

WASTE STREAM	9C16	PWTP Sludge
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SITE Dungeness 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	= 11.0		
Future arisings:				
Total future arisings:		0.0		
Total waste volume:		11.0		

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

Comment on arising rates: -

Additional information on quantities: -

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x -
Stock (lower):	x 0.80	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. There will also be sand from the final emptying of the pond sand filters.

PHYSICAL CHARACTERISTICS

General description: The waste consists of corrosion products such as magnesium hydroxide and carbonate detached from fuel elements and extraneous materials such as flakes of paint from the ponds. Also there is some filter sand. Sludge particles may be up to millimetre size, and there will probably be 50-450 kg/m³ of dry 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): = 1.9

Comment on density: The bulk density of the sludge is likely to range from 1.05 to 1.15 t/m³ with an average of 1.1 t/m³. Sand from sand filters (4.8 m³) will have a density of about 2.65 t/m³ so the overall mean bulk density is about 1.9 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Magnesium hydroxide, magnesium carbonate, siliceous materials including sand, perhaps some oil contamination and a range of other materials including paint flakes.

Chemical state: Alkali

Sheet metal proportion / thickness: There are no bulk metal items present.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 0	-	
Other ferrous metals.....	= 0	-	
Iron.....	-	-	
Aluminium.....	= 0	-	
Beryllium.....	TR	-	
Cobalt.....	-	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	< 1.0	Some unreacted Magnox (<1%) is expected.	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	NE	-	
Paper, cotton.....	NE	-	
Wood.....	NE	-	
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.....	~ 10.0	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	~ 40.0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	~ 47.0	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....		-	
Asbestos.....	= 0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	P	-	
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.....	NE	-
Nitrate.....	= 0	-
Nitrite.....	= 0	-
Phosphate.....	= 0	-
Sulphate.....	= 0	-
Sulphide.....	= 0	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	< 1.0	-
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.....	< 1.0	-
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):

Yes		
	(%wt)	Type(s) and comment
EDTA.....	TR	-
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:

Waste will be dried using a fill/dry cycle to optimise waste loading volume.

Conditioning plants:

Plant Name	Location
DNA AVDS	Dungeness A

Likely conditioning matrix:

-

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
	500 I RS drum (0mm Pb)	100.0	0.46	0.49	24	-

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.

Measurement of radioactivities: Estimated from available data.

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 organic or inorganic compounds.
C-14: Carbon 14 may be present as graphite.
Cl-36: The chemical form of chlorine 36 has not been assessed.
Se-79: The chemical form of selenium has not been determined.
Tc-99: The chemical form of technetium has not been determined.
I-129: -
Ra: -
Th: -
U: The chemical form of uranium isotopes has not been determined but may 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 may be plutonium oxides.

WASTE STREAM			9C16		PWTP 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	3.17E-05	C C 2			Gd 153		8		
Be 10	1.00E-07	C C 2			Ho 163		8		
C 14	6.99E-06	C C 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26	3.00E-05	C C 2			Tm 171		8		
Cl 36	1.00E-04	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41	2.00E-05	C C 2			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54	2.92E-07	C C 2			Pb 205		8		
Fe 55	3.88E-03	C C 2			Pb 210		8		
Co 60	2.32E-03	C C 2			Bi 208		8		
Ni 59	2.00E-05	C C 2			Bi 210m		8		
Ni 63	1.85E-03	C C 2			Po 210		8		
Zn 65	6.92E-08	C C 2			Ra 223		8		
Se 79	2.76E-08	C C 2			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	3.04E-03	C C 2			Th 227		8		
Zr 93	3.00E-07	C C 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	1.32E-07	C C 2			Th 232		8		
Nb 94		8			Th 234	3.00E-06	C C 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233	1.00E-05	C C 2		
Tc 99	9.00E-08	C C 2			U 232		8		
Ru 106	7.51E-06	C C 2			U 233		8		
Pd 107	1.00E-08	C C 2			U 234	3.01E-06	C C 2		
Ag 108m	4.91E-08	C C 2			U 235	8.00E-08	C C 2		
Ag 110m		8			U 236	4.00E-07	C C 2		
Cd 109		8			U 238	3.00E-06	C C 2		
Cd 113m	1.13E-07	C C 2			Np 237	1.00E-05	C C 2		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	4.58E-04	C C 2		
Sn 123		8			Pu 239	6.00E-04	C C 2		
Sn 126	7.88E-08	C C 2			Pu 240	7.99E-04	C C 2		
Sb 125	1.98E-05	C C 2			Pu 241	4.05E-02	C C 2		
Sb 126	1.10E-08	C C 2			Pu 242	1.00E-06	C C 2		
Te 125m	< 4.96E-06	C 3			Am 241	1.96E-03	C C 2		
Te 127m		8			Am 242m	7.56E-06	C C 2		
I 129	4.00E-09	C C 2			Am 243	3.00E-06	C C 2		
Cs 134	1.13E-05	C C 2			Cm 242	6.24E-06	C C 2		
Cs 135	2.00E-07	C C 2			Cm 243	1.54E-06	C C 2		
Cs 137	4.61E-03	C C 2			Cm 244	3.88E-05	C C 2		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144	9.79E-07	C C 2			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	5.79E-04	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	3.66E-05	C C 2			Unsp a				
Eu 152	1.12E-06	C C 2			Unsp b/g				
Eu 154	4.02E-04	C C 2			Total a	3.88E-03	*	0	*
Eu 155	2.05E-04	C C 2		C	Total b/g	5.77E-02	*	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