqueous liquids		-	
Free non-aqueous liquids		-	
Powder/Ash		-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride		-
Chloride		-
Iodide		-
Cyanide		-
Carbonate		-
Nitrate		-
Nitrite		-
Phosphate		-
Sulphate		-
Sulphide		-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals		-
Low flash point liquids		-
Explosive materials		-
Phosphorus		-
Hydrides		-
Biological etc. materials		-
Biodegradable materials	= 1.0	-
Putrescible wastes		-
Non-putrescible wastes	= 1.0	-
Corrosive materials		-
Pyrophoric materials		-
Generating toxic gases		-
Reacting with water	= 2.0	-
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): Yes

	(%wt)	Type(s) and comment
EDTA	< 0.01	-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		-
Total complexing agents	< 0.01	-

Physical components:

	Number	Type(s) and comment
Sources	= 0	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		30 items every 5 years
EEE Type 2		30 items every 5 years
EEE Type 3		15 items every 5 years
EEE Type 4		20 items every 5 years
EEE Type 5		10 items every 5 years

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)	On-site	= 13.6
Incineration	Off-site	= 79.1
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	= 2.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 5.3

Comments on planned treatments: For inventory purposes, it is assumed that supercompaction will continue after the closure of WAMAC in 2028. Incineration and metal treatment will take place off-site. Waste not requiring treatment is mostly VLLW and non-compactable LLW for direct disposal to LLWR.

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)	2.9	10.0	18.3	1	-
1/2 Height WAMAC IP-2 ISO (TC08)	13.6	59.3	18.8	1	-

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	= 16.6	= 0.32	2025
Expected to be consigned to a Landfill Facility	= 1.3	= 1.5	2025
Expected to be disposed On-Site	= 1.0	= 1.5	2025
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 79.1	= 0.14	2025
Expected to be consigned to a Metal Treatment Facility	= 2.0	= 1.4	2025
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: 17 01 01, 20 02 01, 17 03 01*, 17 05 03*, 17 05 04, 17 09 04, 17 09 03*

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: The activity arises from the contamination from laboratory areas used for PIE. The waste becomes contaminated during care and maintenance.

Uncertainty: The uncertainty associated with the fingerprinting analysis is likely to be low, however the volumes and total activity information (and possibly some other assumptions) are likely to be more notional and thus more uncertain.

Measurement of radioactivities: Specific activity data is based on data in the corresponding WCH, which in turn maps an estimated total activity to an analytically derived radionuclide fingerprint.

Chemical form of radionuclides:

H-3: -
C-14: -
Cl-36: -
Se-79: -
Tc-99: -
I-129: -
Ra: -
Th: -
U: -
Np: -
Pu: -

WASTE STREAM **2X59** **Disposal of solid LLW from PIE Laboratory**

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					Gd 153				
Be 10					Ho 163				
C 14			= 1.66E-09	C C 2	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					Pb 205				
Fe 55					Pb 210				
Co 60			= 2.49E-09	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			= 1.21E-07	C C 2	Po 210				
Zn 65					Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90			= 2.37E-06	C C 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230			= 3.32E-09	C C 2
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99			= 8.31E-10	C C 2	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			= 1.26E-07	C C 2
Sn 123					Pu 239			= 2.24E-08	C C 2
Sn 126					Pu 240			= 2.91E-08	C C 2
Sb 125					Pu 241			= 1.06E-06	C C 2
Sb 126					Pu 242			= 2.47E-10	C C 2
Te 125m					Am 241			= 2.07E-07	C C 2
Te 127m					Am 242m				
I 129			= 2.49E-08	C C 2	Am 243				
Cs 134					Cm 242			= 2.60E-10	C C 2
Cs 135					Cm 243			= 2.49E-09	C C 2
Cs 137			= 4.26E-06	C C 2	Cm 244			= 5.65E-08	C C 2
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					Unsp a				
Eu 152					Unsp b/g				
Eu 154			= 1.66E-08	C C 2	**Total a**	**0**	*	**4.47E-07**	*
Eu 155					**Total b/g**	**0**	*	**7.86E-06**	*

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