WASTE STREAM	5C325	Radiochemical Laboratory Decommissioning VLLW and LA-LLW

SITE Harwell

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE VLLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2021 - 31.3.2025.....	2628.0 m³
Total future arisings:		2628.0 m³
Total waste volume:		2628.0 m³

Comment on volumes: VLLW and LA-LLW soil and rubble arising from building decommissioning. 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	Arisings (upper)	x 2.0
Stock (lower):	x	Arisings (lower)	x 0.2

WASTE SOURCE -

PHYSICAL CHARACTERISTICS

General description: Predominantly soil. There should be no large items in this waste stream. Land and buildings on the Harwell site, contaminated as a result of past operations.

Physical components (%wt): Soil ~~85%; concrete/rubble ~~15%.

Sealed sources: -

Bulk density (t/m³): ~1.4

Comment on density: Average density for soil.

CHEMICAL COMPOSITION

General description and components (%wt): Soil ~~85%; concrete/rubble ~~15%.

Chemical state: -

Chemical form of radionuclides: -

Metals and alloys (%wt): There should be no sheet metal or bulk metal items present in the waste stream.

Stainless steel.....	NE
Other ferrous metals.....	NE
Iron.....	
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE
Nickel.....	
Titanium.....	
Uranium.....	NE
Zinc.....	NE
Zircaloy/Zirconium.....	NE
Other metals.....	NE

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Organics (%wt):	-	
	Total cellulosics	NE
	Paper, cotton	NE
	Wood	NE
	Halogenated plastics	NE
	Total non-halogenated plastics	NE
	Condensation polymers	NE
	Others	NE
	Organic ion exchange materials	NE
	Total rubber	NE
	Halogenated rubber	NE
	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):	-	
	Inorganic ion exchange materials.	NE
	Inorganic sludges and flocs	NE
	Soil	~~85.0
	Brick/Stone/Rubble	~~10.0
	Cementitious material	~~5.0
	Sand	
	Glass/Ceramics	NE
	Graphite	NE
	Desiccants/Catalysts	
	Asbestos	
	Non/low friable	
	Moderately friable	
	Highly friable	
	Free aqueous liquids	
	Free non-aqueous liquids	
	Powder/Ash	
Inorganic anions (%wt):	-	

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

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		
Recyling / reuse		
Other / various		
None		100.0

Comment on planned treatments: It is intended that the waste stream will be disposed of via controlled burial to an off-site landfill, therefore no waste containers will be produced. Disposal is likely to be in 1m3 bags at an off-site facility.

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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: (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m³	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			

Other information: -

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

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:	Contamination as a result of past operations.
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:	Specific activity estimates are based on consignments from this stream in 2012. These are the best estimates currently, but some areas have yet to be characterised, and so values may changes as more data becomes available. Activities decayed to reflect arisings date for 2019 UKRWI.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
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			5.9E-09	B B 2
Co 60			6.88E-08	B B 2	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63				8	Po 210			5.54E-09	B B 2
Zn 65				8	Ra 223			1.36E-09	B B 2
Se 79				8	Ra 225				8
Kr 81				8	Ra 226			2.72E-08	B B 2
Kr 85				8	Ra 228			1.4E-09	B B 2
Rb 87				8	Ac 227			1.36E-09	B B 2
Sr 90				8	Th 227			1.34E-09	B B 2
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230			2.72E-08	B B 2
Nb 93m				8	Th 232			2.26E-09	B B 2
Nb 94				8	Th 234			2.72E-08	B B 2
Mo 93				8	Pa 231			1.36E-09	B B 2
Tc 97				8	Pa 233				8
Tc 99				8	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234			2.72E-08	B B 2
Ag 108m				8	U 235			1.36E-09	B B 2
Ag 110m				8	U 236				8
Cd 109				8	U 238			2.72E-08	B B 2
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238			1.47E-08	B B 2
Sn 123				8	Pu 239			2.15E-07	B B 2
Sn 126				8	Pu 240			2.15E-07	B B 2
Sb 125				8	Pu 241			2.16E-07	B B 2
Sb 126				8	Pu 242				8
Te 125m				8	Am 241			1.94E-07	B B 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			1.91E-07	B B 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	**Total a**	**0**		**7.61E-07**	**B 2**
Eu 155				8	**Total b/g**	**0**		**5.12E-07**	**B 2**

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