

WASTE STREAM	3T06	LLW Sludges
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SITE Hinkley Point C
SITE OWNER NNB GenCo (HPC) Ltd
WASTE CUSTODIAN NNB GenCo (HPC) Ltd
WASTE TYPE LLW
 Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	0m ³
Future arisings -	1.4.2027 - 31.3.2028.....	~1.0m ³
	1.4.2028 - 31.3.2029.....	~1.0m ³
	1.4.2029 - 31.3.2030.....	~1.0m ³
	1.4.2030 - 31.3.2031.....	~1.0m ³
	1.4.2031 - 31.3.2032.....	~1.0m ³
	1.4.2032 - 31.3.2033.....	~1.0m ³
	1.4.2033 - 31.3.2034.....	~1.0m ³
	1.4.2034 - 31.3.2035.....	~1.0m ³
	1.4.2035 - 31.3.2036.....	~1.0m ³
	1.4.2036 - 31.3.2037.....	~1.0m ³
	1.4.2037 - 31.3.2038.....	~1.0m ³
	1.4.2038 - 31.3.2039.....	~1.0m ³
	1.4.2039 - 31.3.2040.....	~1.0m ³
	1.4.2040 - 31.3.2041.....	~1.0m ³
	1.4.2041 - 31.3.2042.....	~1.0m ³
	1.4.2042 - 31.3.2043.....	~1.0m ³
	1.4.2043 - 31.3.2044.....	~1.0m ³
	1.4.2044 - 31.3.2045.....	~1.0m ³
	1.4.2045 - 31.3.2046.....	~1.0m ³
	1.4.2046 - 31.3.2047.....	~1.0m ³
	1.4.2047 - 31.3.2048.....	~1.0m ³
	1.4.2048 - 31.3.2049.....	~1.0m ³
	1.4.2049 - 31.3.2050.....	~1.0m ³
	1.4.2050 - 31.3.2051.....	~1.0m ³
	1.4.2051 - 31.3.2052.....	~1.0m ³
	1.4.2052 - 31.3.2053.....	~1.0m ³
	1.4.2053 - 31.3.2054.....	~1.0m ³
	1.4.2054 - 31.3.2055.....	~1.0m ³
	1.4.2055 - 31.3.2056.....	~1.0m ³
	1.4.2056 - 31.3.2057.....	~1.0m ³
	1.4.2057 - 31.3.2058.....	~1.0m ³
	1.4.2058 - 31.3.2059.....	~1.0m ³
	1.4.2059 - 31.3.2060.....	~1.0m ³
	1.4.2060 - 31.3.2061.....	~1.0m ³
	1.4.2061 - 31.3.2062.....	~1.0m ³
	1.4.2062 - 31.3.2063.....	~1.0m ³
	1.4.2063 - 31.3.2064.....	~1.0m ³
	1.4.2064 - 31.3.2065.....	~1.0m ³
	1.4.2065 - 31.3.2066.....	~1.0m ³
	1.4.2066 - 31.3.2067.....	~1.0m ³
	1.4.2067 - 31.3.2068.....	~1.0m ³
	1.4.2068 - 31.3.2069.....	~1.0m ³
	1.4.2069 - 31.3.2070.....	~1.0m ³
	1.4.2070 - 31.3.2071.....	~1.0m ³
	1.4.2071 - 31.3.2072.....	~1.0m ³
	1.4.2072 - 31.3.2073.....	~1.0m ³
	1.4.2073 - 31.3.2074.....	~1.0m ³
	1.4.2074 - 31.3.2075.....	~1.0m ³

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1.4.2075 - 31.3.2076.....	~1.0 m ³
1.4.2076 - 31.3.2077.....	~1.0 m ³
1.4.2077 - 31.3.2078.....	~1.0 m ³
1.4.2078 - 31.3.2079.....	~1.0 m ³
1.4.2079 - 31.3.2080.....	~1.0 m ³
1.4.2080 - 31.3.2081.....	~1.0 m ³
1.4.2081 - 31.3.2082.....	~1.0 m ³
1.4.2082 - 31.3.2083.....	~1.0 m ³
1.4.2083 - 31.3.2084.....	~1.0 m ³
1.4.2084 - 31.3.2085.....	~1.0 m ³
1.4.2085 - 31.3.2086.....	~1.0 m ³
1.4.2086 - 31.3.2087.....	~1.0 m ³

Total future arisings: 60.0 m³

Total waste volume: 60.0 m³

Comment on volumes: No volume uncertainty data currently available.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.0
 Stock (lower): x Arisings (lower) x 1.0

WASTE SOURCE

During the operation of the Hinkley Point C UK EPR units, particulates will settle as sludges in various buffer and storage tanks associated with the auxiliary water circuits (e.g. Liquid Waste Processing System (TEU [LWPS]), Liquid Radwaste Monitoring and Discharge System (KER [LRMDS])). These are contaminated with a range of fission and activated corrosion products. This sludge is periodically cleaned out and removed for treatment prior to disposal.

