

WASTE STREAM	5G308	Legacy Decommissioning LLW
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SITE Winfrith

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

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 - 31.3.2037	103.5		
Total future arisings:		103.5		
Total waste volume:		103.5		

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

Comment on arising rates: -

Additional information on quantities: Historic wastes arising from previous operations and decommissioning of various Winfrith facilities (most notably SGHWR and DRAGON). This waste is subject to an ongoing programme of characterisation with the objective of identifying appropriate disposal routes.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.50
Stock (lower): x - Arisings (lower): x 0.50

WASTE SOURCE This waste stream covers historic and legacy wastes from facilities across the Winfrith site.

PHYSICAL CHARACTERISTICS

General description: The wastes arose from a variety of facilities that are no longer in existence, including but not limited to:
Reactor Safety Test Compound (RSTC);
Fire test area;
Commercial supercompaction operations prior to 1990;
laboratory experimentation and trial fabrication;
PIE facility and supporting systems such as drains and vents;
Historic waste processing operations
Current waste processing activities
Legacy NDA (UKAEA) assets - known as SAFER or DRAWMOPS liability.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.74

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Mainly metal (73%) Concrete/rubble (9%), soil (1%), Biodegradable- non putrescibles (1%) Biodegradable- putrescibles (1%), plastic - halogenated (1%), plastics - non-halogenated (1%) rubber (1%), wood (1%), powders/ash (1%) Other organic (1%) and others (9%)

Chemical state: Neutral

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 19.4	Drums (300 kg metal component of concrete lined drums and 122 kg additional drums), ex-B45 tank (657 kg), Molten Fuel Test Facility (MFTF) vessel (11157 kg), WETP damper (265 kg), Washing machine components (221 kg), ex-B45 U container (1754 kg), size reduced pipework and reactor components	
Other ferrous metals.....	~ 36.7	Drums (4180kg), NORM valve (91 kg) washing machine components (515. kg), ex-A40 sump tank (564 kg), air filtration housings (702 kg), Vapormatt 1000 blasting glovebox (240 kg), hydraulic press (2814 kg), floor blaster (134 kg), excavator buckets (296 kg), band saw (595 kg), hack saw (1188 kg), MEWP (882 kg), scabber (1188 kg), hydraulic power pack (262 kg), shot, size reduced tanks, frames and structural elements.	
Iron.....	-		
Aluminium.....	-		
Beryllium.....	TR	Cladding on fuel pins, metallic contamination on PPE from fuel handling operations	
Cobalt.....	-		
Copper.....	-		
Lead.....	~ 18.9	Shielding blocks, shot, contaminant in paint	
Magnox/Magnesium.....	-		
Nickel.....	-		
Titanium.....	-		
Uranium.....	-		
Zinc.....	-		
Zircaloy/Zirconium.....	= 0		
Other metals.....	-		

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	= 1.0	-	
Paper, cotton.....	-		
Wood.....	~ 1.0		
Halogenated plastics.....	~ 1.0	PVC wrapping, pipework	
Total non-halogenated plastics.....	~ 1.0	PPE, wipes, packaging, polybags	
Condensation polymers.....	~ 0.50		
Others.....	~ 0.50		
Organic ion exchange materials.....	-		
Total rubber.....	~ 1.0		
Halogenated rubber.....	~ 0.50	neoprene	
Non-halogenated rubber.....	~ 0.50		
Hydrocarbons.....	-		
Oil or grease.....	~ 0.04	Various (MSDS unavailable), some treated with absorbent materials	
Fuel.....	-		
Asphalt/Tarmac (cont.coal tar).....	-		
Asphalt/Tarmac (no coal tar).....	-		
Bitumen.....	-		
Others.....	-		
Other organics.....	P 0.20	Paint (322.32 kg) - VLLW / LLW	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0.06	"Cemented (84.04 kg) - MSDS unavailable, organic ion exchange resins based on divinylbenzene copolymer (36.62kg cation, 15.50kg anion and 31.92kg mixed cation/anion) Bagged (12.2 kg) - MSDS unavailable Contaminated PPE (3.7 kg) - MSDS unavailable"	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 1.0	-	
Brick/Stone/Rubble.....	~ 9.0	concrete/rubble	
Cementitious material.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	~ 0.72	- Ceramics (562.24 kg) - VLLW - Fibreglass (371.88 kg) - VLLW, Glass (non-borated glassware and window panes) - (153.58 kg) - incineration (with oil) / alternative (with mercury and sodium lamps) / VLLW / LLW, fibreglass lagging (64.99kg)	
Graphite.....	TR	Graphite (10.58 kg) - VLLW	
Desiccants/Catalysts.....	TR	Silica Gel	
Asbestos.....	7.6	There is likely to be some quantity of asbestos present.	
Non/low friable.....	-	-	
Moderately friable.....	-	-	
Highly friable.....	~ 7.6	Lagging and cladding - mixture of amphibole and serpentine (chrysotile)	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	-	-	
Powder/Ash.....	~ 1.0	Charcoal and others	

