

WASTE STREAM	9J949	Pond and Effluent Treatment Plant LLW
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SITE Hunterston A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 0		
Future arisings:	1.4.2025 - 31.3.2026	70.4		
	1.4.2026 - 31.3.2027	64.4		
	1.4.2027 - 31.3.2028	59.4		
	1.4.2028 - 31.3.2029	69.4		
	1.4.2029 - 31.3.2030	59.4		
Total future arisings:		323.0		
Total waste volume:		323.0		

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

Comment on arising rates: -

Additional information on quantities: Waste volumes include a proportion of secondary waste arisings and contaminated soil.

Uncertainty factors on volumes: Stock (upper): x - Arisings (upper): x 1.20
Stock (lower): x - Arisings (lower): x 0.80

WASTE SOURCE Waste arisings from Initial Decommissioning Works of the ponds and Active Effluent Treatment Plant areas, also some contaminated soil.

PHYSICAL CHARACTERISTICS

General description: This includes wastes which have been in contact with 'wet' systems, in particular with Cartridge Cooling Pond (CCP) water and the radioactive drains collection systems which are processed through the Active Effluent Treatment Plant (AETP). During the upcoming WCH period the wastestream will also include MRT sludge wastes which originate from miscellaneous effluent from the site's active drain network.

Changes since waste generated: -

Bulk density (t/m³): ~ 0.63

Comment on density: The mean waste density is approximately 0.63 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Metal (23%), Soil/rubble (19%), Wood (3%) plastics non-halogenated (34%), biodegradable non-putrescibles (10% wt), other organic (1% wt) other (10%wt).

Chemical state: Neutral

Sheet metal proportion / thickness: Not fully assessed.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	-	-	
Other ferrous metals.....	= 23.7	Steel items, e.g. small plant items, fittings, tools etc.	
Iron.....	= 0.02	Within MRT sludge - Expected to be present in cationic form 37.08kg	
Aluminium.....	= 0.22	Items e.g. shelving and brackets etc.	
Beryllium.....	TR	Within MRT sludge - Expected to be present in cationic form 0.005kg	
Cobalt.....	TR	Within MRT sludge - Expected to be present in cationic form 0.03kg of 11340.00kg total"	
Copper.....	= 0.10	Items e.g. pipework and fittings etc.	
Lead.....	= 0.09	Items e.g. flashings and fittings etc.	
Magnox/Magnesium.....	= 0.01	Within MRT sludge - Expected to be present in cationic form 9.56kg	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	-	-	
Zinc.....	TR	Within MRT sludge - Expected to be present in cationic form 1.45kg	
Zircaloy/Zirconium.....	-	-	
Other metals.....	-	-	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	~ 3.0	-	
Paper, cotton.....	-	-	
Wood.....	= 3.0	-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	~ 35.2	-	
Condensation polymers.....	= 0	-	
Others.....	~ 35.2	Items e.g. polythene, tanks, pipework, IBCs etc.	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	NE	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	0.02	-	
Oil or grease.....	= 0.02	Grease, grease/oil contaminated rags, mixed	
Fuel.....	-	-	
Asphalt/Tarmac (cont.coal tar).....	-	-	
Asphalt/Tarmac (no coal tar).....	-	-	
Bitumen.....	-	-	
Others.....	-	-	
Other organics.....	-	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	= 7.4	Raw waste - all sludge, excluding the contents disclosed separately as contents 'within MRT sludge' in Table 6.1 and elsewhere in Table 6.2 11187.41 of 11340.00kg total"	
Soil.....	-	-	
Brick/Stone/Rubble.....	= 19.0	-	
Cementitious material.....	= 0	-	
Sand.....	-	-	
Glass/Ceramics.....	= 0.01	Man made mineral fibre	
Graphite.....	NE	-	
Desiccants/Catalysts.....	-	-	
Asbestos.....	= 0.03	-	
Non/low friable.....	0.02	chrysotile (white)	
Moderately friable.....	0.01	chrysotile (white)	
Highly friable.....	-	-	
Free aqueous liquids.....	= 0	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	= 0	-
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.....	10.0	-
Putrescible wastes.....	= 0.02	mixed
Non-putrescible wastes.....	= 10.0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	P	surface area of Aluminium 2500000cm2.
Higher activity particles.....	-	-
Soluble solids as bulk chemical compounds.....	-	-

Hazardous substances / non hazardous pollutants:

