

WASTE STREAM	9D23	Sludge
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SITE Hinkley Point A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025			
Future arisings:	~ 4.8			
Total future arisings:	0.0			
Total waste volume:	4.8			

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: -

Additional information on quantities: Volumes may be between 5 and 15m³ and are still to be confirmed

Uncertainty factors on volumes:

Stock (upper):	x 1.30	Arisings (upper):	x -
Stock (lower):	x 0.90	Arisings (lower):	x -

WASTE SOURCE The sludge originates from routine filtration of liquid effluents and cooling pond water and from special clean-up operations on cooling ponds.

PHYSICAL CHARACTERISTICS

General description: The waste consists of fuel pond corrosion products such as magnesium hydroxide and carbonate detached from fuel elements and extraneous materials such as flakes of paint and ion exchange from Caesium Removal units. Also there is some filter sand. Sludge particles may be up to millimetre size, and there will probably be 80-900 kg/m³ of solid material. Once fluidised the sludges should be readily transferred by pumping but reconcentration may be time consuming. There are no large items that may require special handling.

Changes since waste generated: -

Bulk density (t/m³): = 1.2

Comment on density: The bulk density of the waste ranges from 0.8 to 1.5 t/m³, with an average of about 1.2 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Water (48% wt), sand/sludge (52% wt). The chemical components of these items are magnesium hydroxide, magnesium carbonate, silica and a range of other materials including ferric oxide and magnetite.

Chemical state: Alkali

Sheet metal proportion / thickness: No sheet or bulk metal present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	P	-	
Iron.....		-	
Aluminium.....	P	-	
Beryllium.....	0	-	
Cobalt.....		-	
Copper.....	= 0	-	
Lead.....	P	-	
Magnox/Magnesium.....	P	Some unreacted Magnox is expected.	
Nickel.....		-	
Titanium.....	P	-	
Uranium.....	P	-	
Zinc.....	P	-	
Zircaloy/Zirconium.....	P	-	
Other metals.....	= 0	There are no "other" metals.	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	= 0	-	
Others.....	= 0	-	
Organic ion exchange materials.....	TR	-	
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.....	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	TR	-	
Inorganic sludges and flocs.....	~ 30.0	Including Ferrous metals (3.7%), aluminium (0.3%), lead (0.02%), magnesium (14%), titanium (0.03%), uranium (1.2%), zinc (0.06%) and zirconium/zircaloy (0.02%)	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	~ 22.0	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	~ 48.0	-	
Free non-aqueous liquids.....	TR	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	= 0	-
Chloride.....	= 0	-
Iodide.....	= 0	-
Cyanide.....	= 0	-
Carbonate.....	= 6.3	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	= 2.0	-
Sulphide.....	= 0	-

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

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....		-

Physical components:

	Number	Type(s) and comment
Sources.....		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

Planned on-site / off-site treatment(s):

Treatment	On-site / Off-site	Stream volume %
Size reduction Decay storage Low force compaction Supercompaction (HFC) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	100.0

Comments on planned treatments:

-

Conditioning method:

Encapsulation of mobile waste into 3m3 box.

Conditioning plants:

Plant Name	Location
HPA MILWEP	Hinkley Point A

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	3 m³ box (side lifting)	100.0	1.5	2.9	4	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -

Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

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

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Contaminated sludge. Contamination by fission products, actinides and activation products.

Uncertainty: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected. Uncertainty bands remain unchanged from extant RWI as it was not deemed possible to provide robust justification for decreasing uncertainty based on the limited sampling carried out as part of the characterisation review.

Measurement of radioactivities: -

Chemical form of radionuclides:

H-3: Most tritium is expected to be present as water but some may be present in the form of other inorganic compounds or as organic compounds.

C-14: Carbon 14 may be present as graphite.

Cl-36: The chlorine 36 content is insignificant.

Se-79: The selenium content is insignificant.

Tc-99: The technetium content is insignificant.

I-129: -

Ra: The radium isotope content is insignificant.

Th: The thorium isotope content is insignificant.

U: The chemical form of uranium isotopes has not been determined but will probably be uranium oxides.

Np: The chemical form of neptunium has not been determined.

Pu: The chemical form of plutonium isotopes has not been determined but will probably be plutonium oxides.

WASTE STREAM			9D23		Sludge				
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	4.90E-03	C C 2			Gd 153		8		
Be 10					Ho 163		8		
C 14	4.67E-03	C C 2			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36					Lu 174		8		
Ar 39					Lu 176		8		
Ar 42					Hf 178n		8		
K 40	< 9.21E-05	C 3			Hf 182		8		
Ca 41					Pt 193		8		
Mn 53					Tl 204		8		
Mn 54	< 8.07E-08	C 3			Pb 205		8		
Fe 55	3.40E-04	C C 2			Pb 210		8		
Co 60	2.52E-03	C C 2			Bi 208		8		
Ni 59					Bi 210m		8		
Ni 63	1.21E-02	C C 2			Po 210		8		
Zn 65	< 3.29E-08	C 3			Ra 223		8		
Se 79					Ra 225		8		
Kr 81					Ra 226		8		
Kr 85					Ra 228		8		
Rb 87					Ac 227		8		
Sr 90	1.04E+00	C C 2			Th 227		8		
Zr 93					Th 228	9.99E-06	C C 2		
Nb 91					Th 229		8		
Nb 92					Th 230	7.72E-09	C C 2		
Nb 93m					Th 232		8		
Nb 94					Th 234	< 1.77E-04	C 3		
Mo 93					Pa 231		8		
Tc 97					Pa 233	< 1.21E-06	C 3		
Tc 99	1.41E-03	C C 2			U 232	< 1.11E-05	C 3		
Ru 106	< 1.66E-06	C 3			U 233		8		
Pd 107					U 234	1.41E-04	C C 2		
Ag 108m					U 235	4.47E-06	C C 2		
Ag 110m					U 236	1.79E-05	C C 2		
Cd 109					U 238	1.77E-04	C C 2		
Cd 113m					Np 237	1.23E-06	C C 2		
Sn 119m					Pu 236		8		
Sn 121m					Pu 238	8.67E-02	C C 2		
Sn 123					Pu 239	1.23E-01	C C 2		
Sn 126					Pu 240	1.23E-01	C C 2		
Sb 125	< 3.31E-05	C 3			Pu 241	1.40E+00	C C 2		
Sb 126					Pu 242		8		
Te 125m	8.28E-06	C C 2			Am 241	5.80E-01	C C 2		
Te 127m					Am 242m		8		
I 129					Am 243		8		
Cs 134	< 3.15E-06	C 3			Cm 242	< 1.62E-08	C 3		
Cs 135					Cm 243	7.60E-05	C C 2		
Cs 137	9.98E-02	C C 2			Cm 244	4.61E-03	C C 2		
Ba 133					Cm 245		8		
La 137					Cm 246		8		
La 138					Cm 248		8		
Ce 144	< 4.36E-07	C 3			Cf 249		8		
Pm 145					Cf 250		8		
Pm 147	1.81E-04	C C 2			Cf 251		8		
Sm 147					Cf 252		8		
Sm 151	3.83E-02	C C 2			Unsp a				
Eu 152					Unsp b/g				
Eu 154	5.11E-03	C C 2			Total a	9.18E-01	*	0	*
Eu 155	5.92E-04	C C 2			Total b/g	2.61E+00	*	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 the 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
* Total calculated from the 114 declared radionuclides