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.....	-	-
Biodegradable materials.....	~ 2.0	-
Putrescible wastes.....	= 1.0	-
Non-putrescible wastes.....	= 1.0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	P	1m2 There is the potential for thermite / sodium to be present as contamination in the Molten Fuel Test Facility vessel. Characterisation is currently in process for this waste. It has been included with a nominal surface area but no mass to capture this potential.
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
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.....	~ 0.14	As metal in various containers. Some suspended in nitric acid.
Others.....	~ 0.12	Sodium, nitric acid, vermiculite, scintillant, absorbant granules

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....	P P P P P	-
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	Off-site	= 0.4
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		~ 98.0

Comments on planned treatments:

41.6% of this stream is expected to be disposed of as VLLW to landfill, 56.4% to LLWR and 1.6% requires alternative treatment yet to be determined.

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 (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	56.4	10.0	18.3	6	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -
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)			
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	= 56.4	0.74	
Expected to be consigned to a Landfill Facility	= 41.6	0.74	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 0.4	0.40	
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known	= 1.6	0.74	

Classification codes for waste expected to be consigned to a landfill facility: 17 04 05, 17 04 07, 17 06 01*

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: The waste could contain fission products and/or activation products.

Uncertainty: -

Measurement of radioactivities: -

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

WASTE STREAM 5G308 Legacy Decommissioning LLW									
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			6.00E-05	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			8.69E-05	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			3.79E-09	C C 2	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55			1.78E-06	C C 2	Pb 210			1.01E-06	C C 2
Co 60			2.61E-05	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			7.83E-05	C C 2	Po 210			9.51E-07	C C 2
Zn 65				8	Ra 223			2.13E-09	8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226			4.06E-06	C C 2
Kr 85				8	Ra 228			1.33E-07	C C 2
Rb 87				8	Ac 227			2.21E-09	C C 2
Sr 90			1.12E-05	C C 2	Th 227			2.13E-09	C C 2
Zr 93				8	Th 228			1.18E-07	C C 2
Nb 91				8	Th 229				8
Nb 92				8	Th 230			2.80E-09	C C 2
Nb 93m				8	Th 232			1.89E-07	C C 2
Nb 94			2.39E-09	C C 2	Th 234			2.80E-06	C C 2
Mo 93				8	Pa 231			2.43E-08	C C 2
Tc 97				8	Pa 233			1.23E-08	C C 2
Tc 99			4.45E-09	C C 2	U 232				8
Ru 106				8	U 233			3.84E-07	C C 2
Pd 107				8	U 234			8.10E-06	C C 2
Ag 108m				8	U 235			2.34E-07	C C 2
Ag 110m				8	U 236			1.62E-08	C C 2
Cd 109				8	U 238			2.80E-06	C C 2
Cd 113m				8	Np 237			1.23E-08	C C 2
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			3.48E-06	C C 2
Sn 123				8	Pu 239			2.58E-05	C C 2
Sn 126				8	Pu 240			1.53E-05	C C 2
Sb 125			3.44E-08	C C 2	Pu 241			9.78E-05	C C 2
Sb 126				8	Pu 242			6.46E-09	C C 2
Te 125m			8.61E-09	C C 2	Am 241			3.07E-05	C C 2
Te 127m				8	Am 242m				8
I 129			1.83E-09	C C 2	Am 243			3.46E-09	C C 2
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243			1.36E-09	C C 2
Cs 137			2.04E-04	C C 2	Cm 244			1.40E-07	C C 2
Ba 133			3.23E-09	C C 2	Cm 245				8
La 137				8	Cm 246				8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147				8	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151				8	Unsp a				
Eu 152			7.63E-09	C C 2	Unsp b/g				
Eu 154			5.14E-08	C C 2	Total a	0	*	9.23E-05	*
Eu 155				8	Total b/g	0	*	5.70E-04	*

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