PHYSICAL CHARACTERISTICS

General description: The physical form of this waste stream is described as a sludge consisting of settled metal oxide particulate.

Physical components (%wt): 100% sludge

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): NE

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Inorganic sludge (100%)

Chemical state: -

Chemical form of radionuclides: -

Metals and alloys (%wt): Metals that are also hazardous are reported in the hazardous section

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....			
Other ferrous metals.....			
Iron.....			
Aluminium.....			
Beryllium.....			
Cobalt.....			
Copper.....			
Lead.....	~0.03		
Magnox/Magnesium.....			
Nickel.....	~0.02		
Titanium.....			

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Uranium.....

Zinc.....

Zircaloy/Zirconium.....

Other metals..... <0.01 antimony

Organics (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	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.....	NE		
Oil or grease	NE		
Fuel.....	NE		
Asphalt/Tarmac (cont.coal tar)...	NE		
Asphalt/Tarmac (no coal tar)....	NE		
Bitumen.....	NE		
Others.....	NE		
Other organics.....	NE		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..			
Inorganic sludges and flocs.....	~100.0		
Soil.....			
Brick/Stone/Rubble.....			
Cementitious material.....			
Sand.....			
Glass/Ceramics.....			
Graphite.....			
Desiccants/Catalysts.....			
Asbestos.....			
Non/low friable.....			
Moderately friable.....			
Highly friable.....			
Free aqueous liquids.....			

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Free non-aqueous liquids.....

Powder/Ash.....

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.....	NE	
Low flash point liquids.....	NE	
Explosive materials.....	NE	
Phosphorus.....	NE	
Hydrides.....	NE	
Biological etc. materials.....	NE	
Biodegradable materials.....	NE	
Putrescible wastes.....	NE	
Non-putrescible wastes.....	NE	
Corrosive materials.....	NE	
Pyrophoric materials.....	NE	
Generating toxic gases.....	NE	
Reacting with water.....	NE	
Higher activity particles.....	NE	
Soluble solids as bulk chemical compounds.....	NE	

Hazardous substances / non hazardous pollutants: -

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

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Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	<0.01
Barium.....	
Boron.....	~0.10
Boron (in Boral).....	
Boron (non-Boral).....	
Cadmium.....	
Caesium.....	
Selenium.....	
Chromium.....	~0.02
Molybdenum.....	
Thallium.....	
Tin.....	
Vanadium.....	
Mercury compounds.....	<0.01
Others.....	
Electronic Electrical Equipment (EEE)	
EEE Type 1.....	
EEE Type 2.....	
EEE Type 3.....	
EEE Type 4.....	
EEE Type 5.....	

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: Yes. Encapsulation in 500l drum

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 Recycling / reuse Other / various None	On-site	100.0

Comment on planned treatments:

Encapsulation

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 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	NE

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 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	~100.0	~2.4	25

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: Waste loading based on 36 drums each with 0.18 m³ of sludge per drum. In reality due to low volumes drums will be mixed with other wastes as part of routine consignment.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste does not have a current WCH.

Agreement in principle received but no disposals made yet.

Waste consigned for disposal to LLWR in year of generation: No. Sludges will be retrieved on a campaign basis for encapsulation and then transfer to LLWR.

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: During the operation of the Hinkley Point C UK EPR units, particulates will settle as sludges in various buffer and storage tanks associated with the auxiliary water circuits (e.g. Liquid Waste Processing System (TEU [LWPS]), Liquid Radwaste Monitoring and Discharge System (KER [LRMDS])). These are contaminated with a range of fission and activated corrosion products. This sludge is periodically cleaned out and removed for treatment prior to disposal.

Uncertainty: -

Definition of total alpha and total beta/gamma: In addition to the individual radionuclides which have been quantified the total beta gamma value accounts for relevant radionuclides which have been identified but not quantified individually. Total alpha may include some relevant radionuclides however which ones and in what quantity is not known at this stage.

Measurement of radioactivities: -

Other information: -

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	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			~8.16E-04	BB 2	Gd 153				
Be 10				6	Ho 163				
C 14			~3.86E-05	BB 2	Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36				6	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41				6	Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60			~3.51E-03	BB 2	Bi 208				
Ni 59				6	Bi 210m				
Ni 63					Po 210				
Zn 65					Ra 223				
Se 79				6	Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90				6	Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m				6	Th 232				
Nb 94				6	Th 234				
Mo 93				6	Pa 231				
Tc 97					Pa 233				
Tc 99				6	U 232				
Ru 106					U 233				
Pd 107				6	U 234				
Ag 108m				6	U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m				6	Pu 238				
Sn 123					Pu 239				
Sn 126				6	Pu 240				
Sb 125				6	Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129			~1.8E-10	BB 2	Am 243				
Cs 134				6	Cm 242				
Cs 135				6	Cm 243				
Cs 137				6	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151				6	Other a				
Eu 152					Other b/g				
Eu 154					Total a	0	~5.26E-07	BB 2	
Eu 155					Total b/g	0	~1.88E-02	BB 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