

WASTE STREAM	5G307	Minor Facilities 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	= 663.1		
Total future arisings:		663.1		
Total waste volume:		663.1		

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

Comment on arising rates: LLW arises as and when various facilities on the Winfrith site are decommissioned.

Additional information on quantities: The waste arising volumes are more uncertain because they relate to facilities (i.e. buildings, sea pipeline) which have not yet been decommissioned and require further characterisation.

Uncertainty factors on volumes:

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

WASTE SOURCE The waste consists of all arisings from the decommissioning of facilities encompassed within Winfrith Plant and Structures Programme.

PHYSICAL CHARACTERISTICS

General description: The waste is primarily formed of metallic wastes, concrete, demolition rubble, grout, soft wastes such as PPE, rubber and wood

Changes since waste generated: Decommissioning wastes- size reduction.

Bulk density (t/m³): = 2.2

Comment on density: Mean bulk density of waste arisings is 2.24 t/m3, derived from total mass divided by total volume.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (28%), concrete/rubble (52%), biodegradables (2%), plastic (12%), soil (3%), rubber (1%), wood (1%), others (1%).

Chemical state: Neutral

Sheet metal proportion / thickness: Various size reduced decommissioning wastes.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 1.4	pipework, tanks, associated furniture	
Other ferrous metals.....	= 23.7	mild steel pipework, tanks, associated furniture, includes 6079 drums for packaging (115501 kg)	
Iron.....	= 2.8	pipework, tanks, associated furniture	
Aluminium.....	-	-	
Beryllium.....	-	-	
Cobalt.....	-	-	
Copper.....	-	-	
Lead.....	= 0.01	Shielding and Lead components of Hazardous paints	
Magnox/Magnesium.....	-	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	-	-	
Zircaloy/Zirconium.....	-	-	
Other metals.....	NE	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 1.0	-	
Paper, cotton.....	= 0	-	
Wood.....	~ 1.0	-	
Halogenated plastics.....	~ 6.3	soft waste, secondary wastes, PPE	
Total non-halogenated plastics.....	~ 6.3	soft waste, secondary wastes, PPE	
Condensation polymers.....	~ 6.3	soft waste, secondary wastes, PPE	
Others.....	NE	-	
Organic ion exchange materials.....	NE	-	
Total rubber.....	~ 1.0	-	
Halogenated rubber.....	~ 0.50	neoprene	
Non-halogenated rubber.....	~ 0.50	-	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	= 0.19	Sludge from A55 tank	
Soil.....	~ 3.0	-	
Brick/Stone/Rubble.....	~ 52.0	-	
Cementitious material.....	-	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0.07	Man Made Mineral Fibre	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	0.07	-	
Non/low friable.....	= 0	-	
Moderately friable.....	= 0.07	chrysotile (white)	
Highly friable.....	= 0	-	
Free aqueous liquids.....	NE	-	
Free non-aqueous liquids.....	NE	-	
Powder/Ash.....	-	-	

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

Inorganic anions (%wt):

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

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.....	2.0	-
Putrescible wastes.....	= 1.0	-
Non-putrescible wastes.....	= 1.0	-
Corrosive materials.....	-	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	-	-
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.....		-
Others.....	= 1.0	Plasterboard

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.....	< 0	-
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	= 0.8
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation	Off-site	= 2.1
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		= 97.2
Treatment not yet determined		
None		

Comments on planned treatments:

94.41% of this stream is expected to be disposed of as VLLW to landfill.

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)	2.8	10.0	18.3	2	-

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	= 2.8	2.2	
Expected to be consigned to a Landfill Facility	= 94.4	2.2	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 0.8	= 0.40	
Expected to be consigned to a Metal Treatment Facility	= 2.1	= 1.4	
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 04 05, 17 05 03*, 17 05 04

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Activity will principally be due to contamination from historic operations on the site, including activation and fission products. A more detailed assessment of the wastes will be performed prior to decommissioning.

Uncertainty: No data available for specific activities for the majority of the waste.

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: Tritium present in the waste.

C-14: C-14 present in steel and concrete.

Cl-36: -

Se-79: -

Tc-99: -

I-129: Some iodine contamination, probably as iodide

Ra: -

Th: Some thorium contamination present

U: Some uranium contamination present

Np: -

Pu: Some plutonium contamination present

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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			4.71E-05	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			4.84E-06	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36				8	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			2.10E-05	C C 2	Pb 210				8
Co 60			2.46E-06	C C 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			8.90E-06	C C 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			3.53E-05	C C 2	Th 227				8
Zr 93				8	Th 228			9.68E-09	C C 2
Nb 91				8	Th 229				8
Nb 92				8	Th 230			4.91E-08	C C 2
Nb 93m				8	Th 232				8
Nb 94				8	Th 234			8.30E-07	C C 2
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234			9.36E-07	C C 2
Ag 108m				8	U 235			1.58E-08	C C 2
Ag 110m				8	U 236				8
Cd 109				8	U 238			8.30E-07	C C 2
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			9.92E-06	C C 2
Sn 123				8	Pu 239			2.53E-05	C C 2
Sn 126				8	Pu 240			2.52E-05	C C 2
Sb 125				8	Pu 241			1.65E-04	C C 2
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			1.52E-04	C C 2
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243			3.11E-08	C C 2
Cs 137			6.08E-05	C C 2	Cm 244			6.63E-07	C C 2
Ba 133				8	Cm 245			3.53E-09	C C 2
La 137				8	Cm 246			3.53E-09	C C 2
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				8	Unsp b/g				
Eu 154			4.06E-08	C C 2	Total a	0	*	2.15E-04	*
Eu 155				8	Total b/g	0	*	3.46E-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