WASTE STREAM 9D922 Sludge Canning Building Decommissioning LLW

SITE	Hinkley Point A
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.....	24.8 m^3
Future arisings -	1.4.2022 - 31.3.2024.....	115.3 m^3
Total future arisings:		115.3 m^3
Total waste volume:		140.1 m^3
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x 1.1
	Stock (lower): x 0.8	Arisings (lower) x 0.5

WASTE SOURCE Decommissioning of the Sludge Canning Building.

PHYSICAL CHARACTERISTICS

General description:	Mixture of building materials and plant items. Concrete, rubble, general wastes and redundant equipment. Metals include stainless steel and mild steel. Glass and plastics. Small quantities of asbestos. The waste will consist of: staircases, handrails, supporting framework, floor plates, building fabrication, lead shielding panels, multiple pumps and transfer lines, a building sump, water tanks, drum handling equipment, a settling tank and a compressed air system (list not exhaustive). All pumps, transfer lines and tanks are free from liquid/oil.
Physical components (%wt):	Concrete/rubble (~1% wt), soil (~1%), metals (~87% wt), glass (<1% wt), plastic (~4% wt), wood (~1%), rubber (~1%), biodegradable (2%), plasterboard (1%), other organic (1%).
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	~0.5
Comment on density:	determined from WCH data mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt):	Concrete/rubble (~1% wt), soil (~1%), metals (~87% wt), glass (<1% wt), plastic (~4% wt), wood (~1%), rubber (~1%), biodegradable (2%), plasterboard (1%), other organic (1%).
Chemical state:	Neutral
Chemical form of radionuclides:	-
Metals and alloys (%wt):	-

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....	~69.9	mild steel components	
Iron.....	~10.6	iron metal / alloy components	
Aluminium.....	~0.20	aluminium components	
Beryllium.....			
Cobalt.....			
Copper.....	~0.60	copper components	
Lead.....	~0.60	lead components	
Magnox/Magnesium.....	0		

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Nickel	~1.9	stainless steel components
Titanium		
Uranium		
Zinc	0.20	galvanised steel components
Zircaloy/Zirconium	0	
Other metals	NE	

Organics (%wt): The waste may contain halogenated plastics and possibly halogenated rubbers.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	~1.0		
Paper, cotton	0		
Wood	~1.0		
Halogenated plastics	~2.0	plastic components	
Total non-halogenated plastics	~2.0	plastic components	
Condensation polymers	~1.0		
Others	~1.0		
Organic ion exchange materials	0		
Total rubber	~1.0		
Halogenated rubber	~0.50		
Non-halogenated rubber	~0.50		
Hydrocarbons			
Oil or grease			
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	~1.0		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	0		
Inorganic sludges and flocs	0		
Soil	~1.0		
Brick/Stone/Rubble	1.0		
Cementitious material	0		
Sand	0		
Glass/Ceramics	~0.80		
Graphite	0		
Desiccants/Catalysts	0		
Asbestos	0.01		
Non/low friable	0		
Moderately friable	0.01	Pipework gaskets - mixture	

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Highly friable	0
Free aqueous liquids	0
Free non-aqueous liquids	0
Powder/Ash	0

Inorganic anions (%wt): -

	(%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: -

	(%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	~2.0	
Putrescible wastes	~1.0	
Non-putrescible wastes	~1.0	
Corrosive materials	0	
Pyrophoric materials	0	
Generating toxic gases	0	
Reacting with water	P	976m2
Higher activity particles		
Soluble solids as bulk chemical compounds		

Hazardous substances / non hazardous pollutants: Asbestos

	(%wt)	Type(s) and comment
Acrylamide		
Benzene		
Chlorinated solvents		
Formaldehyde		

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Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....		
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....	2.6	stainless steel components
Molybdenum.....	0.40	stainless steel components
Thallium.....		
Tin.....		
Vanadium.....		
Mercury compounds.....		
Others.....	1.0	Plasterboard
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....	P	10 electrical pumps
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: Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed 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	On-site	~4.0
Supercompaction (HFC)	Off-site	~4.0
Incineration	Off-site	~12.0
Solidification		
Decontamination		
Metal treatment	Off-site	~36.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None		48.0

Comment on planned treatments: 36% of the waste will potentially go for Metal Melt with 4% to Landfill.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	~48.0	0.50
Expected to be consigned to a Landfill Facility	~4.0	0.50
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	~12.0	0.40
Expected to be consigned to a Metal Treatment Facility	~36.0	1.4
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	4.0	43.2	< 1
1/2 Height IP-2 Disposal/Re-usable ISO	44.0	10	7
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: 43.2m3 loading volume is calculated based on the fact that you can low force compact two times the normal volume of waste into a 200 litre/0.2m3 drum (400 litres/0.4m3), you can then fit 36 drums (14.4m3) into a ½ height ISO, each drum can be super-compacted to a 1/3 of its original volume so therefore we can get 3 x the amount of un-compacted drums into the final disposal container (43.2m3).

Waste Planned for Disposal at the LLW Repository:

Container voidage: Not yet determined.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste has a current WCH.
Inventory information is consistent with the current WCH.

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

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 Sludge Canning Building was built to process radioactive sludge from the ponds. Contamination of steel pipework, vessels, surfaces and concrete structure. Activity is derived from activation products, fission products and fuel contamination.

Uncertainty: The values quoted were derived by measurement and calculation using plant items in the building, and are indicative of the activities that are expected.

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: Activities taken from WCH 1MXN-3HIA-0-WCH-0-4060 V5 and decayed by six years for RWI 2022.

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	1.32E-06	C C 2	1.32E-06	C C 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	4.15E-06	C C 2	4.15E-06	C C 2	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		8		8	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		8		8	Pb 210		8		8
Co 60	2.1E-07	C C 2	2.1E-07	C C 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.33E-06	C C 2	1.33E-06	C C 2	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	5.93E-04	C C 2	5.93E-04	C C 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233	2.37E-09	C C 2	2.37E-09	C C 2
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234	4.63E-07	C C 2	4.63E-07	C C 2
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237	2.41E-09	C C 2	2.41E-09	C C 2
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	7.79E-05	C C 2	7.79E-05	C C 2
Sn 123		8		8	Pu 239	1.62E-04	C C 2	1.62E-04	C C 2
Sn 126		8		8	Pu 240	1.62E-04	C C 2	1.62E-04	C C 2
Sb 125		8		8	Pu 241	1.47E-03	C C 2	1.47E-03	C C 2
Sb 126		8		8	Pu 242	4.15E-06	C C 2	4.15E-06	C C 2
Te 125m		8		8	Am 241	1.24E-03	C C 2	1.24E-03	C C 2
Te 127m		8		8	Am 242m		8		8
I 129	9.23E-07	C C 2	9.23E-07	C C 2	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243	4.82E-06	C C 2	4.82E-06	C C 2
Cs 137	2.51E-04	C C 2	2.51E-04	C C 2	Cm 244	4.4E-06	C C 2	4.4E-06	C C 2
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	9.45E-08	C C 2	9.45E-08	C C 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152		8		8	Other b/g				
Eu 154	8.25E-06	C C 2	8.25E-06	C C 2	**Total a**	**1.66E-03**	**C C 2**	**1.66E-03**	**C C 2**
Eu 155	3.91E-07	C C 2	3.91E-07	C C 2	**Total b/g**	**2.33E-03**	**C C 2**	**2.33E-03**	**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