WASTE STREAM 5C313 B466 Ponds Decommissioning LLW

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

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	4.0 m³
Future arisings -	1.4.2024 - 31.3.2026.....	7.5 m³
Total future arisings:		7.5 m³
Total waste volume:		11.5 m³

Comment on volumes:	Volumes updated for 2016 RWI to reflect SMART Inventory Review			
Uncertainty factors on volumes:	Stock (upper):	x 1.2	Arisings (upper)	x 1.2
	Stock (lower):	x 0.8	Arisings (lower)	x 0.8

WASTE SOURCE Decommissioning of Co60 ponds.

PHYSICAL CHARACTERISTICS

General description:	Waste from decommissioning ponds/tanks consisting of metal, concrete and building rubble.
Physical components (%vol):	Metal, concrete, building rubble, cellulose, plastics, and rubber.
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m³):	~1.5
Comment on density:	Density will vary between 1 to 2 Te/m3.

CHEMICAL COMPOSITION

General description and components (%wt):	Metal, concrete, building rubble, cellulose, plastics, and rubber.
Chemical state:	Neutral
Chemical form of radionuclides:	-
Metals and alloys (%wt):	-

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	P		
Other ferrous metals.....	~35.0		
Iron.....			
Aluminium.....	P		
Beryllium.....			
Cobalt.....			
Copper.....	P		
Lead.....	P		
Magnox/Magnesium.....	TR		
Nickel.....			
Titanium.....			
Uranium.....	TR	Traces of Uranium metal may be present.	

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Zinc	NE
Zircaloy/Zirconium	TR
Other metals	

Organics (%wt): Halogenated plastics present are PVC and PTFE. Halogenated rubbers present are hypalon and neoprene.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	5.0		
Paper, cotton	P		
Wood	~5.0		
Halogenated plastics	P	PVC and PTFE.	
Total non-halogenated plastics	NE		
Condensation polymers	NE		
Others	NE		
Organic ion exchange materials	NE		
Total rubber	P		
Halogenated rubber	P	Hypalon and 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): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	NE		
Inorganic sludges and flocs	NE		
Soil	0		
Brick/Stone/Rubble	P		
Cementitious material	~60.0		
Sand			
Glass/Ceramics	0		
Graphite	0		
Desiccants/Catalysts			
Asbestos	0		
Non/low friable			
Moderately friable			
Highly friable			
Free aqueous liquids	0		
Free non-aqueous liquids	0		

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Powder/Ash.....	0

Inorganic anions (%wt): Carbonates present in concrete.

	(%wt)	Type(s) and comment
Fluoride.....	0	
Chloride.....	0	
Iodide.....	0	
Cyanide.....	0	
Carbonate.....	P	
Nitrate.....	0	
Nitrite.....	0	
Phosphate.....	0	
Sulphate.....	0	
Sulphide.....	0	

Materials of interest for waste acceptance criteria: Traces of uranium metal may be present.

	(%wt)	Type(s) and comment
Combustible metals.....	TR	
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: -

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		

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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):

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

Potential for the waste to contain discrete items:	Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIsLarge Concrete Items (LCIs) may be DIs; drummed (ungrouted)/"rubbleised" wastes assumed not DIs

TREATMENT, PACKAGING AND DISPOSAL

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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: -

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	100.0	1.5
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		

Classification codes for waste expected to be consigned to a landfill facility: -

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

Waste Packaging for Disposal:

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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	100.0	~10	2

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: No. Data not yet available.

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

Source: The radionuclide fingerprint for this waste stream has been updated using data from waste stream 5C331.

Uncertainty: The radionuclides in the table are expected to be present but dominated by Co60 and Cs137. Full characterisation will be undertaken near to the start of decommissioning.

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: The radionuclides in the table are expected to be present but dominated by Co60 and Cs137. Full characterisation will be undertaken near to the start of decommissioning.

Other information: -

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Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3		6		6	Gd 153		6		6
Be 10		8		8	Ho 163		8		8
C 14		8		8	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		6		6	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55		6		6	Pb 210	4.88E-09	C C 2	6.31E-09	C C 2
Co 60	9.64E-08	C C 2	7.41E-08	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63		8		8	Po 210	4.46E-09	C C 2	5.92E-09	C C 2
Zn 65		8		8	Ra 223	1.46E-09	C C 2	1.46E-09	C C 2
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226	2.91E-08	C C 2	2.91E-08	C C 2
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227	1.46E-09	C C 2	1.46E-09	C C 2
Sr 90		8		8	Th 227	1.44E-09	C C 2	1.44E-09	C C 2
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230	2.91E-08	C C 2	2.91E-08	C C 2
Nb 93m		8		8	Th 232	2.42E-09	C C 2	2.42E-09	C C 2
Nb 94		8		8	Th 234	2.91E-08	C C 2	2.91E-08	C C 2
Mo 93		8		8	Pa 231	1.46E-09	C C 2	1.46E-09	C C 2
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	2.91E-08	C C 2	2.91E-08	C C 2
Ag 108m		8		8	U 235	1.46E-09	C C 2	1.46E-09	C C 2
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238	2.91E-08	C C 2	2.91E-08	C C 2
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	1.59E-08	C C 2	1.57E-08	C C 2
Sn 123		8		8	Pu 239	2.3E-07	C C 2	2.3E-07	C C 2
Sn 126		8		8	Pu 240	2.3E-07	C C 2	2.3E-07	C C 2
Sb 125		8		8	Pu 241	2.55E-07	C C 2	2.31E-07	C C 2
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	2.07E-07	C C 2	2.07E-07	C C 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	2.15E-07	C C 2	2.05E-07	C C 2	Cm 244		8		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147		8		8	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152		6		6	Other b/g				
Eu 154		6		6	**Total a**	**8.12E-07**	**C C 2**	**8.13E-07**	**C C 2**
Eu 155		6		6	**Total b/g**	**6.02E-07**	**C C 2**	**5.47E-07**	**C C 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