

WASTE STREAM	9H27	Auxiliary Gas Systems
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SITE Wylfa

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	4.4 m ³
Future arisings -	1.4.2022 - 31.3.2023.....	0.6 m ³
Total future arisings:		0.6 m ³
Total waste volume:		5.0 m ³

Comment on volumes: Note the 4.35m³ is the total volume of drums and not the actual volume of waste. 0.6m³ future arisings is an estimate based on previously retrieved and packaged waste i.e. drier drain vessels & BCD piston rods, and volume is package based (4x drums @ 0.15m³)

Uncertainty factors on volumes: Stock (upper): x 1.2 Arisings (upper) x 1.2
 Stock (lower): x 0.9 Arisings (lower) x 0.9

WASTE SOURCE Hard trash, redundant equipment and consumables from the auxiliary gas system and burst can detector systems.

PHYSICAL CHARACTERISTICS

General description: Metal, plastic, paper and cloth

Physical components (%wt): Paper/cloth (11% wt), plastic/rubber (15% wt), metal (70% wt (inc Steel Drums)), wood (2% wt) and rubble/concrete 2%.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 5.5

Comment on density: 70% of stream is metal.

CHEMICAL COMPOSITION

General description and components (%wt): The waste comprises metal, plastic, paper and cloth. Also rubber in trace quantities and possibly glass. Chlorine-36 is present as solid ammonium chloride. Paper/cloth (11% wt), plastic/rubber (15% wt), metal waste (40% wt), steel drums (~30% wt), wood (2% wt) and rubble/concrete (2% wt).

Chemical state: Neutral

Chemical form of radionuclides: H-3: The chemical form of tritium has not been determined.
 C-14: The chemical form of carbon 14 has not been determined
 Cl-36: The majority of chlorine 36 is expected to be in the form of ammonium chloride.
 Se-79: The selenium 79 content is insignificant
 Tc-99: The chemical form of technetium 99 has not been determined.
 Ra: Radium isotope content is expected to be insignificant
 Th: The thorium content is insignificant
 U: The uranium isotope content is insignificant
 Np: The neptunium isotope content is insignificant
 Pu: The plutonium isotope content is insignificant

Metals and alloys (%wt): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	5.0		
Other ferrous metals.....	~65.0		
Iron.....			
Aluminium.....	TR		
Beryllium.....			

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Cobalt.....	
Copper.....	TR
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	
Zinc.....	TR
Zircaloy/Zirconium.....	0
Other metals.....	0

Organics (%wt): Halogenated plastics and rubbers are present but material types have not been identified.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	13.0		
Paper, cotton.....	11.0		
Wood.....	2.0		
Halogenated plastics	7.5		
Total non-halogenated plastics.....	7.5		
Condensation polymers.....	3.8		
Others.....	3.8		
Organic ion exchange materials....	0		
Total rubber.....	TR		
Halogenated rubber	TR		
Non-halogenated rubber.....	TR		
Hydrocarbons.....			
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...			
Asphalt/Tarmac (no coal tar)....			
Bitumen.....			
Others.....			
Other organics.....	TR		

Other materials (%wt): Traces of Graphite may be present.

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	~1.0		
Cementitious material.....	~1.0		
Sand.....			
Glass/Ceramics.....	0		
Graphite.....	TR		

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Desiccants/Catalysts.....		
Asbestos.....	<1.0	Form and quantity of asbestos not known
Non/low friable.....	<1.0	
Moderately friable.....		
Highly friable.....		
Free aqueous liquids.....	0	
Free non-aqueous liquids.....	0	
Powder/Ash.....	0	

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.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	
Biological etc. materials.....	0	
Biodegradable materials.....	0	
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.....		

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Hazardous substances /
non hazardous pollutants: None expected apart from Asbestos (<1% wt)

	(%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.....		

Complexing agents (%wt): No

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

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Potential for the waste to contain discrete items:

Yes. Large Metal Items (LMIs)/"substantial" thickness items considered "durable" assumed DIs; Stainless items assumed DIs

PACKAGING AND CONDITIONING

Conditioning method:

It has been assumed the Waste will be transferred to a Type VI DCIC however this is subject to the necessary options assessment studies and has not been confirmed. An opportunity to divert some waste from DCICs through Nuclear Waste Services alternative treatment route is being pursued with thermal treatment considered the optimised solution subject to gaining the appropriate approvals from the regulator'

Plant Name:

-

Location:

Wylfa Power Station

Plant startup date:

-

Total capacity (m³/y incoming waste):

-

Target start date for packaging this stream:

-

Throughput for this stream (m³/y incoming waste):

-

Other information:

-

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
3m ³ RS box	100.0	1.7	2.5	3

Likely container type comment:

-

Range in container waste volume:

-

Other information on containers:

-

Likely conditioning matrix:

None

Other information:

-

Conditioned density (t/m³):

-

Conditioned density comment:

-

Other information on conditioning:

-

Opportunities for alternative disposal routing:

Yes

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

RADIOACTIVITY

Source:

Main sources of activity are Cl36, C-14 and H-3

Uncertainty:

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

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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 Y0682 The radiochemical analysis of Wylfa 9H14D metallic waste issue 3, 2017; NNL12060 Radiochemical analysis of Wylfa 9H14 samples – phase 2, 2012; GAU4156 Analysis of 39 metal and 2 plastic samples, issue 2, 2020 for RWI 2022 update.

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	1.67E-03	CC 2	1.67E-03	CC 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	3.05E-02	CC 2	3.05E-02	CC 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	3.24E-02	CC 2	3.24E-02	CC 2	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54	1.01E-06	CC 2	1.01E-06	CC 2	Pb 205		8		8
Fe 55	5.21E-07	CC 2	5.21E-07	CC 2	Pb 210		8		8
Co 60	4.79E-08	CC 2	4.79E-08	CC 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	4.01E-05	CC 2	4.01E-05	CC 2	Po 210		8		8
Zn 65	7.18E-06	CC 2	7.18E-06	CC 2	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	1.84E-08	CC 2	1.84E-08	CC 2	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94	1.51E-06	CC 2	1.51E-06	CC 2	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m	1.37E-08	CC 2	1.37E-08	CC 2	U 235		8		8
Ag 110m	8.29E-06	CC 2	8.29E-06	CC 2	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238		8		8
Sn 123		8		8	Pu 239		8		8
Sn 126		8		8	Pu 240		8		8
Sb 125		8		8	Pu 241		8		8
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	3.59E-08	CC 2	3.59E-08	CC 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242	1.56E-09	CC 2	1.56E-09	CC 2
Cs 135		8		8	Cm 243		8		8
Cs 137	3.01E-08	CC 2	3.01E-08	CC 2	Cm 244		8		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	4.08E-08	CC 2	4.08E-08	CC 2	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	1.32E-08	CC 2	1.32E-08	CC 2	Other b/g	2.50E-04	CC 2	2.50E-04	CC 2
Eu 154		8		8	Total a	3.75E-08	CC 2	3.75E-08	CC 2
Eu 155	7.47E-08	CC 2	7.47E-08	CC 2	Total b/g	6.49E-02	CC 2	6.49E-02	CC 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