

WASTE STREAM	5C326	Active Handling Facility Decommissioning VLLW and LA-LLW
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SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE VLLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 50.0		
Future arisings:	1.4.2029 - 31.3.2053	423.0		
Total future arisings:		423.0		
Total waste volume:		473.0		

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

Comment on arising rates: VLLW and LA-LLW soil and rubble arising from building decommissioning

Additional information on quantities: Volumes updated for 2016 RWI to reflect SMART Inventory Review. This waste was originally part of 5C300 but this has been split to provide greater clarity

Uncertainty factors on volumes: Stock (upper): x 1.00 Arisings (upper): x 2.00
Stock (lower): x 1.00 Arisings (lower): x 0.20

WASTE SOURCE -

PHYSICAL CHARACTERISTICS

General description: Low level and Very Low Level waste from post operational clear out work within the facility. The waste mainly comprises materials which have been removed during these activities, such as metal support structures and shielded cells, and various waste materials from the decommissioning of redundant plant. There are also secondary materials such as used PPE, swabs etc., associated with the management of these wastes.

Changes since waste generated: Land and buildings on the Harwell site, contaminated as a result of past operations.

Bulk density (t/m³): ~ 0.11

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): metal ~25%, 2% concrete/rubble, 4% biodegradable, 37% plastics, 15% rubber, 10% wood, 7% other including zinc bromide (0.5%)

Chemical state: -

Sheet metal proportion / thickness: -

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 11.0	Solid sheet, tubes, crushed drums	
Other ferrous metals.....	~ 9.0	Mild Steel - Solid sheet, tubes, crushed drums	
Iron.....	-	-	
Aluminium.....	~ 0.02	Solid metal sheet, tubes	
Beryllium.....	NE	-	
Cobalt.....	-	-	
Copper.....	~ 0.01	Solid metal wire, sheet	
Lead.....	~ 0.05	Block, sheet, container	
Magnox/Magnesium.....	NE	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	TR	Traces of UDEP	
Zinc.....	~ 0.10	Wire, crushed drum (galvanisation) (0.1%)	
Zircaloy/Zirconium.....	NE	-	
Other metals.....	~ 4.8	undefined	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 10.0	-	
Paper, cotton.....	= 0	-	
Wood.....	~ 10.0	-	
Halogenated plastics.....	~ 2.0	Sheeting, packaging, bags	
Total non-halogenated plastics.....	~ 35.0	-	
Condensation polymers.....	~ 17.5	Sheeting, packaging, bags	
Others.....	~ 17.5	Sheeting, packaging, bags	
Organic ion exchange materials.....	NE	-	
Total rubber.....	~ 15.0	-	
Halogenated rubber.....	~ 7.5	-	
Non-halogenated rubber.....	~ 7.5	-	
Hydrocarbons.....		-	
Oil or grease.....		-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....		-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....		-	
Others.....		-	
Other organics.....	NE	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	NE	-	
Soil.....		-	
Brick/Stone/Rubble.....	~ 2.0	-	
Cementitious material.....		-	
Sand.....		-	
Glass/Ceramics.....	NE	-	
Graphite.....	NE	-	
Desiccants/Catalysts.....		-	
Asbestos.....	~ 1.0	-	
Non/low friable.....	~ 1.0	Cladding / electrical chrysotile (white)	
Moderately friable.....		-	
Highly friable.....		-	
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.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	NE	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

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.....	~ 4.0	-
Putrescible wastes.....	~ 2.0	-
Non-putrescible wastes.....	~ 2.0	-
Corrosive materials.....		-
Pyrophoric materials.....		-
Generating toxic gases.....		-
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.....		-

Complexing agents (%wt):

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

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	P	-
EEE Type 2.....	P	-
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	~ 77.0
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		~ 23.0

Comments on planned treatments:

It is intended that 23% of the wastestream will be disposed of via controlled burial to an off-site landfill, therefore no waste containers will be produced.

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
	-	-	-	-	-	-

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			
Expected to be consigned to a Landfill Facility	= 23.0	0.11	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 77.0	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			

Classification codes for waste expected to be consigned to a landfill facility: 17 04 07, 17 06 01*, 17 02 01, 17 02 03

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Contamination as a result of past operations.

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		5C326		Active Handling Facility Decommissioning VLLW and LA-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		8		8	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14		8		8	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55		8		8	Pb 210		8		8
Co 60	3.49E-07	C C 2	2.06E-07	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	2.07E-06	C C 2	1.88E-06	C C 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234	1.20E-09	C C 2	1.20E-09	C C 2
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	1.20E-09	C C 2	1.20E-09	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	9.39E-09	C C 2	9.09E-09	C C 2
Sn 123		8		8	Pu 239	2.00E-08	C C 2	2.00E-08	C C 2
Sn 126		8		8	Pu 240	2.00E-08	C C 2	2.00E-08	C C 2
Sb 125		8		8	Pu 241	6.80E-07	C C 2	5.61E-07	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	1.59E-07	C C 2	1.62E-07	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	8.32E-06	C C 2	7.59E-06	C C 2	Cm 244		8		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Unsp a				
Eu 152		8		8	Unsp b/g				
Eu 154	1.58E-07	C C 2	1.14E-07	C C 2	Total a	2.10E-07	*	2.12E-07	*
Eu 155		8		8	Total b/g	1.16E-05	*	1.04E-05	*

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