

WASTE STREAM	5G24	Winfrith LLW Sources
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SITE Winfrith
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	2.0 m ³
Total future arisings:		0 m ³
Total waste volume:		2.0 m ³
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

WASTE SOURCE LLW sources arising from operations and experiments on the site.

PHYSICAL CHARACTERISTICS

General description: The sources will be varying sizes, and packaging will vary from plastic sealed/wrapped, concreted into a metal/plastic bin, cardboard box etc.

Physical components (%vol): Sources and immediate shielding (80%) miscellaneous items

Sealed sources: The waste contains sealed sources.

Bulk density (t/m³): ~2

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Sources (79%), unspecified and ferrous metals (12%), plastics (7%), others (2%). Sources will comprise metal/ plastic/ mica holders and source material.

Chemical state: Neutral

Chemical form of radionuclides: C-14: Present as labelled organic compounds
U: Metal or oxide

Metals and alloys (%wt):

Stainless steel.....	~10.0	
Other ferrous metals.....	~65.0	
Iron.....		
Aluminium.....	~0.10	
Beryllium.....		
Cobalt.....		
Copper.....	TR	
Lead.....	~10.0	
Magnox/Magnesium.....		
Nickel.....		
Titanium.....		
Uranium.....	P	
Zinc.....	0	
Zircaloy/Zirconium.....		
Other metals.....	~1.0	Tungsten and Depleted Uranium

Organics (%wt): -

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Total cellulose	~0.90
Paper, cotton	~0.90
Wood	0
Halogenated plastics	~1.0
Total non-halogenated plastics	~10.0
Condensation polymers	NE
Others	~10.0
Organic ion exchange materials	0
Total rubber	TR
Halogenated rubber	TR
Non-halogenated rubber	TR
Hydrocarbons	
Oil or grease	
Fuel	
Asphalt/Tarmac (cont.coal tar)	
Asphalt/Tarmac (no coal tar)	
Bitumen	
Others	
Other organics	NE

PVC is expected to be present together with small amounts of PTFE, neoprene and hypalon.

neoprene

Other materials (%wt):

-	
Inorganic ion exchange materials	
Inorganic sludges and flocs	
Soil	
Brick/Stone/Rubble	
Cementitious material	
Sand	
Glass/Ceramics	~0.80
Graphite	
Desiccants/Catalysts	
Asbestos	NE
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	NE
Free non-aqueous liquids	NE
Powder/Ash	NE

Inorganic anions (%wt):

Inorganic anions are not expected to be present in significant quantities

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Fluoride.....	<0.01
Chloride.....	<0.01
Iodide.....	<0.01
Cyanide.....	0
Carbonate.....	<0.10
Nitrate.....	<0.10
Nitrite.....	<0.10
Phosphate.....	<0.10
Sulphate.....	<0.10
Sulphide.....	<0.10

Materials of interest for waste acceptance criteria:

-	
Combustible metals.....	~2.0
Low flash point liquids.....	~0.50
Explosive materials.....	<0.01
Phosphorus.....	<0.01
Hydrides.....	<0.01
Biological etc. materials.....	<0.10
Biodegradable materials.....	<0.01
Putrescible wastes.....	<0.01
Non-putrescible wastes.....	
Corrosive materials.....	<0.01
Pyrophoric materials.....	<0.01
Generating toxic gases.....	<0.01
Reacting with water.....	<0.01
Active particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants:

-	
Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	
Boron.....	

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- Cadmium.....
- Caesium.....
- Selenium.....
- Chromium.....
- Molybdenum.....
- Thallium.....
- Tin.....
- Vanadium.....
- Mercury compounds.....
- Others.....
- Electronic Electrical Equipment (EEE)
 - EEE Type 1.....
 - EEE Type 2.....
 - EEE Type 3.....
 - EEE Type 4.....
 - EEE Type 5.....

Complexing agents (%wt):

- EDTA.....
- DPTA.....
- NTA.....
- Polycarboxylic acids.....
- Other organic complexants.....
- Total complexing agents.....

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		100.0

Comment on planned treatments:

-

WASTE STREAM**5G24****Winfrith LLW Sources****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Waste Packaging for Disposal:

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other	100.0	~2	1

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

Potential for the waste to contain discrete items: -

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

RADIOACTIVITY

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Source:	-
Uncertainty:	Radionuclides expected to be present shown in above table. Awaiting characterisation to determine activity values.
Definition of total alpha and total beta/gamma:	Where totals are shown on the table of radionuclide activities they are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma'.
Measurement of radioactivities:	-
Other information:	-

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Nuclide	Mean radioactivity, TBq/m ³			Nuclide	Mean radioactivity, TBq/m ³		
	Waste at 1.4.2019	Bands and Code	Future arisings		Waste at 1.4.2019	Bands and Code	Future arisings
H 3		8		Gd 153		8	
Be 10		8		Ho 163		8	
C 14		8		Ho 166m		8	
Na 22		8		Tm 170		8	
Al 26		8		Tm 171		8	
Cl 36		6		Lu 174		8	
Ar 39		8		Lu 176		8	
Ar 42		8		Hf 178n		8	
K 40		6		Hf 182		8	
Ca 41		8		Pt 193		8	
Mn 53		8		Tl 204		8	
Mn 54		8		Pb 205		8	
Fe 55		6		Pb 210		8	
Co 60		6		Bi 208		8	
Ni 59		8		Bi 210m		8	
Ni 63		6		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		6		Th 227		8	
Zr 93		8		Th 228		8	
Nb 91		8		Th 229		8	
Nb 92		8		Th 230		8	
Nb 93m		8		Th 232		8	
Nb 94		8		Th 234		8	
Mo 93		8		Pa 231		8	
Tc 97		8		Pa 233		8	
Tc 99		6		U 232		8	
Ru 106		8		U 233		8	
Pd 107		8		U 234		8	
Ag 108m		8		U 235		8	
Ag 110m		8		U 236		8	
Cd 109		8		U 238		8	
Cd 113m		8		Np 237		8	
Sn 119m		8		Pu 236		8	
Sn 121m		8		Pu 238		8	
Sn 123		8		Pu 239		8	
Sn 126		8		Pu 240		8	
Sb 125		8		Pu 241		8	
Sb 126		8		Pu 242		8	
Te 125m		8		Am 241		8	
Te 127m		8		Am 242m		8	
I 129		6		Am 243		8	
Cs 134		8		Cm 242		8	
Cs 135		8		Cm 243		8	
Cs 137		8		Cm 244		8	
Ba 133		6		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		Other a			
Eu 152		8		Other b/g			
Eu 154		8		Total a	NE	0	
Eu 155		8		Total b/g	NE	0	

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 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