	(%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.....	TR	Within MRT sludge - Expected to be present in cationic form 0.14kg
Caesium.....	-	-
Selenium.....	-	-
Chromium.....	TR	Within MRT sludge - Expected to be present in cationic form 0.92kg of 11340.00kg total
Molybdenum.....	-	-
Thallium.....	-	-
Tin.....	-	-
Vanadium.....	-	-
Mercury compounds.....	-	-
Others.....	-	-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	-	-
DPTA.....	-	-
NTA.....	-	-
Polycarboxylic acids.....	-	-
Other organic complexants.....	-	-
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	-	-
Electronic & Electrical Equipment (EEE)	-	-
EEE Type 1.....	-	-
EEE Type 2.....	P	-
EEE Type 3.....	P	-
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	On-site	= 9.5
Supercompaction (HFC)	Off-site	= 9.5
Incineration	Off-site	= 38.2
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	= 0.5
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		= 51.9

Comments on planned treatments:

9.48 % of this waste stream is expected to be sent to landfill as VLLW.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

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
1/2 Height WAMAC IP-2 ISO (TC08)	9.5	43.2	18.8	1	-
1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	42.4	10.0	18.3	14	-

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)			
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	= 51.9	0.60	
Expected to be consigned to a Landfill Facility	= 9.5	0.60	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 38.2	0.40	
Expected to be consigned to a Metal Treatment Facility	= 0.5	1.4	
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:

17 04 05, 17 05 03*, 17 05 04, 20 01 01, 17 02 03

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source:

-

Uncertainty:

Activity values are current best estimates. Specific activity is a function of Station operating history. The values quoted are indicative of the activities that would be expected.

Measurement of radioactivities:

The specific activities have been estimated from the waste stream fingerprint compiled from the analysis of a number of waste samples for this stream.

Chemical form of radionuclides:

H-3: Tritium may be present as tritiated water.
C-14: Chemical form of carbon 14 may be graphite.
Cl-36: The chemical form of chlorine 36 has not been determined.
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: The radium isotope content is insignificant.
Th: The thorium content is insignificant.
U: The chemical form of uranium isotopes has not been determined but may be uranium oxides.
Np: Neptunium isotope content is expected to be insignificant.
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

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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			2.23E-06	C C 2	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.12E-06	C C 2	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			1.62E-06	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			1.77E-08	C C 2	Pt 193				8
Mn 53				8	Ti 204				8
Mn 54				8	Pb 205				8
Fe 55			7.15E-07	C C 2	Pb 210				8
Co 60			3.93E-07	C C 2	Bi 208				8
Ni 59			4.12E-09	C C 2	Bi 210m				8
Ni 63			5.03E-06	C C 2	Po 210				8
Zn 65				8	Ra 223				8
Se 79			2.41E-09	C C 2	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85			5.84E-06	C C 2	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			8.88E-04	C C 2	Th 227				8
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m			5.15E-09	C C 2	Th 232				8
Nb 94			3.99E-07	C C 2	Th 234			2.40E-07	C C 2
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233			8.62E-08	C C 2
Tc 99			9.38E-07	C C 2	U 232				8
Ru 106			2.29E-09	C C 2	U 233				8
Pd 107				8	U 234			2.40E-07	C C 2
Ag 108m			1.03E-06	C C 2	U 235			1.04E-08	C C 2
Ag 110m				8	U 236			4.27E-08	C C 2
Cd 109				8	U 238			2.40E-07	C C 2
Cd 113m			2.47E-08	C C 2	Np 237			8.62E-08	C C 2
Sn 119m				8	Pu 236				8
Sn 121m			1.17E-07	C C 2	Pu 238			1.90E-05	C C 2
Sn 123				8	Pu 239			1.88E-05	C C 2
Sn 126			5.24E-09	C C 2	Pu 240			2.06E-05	C C 2
Sb 125			3.08E-07	C C 2	Pu 241			3.34E-04	C C 2
Sb 126				8	Pu 242			4.70E-09	C C 2
Te 125m			7.71E-08	C C 2	Am 241			9.35E-05	C C 2
Te 127m				8	Am 242m			2.92E-08	C C 2
I 129			1.39E-06	C C 2	Am 243			1.12E-08	C C 2
Cs 134			3.77E-08	C C 2	Cm 242			2.41E-08	C C 2
Cs 135			5.16E-09	C C 2	Cm 243			1.02E-07	C C 2
Cs 137			6.84E-04	C C 2	Cm 244			1.26E-06	C C 2
Ba 133			1.07E-06	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			1.32E-07	C C 2	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			9.10E-06	C C 2	Unsp a				
Eu 152			4.32E-06	C C 2	Unsp b/g				
Eu 154			2.06E-06	C C 2	Total a	0	*	1.54E-04	*
Eu 155			4.44E-07	C C 2	Total b/g	0	*	1.94E-03	*

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