

WASTE STREAM	1A02	LLW Non-Compactable Drummable
--------------	------	-------------------------------

SITE Amersham

SITE OWNER GE Healthcare

WASTE CUSTODIAN GE Healthcare Limited

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 7.3		
Future arisings:	1.4.2025 - 31.3.2030	~ 350.0		
Total future arisings:		350.0		
Total waste volume:		357.3		

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

Comment on arising rates: Waste arisings will be only from decommissioning over the next 5-10 years.

Additional information on quantities: -

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

WASTE SOURCE This waste was generated as a result of manufacturing and developing radio-pharmaceuticals and bio-science products. Waste will now only arise from decommissioning of redundant facilities.

PHYSICAL CHARACTERISTICS

General description: The waste generated is typically small laboratory equipment and consumables. The waste comprises glassware, plastic and metal items. No items require special handling.

The wastestream incorporates previous 1A09 incineration wastes and includes some liquids such as scintillation samples, standard solutions, and aqueous liquids in vials (medical product manufacturing rejections). Also ZnBr₂ from the Senior Caves facility decommissioning.

Composition data based on the majority stream, adding in 1A09 has not changed these numbers other than 1% for liquid to account for the liquid content of the incineration wastes

Changes since waste generated: None

Bulk density (t/m³): ~ 0.35

Comment on density: The waste density is 0.35 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Metals (53wt%), paper and cardboard (2wt%), glass (25wt%), plastic / rubber (16wt%), wood (1wt%), liquids (1wt%) and other (2wt%).

Chemical state: Neutral

Sheet metal proportion / thickness: Sheet metal: 20 wt% with typical thickness 1mm. Bulk items: 80 wt% with typical size 0.04m³.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 4.8	304/316	
Other ferrous metals.....	~ 35.5	Mild steel drum to BS1449 Part 1	
Iron.....	-	-	
Aluminium.....	< 1.0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	< 1.1	-	
Lead.....	~ 9.5	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	TR	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	< 0.10	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	~ 1.0	Tin, molybdenum may be present	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 3.0	-	
Paper, cotton.....	~ 2.0	-	
Wood.....	~ 1.0	-	
Halogenated plastics.....	~ 3.9	PVC sheeting / gaitors	
Total non-halogenated plastics.....	~ 6.0	Polyethylene / Polystyrene	
Condensation polymers.....	< 0.10	-	
Others.....	~ 6.0	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	~ 6.0	-	
Halogenated rubber.....	~ 3.0	Hypalon/neoprene gloves/gaitors	
Non-halogenated rubber.....	~ 3.0	Latex gloves	
Hydrocarbons.....	-	-	
Oil or grease.....	-	-	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	< 0.10	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	~ 26.0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	< 1.0	-	
Non/low friable.....	< 1.0	Floor / ceiling tiles	
Moderately friable.....	-	-	
Highly friable.....	-	-	
Free aqueous liquids.....	= 1.0	Zinc Bromide	
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.....	< 0.10	-
Chloride.....	< 0.10	-
Iodide.....	< 0.10	-
Cyanide.....	= 0	-
Carbonate.....	< 0.10	-
Nitrate.....	< 0.10	-
Nitrite.....	= 0	-
Phosphate.....	< 0.10	-
Sulphate.....	< 0.10	-
Sulphide.....	< 0.10	-

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.....	= 0	-
Non-putrescible wastes.....	= 2.0	paper / cotton.
Corrosive materials.....	P	Tiny quantities of acids in some incinerable wastes
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.....	= 3.9	PVC
Arsenic.....	= 0	-
Barium.....	= 0	-
Boron.....	= 0.20	-
Boron (in Boral).....		
Boron (non-Boral).....	0.20	Boron in Borosilicate glass
Cadmium.....	= 0	-
Caesium.....	= 0	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	= 0	-
Tin.....	P	<1%wt
Vanadium.....	= 0	-
Mercury compounds.....	= 0	-
Others.....	= 0	-

Complexing agents (%wt):

Yes		
	(%wt)	Type(s) and comment
EDTA.....		-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....	<< 0.01	The waste may contain minute quantities of EDTA on swabs.
Total complexing agents.....	<< 0.01	-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....	< 100	Stripped down circuit boards
EEE Type 2.....		-
EEE Type 3.....	< 100	tools
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		
None		= 99.0

