WASTE STREAM 9R101/C Berkeley Centre Decommissioning : Primary ILW

SITE	Berkeley
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	ILW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Conditioned	Packaged
Stocks:	At 1.4.2022.....	15.0 m^3	32.6 m^3
Total future arisings:		0 m^3	0 m^3
Total waste volume:		15.0 m^3	32.6 m^3
Number of waste packages in stock:	At 1.4.2022.....	6 package(s)	

Comment on volumes:	Decommissioning of active facilities commenced in 2005.			
Uncertainty factors on volumes:	Stock (upper):	x 1.1	Arisings (upper)	x
	Stock (lower):	x 0.9	Arisings (lower)	x
WASTE SOURCE	Materials that have been used in the examination of irradiated fuel, steel and graphite.			

PHYSICAL CHARACTERISTICS

General description:	A variety of mild steel, stainless steel, lead and other materials mostly laboratory constructional materials and equipment. Includes some secondary waste. Waste can be packaged in standard ILW packages.
Physical components (%vol):	67% General Scrap, 14% General Waste, 10% Steel, 4% Plastics, 2% Stainless Steel, 3% Other.
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	~1.5
Comment on density:	The average bulk density is estimated at ~1.5 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt):	A variety of mild steels, stainless steels, lead and other materials. Percentage breakdown has not been assessed.
Chemical state:	Neutral
Chemical form of radionuclides:	H-3: The chemical form of tritium has not been assessed. C-14: The chemical form of carbon 14 has not been assessed. Cl-36: The chemical form of chlorine 36 has not been assessed. Ra: The radium isotopes content is expected to be insignificant. Th: The thorium isotopes content is expected to be insignificant. U: The chemical form of uranium isotopes has not been assessed. Pu: The chemical form of plutonium isotopes has not been assessed.
Metals and alloys (%wt):	Proportions of bulk metal items have not been assessed. Some items may be cut for packaging.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	NE		
Iron.....			
Aluminium.....	NE		
Beryllium.....	NE		
Cobalt.....	NE	Stellite	
Copper.....	NE		

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Lead	NE	
Magnox/Magnesium	TR	
Nickel	TR	Nimonic
Titanium		
Uranium		
Zinc	NE	
Zircaloy/Zirconium	NE	
Other metals	NE	Not fully assessed.

Organics (%wt): Some organic materials may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
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	0		
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): -

	(%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			
Glass/Ceramics	NE		
Graphite	NE		
Desiccants/Catalysts			
Asbestos	0		

Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	0
Powder/Ash.....	TR

Inorganic anions (%wt): Not assessed.

	(%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: No materials likely to pose a fire or other non-radiological hazard have been identified.

	(%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.....	0	
Putrescible wastes.....	0	
Non-putrescible wastes.....		
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	0	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances / non hazardous pollutants: Some lead is expected, other toxic metal contents have not been fully assessed.

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		

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Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	
Boron.....	0
Boron (in Boral).....	
Boron (non-Boral).....	
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): Yes

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....		
Total complexing agents.....	TR	

Potential for the waste to contain discrete items: Not yet determined. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

PACKAGING AND CONDITIONING

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Container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages
3m^3 RS box	100.0	~2.5	2.5	6

Container type comment: -

Range in container waste volume: -

Other information on containers: -

Conditioned density (t/m^3): -

Conditioned density comment: -

Other information on conditioning: -

RADIOACTIVITY

Source: Contamination of the materials.

Uncertainty: Estimates have been made from waste disposed during previous cave line refurbishment.

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: From health physics returns of LLW packages sent for disposal.

Other information: There will be contamination by fission products and activation products.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	1.29E-04	C C 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	2.00E-05	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	5E-05	C C 2			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	6.59E-06	C C 2			Pb 210		8		
Co 60	2.78E-05	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	5.41E-04	C C 2			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	1.40E-02	C C 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	1E-07	C C 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	4.11E-07	C C 2		
Ag 108m	9.75E-06	C C 2			U 235	7E-09	C C 2		
Ag 110m		8			U 236	8.00E-08	C C 2		
Cd 109		8			U 238	1E-07	C C 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	2.67E-04	C C 2		
Sn 123		8			Pu 239	7.00E-05	C C 2		
Sn 126		8			Pu 240	1.00E-04	C C 2		
Sb 125	1.37E-06	C C 2			Pu 241	3.40E-03	C C 2		
Sb 126		8			Pu 242		8		
Te 125m	3.42E-07	C C 2			Am 241	4.12E-04	C C 2		
Te 127m		8			Am 242m		8		
I 129	4E-09	C C 2			Am 243		8		
Cs 134	6.50E-07	C C 2			Cm 242		8		
Cs 135		8			Cm 243	1.41E-06	C C 2		
Cs 137	6.38E-03	C C 2			Cm 244	4.51E-05	C C 2		
Ba 133	2.61E-06	C C 2			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	1.14E-05	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152		8			Other b/g				
Eu 154	5.95E-05	C C 2			**Total a**	**8.95E-04**	**C C 2**	**0**	
Eu 155	5.98E-06	C C 2			**Total b/g**	**2.46E-02**	**C C 2**	**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