

<b>WASTE STREAM</b>	<b>5G11</b>	<b>LLW Concrete Lined Drums</b>
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**SITE** Winfrith  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Magnox Limited  
**WASTE TYPE** LLW; PFSD

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	2.5 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		2.5 m <sup>3</sup>
Comment on volumes:	The volume has been calculated from the internal volume of the CLDs 0.63m <sup>3</sup> x 4CLDs = 2.52m <sup>3</sup>	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

**WASTE SOURCE** Historic Processing of wastes for sea disposal. Waste origins varied.

**PHYSICAL CHARACTERISTICS**

**General description:** Concrete-lined drums: 4off 1803 (0.63m<sup>3</sup> each). Miscellaneous waste held in mild steel drums within a concrete carcass.  
**Physical components (%wt):** 100% Concrete lined drums: 4off 1803 (0.63m<sup>3</sup> each). Waste in containers within the core - 36" high by 22" dia.  
**Sealed sources:** -  
**Bulk density (t/m<sup>3</sup>):** 1.56  
**Comment on density:** Recorded masses divided by total volume.

**CHEMICAL COMPOSITION**

**General description and components (%wt):** Concrete (>80 vol%), metals, plastics, glass, rubber, cellulose, possibly graphite (proportions not known, but have been estimated).  
**Chemical state:** Neutral  
**Chemical form of radionuclides:** U: Predominantly as oxide.  
 Pu: Predominantly as oxide.  
**Metals and alloys (%wt):** -

Stainless steel.....	P	
Other ferrous metals.....	~10.0	Mild steel present as outer drum, inner cans and reinforcement.
Iron.....		
Aluminium.....	P	
Beryllium.....	P	
Cobalt.....		
Copper.....	P	
Lead.....	P	Lead provides shielding in cores.
Magnox/Magnesium.....	0	
Nickel.....		
Titanium.....		
Uranium.....	TR	
Zinc.....	0	
Zircaloy/Zirconium.....	TR	
Other metals.....	NE	

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## Organics (%wt):

-		
Total cellulose	~2.0	
Paper, cotton	~2.0	
Wood	NE	
Halogenated plastics	~2.0	PVC
Total non-halogenated plastics	~2.0	
Condensation polymers	NE	
Others	~2.0	
Organic ion exchange materials	0	
Total rubber	~2.0	
Halogenated rubber	~2.0	Neoprene
Non-halogenated rubber	NE	
Hydrocarbons		
Oil or grease		
Fuel		
Asphalt/Tarmac (cont.coal tar)		
Asphalt/Tarmac (no coal tar)		
Bitumen		
Others		
Other organics	NE	

## Other materials (%wt):

Graphite present in one drum with the Be-clad fuel pins.		
Inorganic ion exchange materials	0	
Inorganic sludges and flocs	0	
Soil	0	
Brick/Stone/Rubble	0	
Cementitious material	~80.0	
Sand		
Glass/Ceramics	~2.0	
Graphite	NE	
Desiccants/Catalysts		
Asbestos	0	
Non/low friable		
Moderately friable		
Highly friable		
Free aqueous liquids	0	
Free non-aqueous liquids	NE	
Powder/Ash	P	

## Inorganic anions (%wt):

Chloride may be present in one package as eutectic powder. Other anions only present as components of cement.

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

Materials of interest for waste acceptance criteria:

-	
Combustible metals.....	0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	0
Biological etc. materials.....	0
Biodegradable materials.....	
Putrescible wastes.....	0
Non-putrescible wastes.....	
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
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):

No  
 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****5G11****LLW Concrete Lined Drums****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 <sup>3</sup>	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	10	< 1

Other information: -

**Waste Planned for Disposal at the LLW Repository:**

Container voidage: -

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).  
The waste does not have a current 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:	Activated metals, fuel contamination. Some sources and clad fuel.
Uncertainty:	-
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:	Combination of historic declarations, facility fingerprints and recent gamma measurements.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			Nuclide	Mean radioactivity, TBq/m <sup>3</sup>		
	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		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		Tl 204		8	
Mn 54		8		Pb 205		8	
Fe 55		8		Pb 210		8	
Co 60	6.38E-09	CC 2		Bi 208		8	
Ni 59		8		Bi 210m		8	
Ni 63		8		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	9.06E-08	CC 2		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	1.7E-05	CC 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	3.4E-05	CC 2	
Ag 108m		8		U 235	8.35E-06	CC 2	
Ag 110m		8		U 236		8	
Cd 109		8		U 238	1.7E-05	CC 2	
Cd 113m		8		Np 237		8	
Sn 119m		8		Pu 236		8	
Sn 121m		8		Pu 238	9.57E-05	CC 2	
Sn 123		8		Pu 239	4.49E-04	CC 2	
Sn 126		8		Pu 240	3.54E-04	CC 2	
Sb 125		8		Pu 241	1.94E-03	CC 2	
Sb 126		8		Pu 242	1.36E-07	CC 2	
Te 125m		8		Am 241	3.59E-04	CC 2	
Te 127m		8		Am 242m		8	
I 129		8		Am 243		8	
Cs 134		8		Cm 242		8	
Cs 135		8		Cm 243		8	
Cs 137	5.33E-07	CC 2		Cm 244		8	
Ba 133		8		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		<b>Total a</b>	<b>1.32E-03</b>	<b>CC 2</b>	<b>0</b>
Eu 155		8		<b>Total b/g</b>	<b>1.96E-03</b>	<b>CC 2</b>	<b>0</b>

**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