Comments on planned treatments:

ZnBr incinerated

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: Majority will be diverted from repository to LALLW or incineration

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	= 5.0	~ 0.35	
Expected to be consigned to a Landfill Facility	= 94.0	~ 0.35	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 1.0	~ 4.0	
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: This waste was generated as a result of manufacturing and developing radio-pharmaceuticals and bio-science products. Radioactivity is present as low level contamination of general laboratory refuse and exists as a wide mixture of nuclides. The business mixture has changed and as a consequence fewer long lived nuclides are being generated. Waste will be generated from decommissioning of pharmaceutical manufacturing areas and redundant manufacturing areas for the production of radioactive sources and bio-science products. The Cs-137 figure is from the incineration of contaminated zinc bromide drained from shielding windows and substantially decontaminated using ion exchange.

Uncertainty: All waste drums are measured individually by gamma spectroscopy using hyperpure germanium detectors, giving high confidence in declared activity.

Measurement of radioactivities: Radioactivity in waste is assessed by either direct measurement or from processing records.

Chemical form of radionuclides: H-3: Organic - trace only
C-14: Organic - trace only
Cl-36: Sodium Chloride
Se-79: -
Tc-99: Trace quantity only - Potassium Pertechnetate
I-129: -
Ra: Radium sulphate
Th: -
U: -
Np: -
Pu: -

WASTE STREAM		1A02		LLW Non-Compactable Drummable					
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	= 2.44E-07	A A 1	~ 1.43E-08	A A 2	Gd 153				
Be 10					Ho 163				
C 14	= 1.84E-06	A A 1	~ 1.43E-08	A A 2	Ho 166m				
Na 22	= 5.94E-08	A A 1	~ 7.14E-08	A A 2	Tm 170				
Al 26					Tm 171				
Cl 36	= 1.37E-05	A A 1			Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53			~ 1.43E-08	A A 2	Tl 204			~ 1.43E-08	A A 2
Mn 54					Pb 205				
Fe 55					Pb 210	= 1.78E-09	A A 1	~ 3.43E-07	A A 2
Co 60	= 2.92E-06	A A 1	~ 1.67E-06	A A 2	Bi 208				
Ni 59					Bi 210m				
Ni 63	= 1.29E-04	A A 1	~ 1.86E-07	A A 2	Po 210			~ 3.43E-07	A A 2
Zn 65			~ 2.86E-07	A A 2	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226	= 5.70E-08	A A 1	~ 3.43E-07	A A 2
Kr 85					Ra 228				
Rb 87					Ac 227	= 1.37E-10	A A 1		
Sr 90	= 1.48E-05	A A 1	~ 6.57E-06	A A 2	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99			~ 1.43E-08	A A 2	U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m	= 3.70E-09	A A 1	~ 3.14E-08	A A 2	U 235				
Ag 110m			~ 1.00E-07	A A 2	U 236				
Cd 109	= 8.21E-09	A A 1	~ 1.00E-06	A A 2	U 238				
Cd 113m					Np 237	= 8.21E-08	A A 1		
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125	= 2.74E-09	A A 1	~ 1.43E-06	A A 2	Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241	= 8.29E-06	A A 1	~ 4.19E-05	A A 2
Te 127m					Am 242m				
I 129					Am 243				
Cs 134	= 2.44E-08	A A 1	~ 3.14E-08	A A 2	Cm 242				
Cs 135					Cm 243				
Cs 137	= 1.28E-05	A A 1	~ 1.91E-05	A A 2	Cm 244				
Ba 133	= 4.55E-06	A A 1	~ 3.73E-07	A A 2	Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147			~ 1.43E-08	A A 2	Cf 251				
Sm 147					Cf 252				
Sm 151					Unsp a				
Eu 152	= 2.06E-07	A A 1	~ 5.71E-07	A A 2	Unsp b/g	= 2.88E-09	A A 1	~ 1.64E-07	A A 2
Eu 154	= 1.49E-08	A A 1	~ 5.40E-07	A A 2	Total a	8.43E-06	*	4.26E-05	*
Eu 155	= 1.10E-09	A A 1	~ 1.43E-08	A A 2	Total b/g	1.80E-04	*	3.26E-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