WASTE STREAM 9D53 VLLW Asbestos and MMMF

SITE	Hinkley Point A
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Magnox Limited
WASTE TYPE	VLLW
Is the waste subject to Scottish Policy:	No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	256.8 m^3
Total future arisings:		0 m^3
Total waste volume:		256.8 m^3
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.5	Arisings (lower) x

WASTE SOURCE

Insulation removed from radiologically designated areas of plant.These wastes are originating from the bulk asbestos strip of the Inlet Gas Valves (IGVs) and Outlet Gas Valves (OGVs) in Reactor 1. These materials will have been subject to neutron activation due to the IGVs and OGVs proximity to the reactor core and weaknesses in the biological shield. Consequently, the materials have elevated levels of activation products such as Co-60 and no reactor gas radionuclides compared to the standard reactor fingerprint used at Hinkley Point A.

PHYSICAL CHARACTERISTICS

General description:	Asbestos and man made mineral fibre (MMMF) insulation material. The types of waste associated with this waste stream are primarily:- Asbestos and MMMF insulation, - Steelwork and scaffold materials, including scaffold poles and scaffold clips, most of which will have asbestos fibres attached, - Chicken wire, which was used a substrate for the insulation. The chicken wire will not be able to be separated from the asbestos and MMMF insulation. - Concrete, which was used as a hard set layer on the outsides of the pipework on top of the layer of lagging, - Plastic wastes in the form of polythene bags and PacTec bags.
Physical components (%vol):	Metal (19% wt), Concrete / rubble (19% wt), other materials (60% wt) and soft organics (2%wt).The principal other materials is insulation of which 48% is asbestos and 12% MMMF.
Sealed sources:	The waste does not contain sealed sources.
Bulk density (t/m^3):	0.59
Comment on density:	Density is taken from WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt):	Metal (19% wt), Concrete / rubble (19% wt), other materials (60% wt) and soft organics (2%wt).The proncipal other materials is insulation of which 48% is asbestos and 12% MMMF.
Chemical state:	Neutral
Chemical form of radionuclides:	H-3: The chemical form of tritium is tritiated water C-14: The carbon content is insignificant Cl-36: Chlorine 36 incorporated in the Magnox may be associated with barium impurity (barium chloride). Other Cl-36 may be associated with surface contamination. Se-79: The selenium content is insignificant. Tc-99: The technetium content is insignificant. Ra: The radium isotope content is insignificant. Th: The thorium content is insignificant. U: The uranium isotope content is insignificant. Np: The neptunium content is insignificant. Pu: The plutonium isotope content is insignificant.
Metals and alloys (%wt):	-

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	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel	0		
Other ferrous metals	~19.0	Alloy (2730 kg of 3000 kg of mild steel-zinc alloy), the rest Metal	
Iron			
Aluminium	0		
Beryllium	TR		
Cobalt			
Copper	0		
Lead	0		
Magnox/Magnesium	0		
Nickel			
Titanium			
Uranium			
Zinc	~0.08	Alloy (270 kg of 1500 kg of mild steel-zinc alloy)	
Zircaloy/Zirconium	0		
Other metals	0		

Organics (%wt): Organic materials have not been fully assessed. There are polythene bags containing the waste.

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

Other materials (%wt): -

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	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	19.0	used as a hard set layer on the outsides of the pipework on top of the layer of lagging	
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	~12.0	MMMF lagging - Fibre glass	
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	~48.0		
Non/low friable.....	0		
Moderately friable.....	0		
Highly friable.....	~48.0	Asbestos lagging. Expected to comprise of white, brown and blue asbestos.	
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Inorganic ions have not been fully 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: Asbestos insulation.

	(%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	

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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: Asbestos (48%).

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

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Complexing agents (%wt): No

	(%wt)	Type(s) and comment
EDTA.....		
DPTA.....		
NTA.....		
Polycarboxylic acids…….		
Other organic complexants.....		
Total complexing agents.....	0	

Potential for the waste to contain discrete items: No. In & of itself not a DI

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: 100% of the waste stream is expected to be sent to Landfill as VLLW.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository		
Expected to be consigned to a Landfill Facility	100.0	0.59
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: 17 04 05, 17 05 03*/04, 17 06 03*, 17 06 01

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: -

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

Waste Packaging for Disposal: (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m^3	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: -

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: Contamination products present in the waste.

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: Data taken from WCH 1MXN-3HIA-0-WCH-M-4319 V4 Approved decayed by 4 years

Other information: -

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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	3.32E-06	C C 1			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.16E-07	C C 1			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	3.57E-08	C C 2			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		8			Pb 205		8		
Fe 55	1.73E-06	C C 1			Pb 210		8		
Co 60	2.11E-06	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	6.35E-07	C C 1			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		8			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		8		
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		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238		8		
Sn 123		8			Pu 239		8		
Sn 126		8			Pu 240		8		
Sb 125		8			Pu 241		8		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	4.14E-09	C C 1		
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	2.72E-09	C C 2			Cm 244		8		
Ba 133	3.34E-08	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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	7.26E-07	C C 2			Other b/g				
Eu 154	5.59E-08	C C 2			**Total a**	**4.14E-09**	**C C 2**	**0**	
Eu 155		8			**Total b/g**	**9.06E-06**	**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