

WASTE STREAM	9H912	Flask Handling Area and AETP LLW
---------------------	--------------	---

SITE Wylfa
SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	3.0m ³
Future arisings -	1.4.2022 - 31.3.2023.....	27.3m ³
	1.4.2023 - 31.3.2024.....	15.4m ³
	1.4.2024 - 31.3.2034.....	203.6m ³
Total future arisings:		246.3m ³
Total waste volume:		249.3m ³

Comment on volumes: -

Uncertainty factors on volumes: Stock (upper): x 1.1 Arisings (upper) x 1.3
 Stock (lower): x 0.9 Arisings (lower) x 0.7

WASTE SOURCE Care and Maintenance preparations and procedures in the areas covered by this waste stream.

PHYSICAL CHARACTERISTICS

General description: Hard trash and redundant equipment. No large items are expected.

Physical components (%wt): Scrap metal from pumps, valves, pipework and steel drums. The waste contains metals, including aluminium and steel, various plastics, paper and wood. Metal (60.5%), Concrete/rubble (8%), Soil (1%), Biodegradable non-putrescibles (18.5%), Plastics halogenated (1%), plastics non-halogenated (2%), rubber (3%), wood (1%), Other organic (2%), others including asbestos (2%), Asphalt (1%)

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~0.58

Comment on density: Density is based WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): The waste contains metals, including aluminium and steel, various plastics, paper and wood. Metal (60.5%), Concrete/rubble (8%), Soil (1%), Biodegradable non-putrescibles (18.5%), Plastics halogenated (1%), plastics non-halogenated (2%), rubber (3%), wood (1%), Other organic (2%), others including asbestos (2%), Asphalt (1%)

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: Chemical form of chlorine 36 has not been determined.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 Ra: Radium isotope content is expected to be insignificant.
 Th: The thorium content is insignificant.
 U: Chemical form of uranium isotopes has not been determined but may be uranium oxides.
 Np: The neptunium content is insignificant.
 Pu: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt): Metal thickness will be variable from about 1 mm up to about 30 mm. Nickel and chromium will be present in stainless steel.

WASTE STREAM	9H912	Flask Handling Area and AETP LLW
---------------------	--------------	---

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	~0.90	Metal (pipework, valves, filters, misc). made up of 17% Chromium, 69.5% Iron, 2.5% Molybdenum, 11% Nickel	
Other ferrous metals.....	~57.9	Drums, tooling, pipework, valves, filters, misc.	
Iron.....			
Aluminium.....	~1.0	Metal (pipework, valves, filters, misc).	
Beryllium.....	0		
Cobalt.....			
Copper.....	~0.10	Cables and WEEE.	
Lead.....	~0.01	Light bulbs (<1m3), lead shot.	
Magnox/Magnesium.....	TR	Metal (pipework, valves, filters, misc.)	
Nickel.....	P	Nickel and chromium will be present in stainless steel.	
Titanium.....			
Uranium.....			
Zinc.....	~0.50	Tooling, buckets, scaffolding.	
Zircaloy/Zirconium.....	0		
Other metals.....	0	No "other" metals expected.	
Organics (%wt):		Cellulosic materials, halogenated plastics expected.	
	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulose.....	1.0		
Paper, cotton.....			
Wood.....	~1.0		
Halogenated plastics	~1.2	Liners, lab waste/packaging.	
Total non-halogenated plastics.....	~2.0	Lab waste/packaging.	
Condensation polymers.....	~1.0	Lab waste/packaging.	
Others.....	~1.0	Lab waste/packaging.	
Organic ion exchange materials....	0		
Total rubber.....	~3.0		
Halogenated rubber	~1.5	neoprene.	
Non-halogenated rubber.....	~1.5		
Hydrocarbons.....	1.0		
Oil or grease			
Fuel.....			
Asphalt/Tarmac (cont.coal tar)...	~1.0	Drummed rubble.	
Asphalt/Tarmac (no coal tar)....	~0.01	Flooring.	
Bitumen.....			
Others.....			
Other organics.....	~2.0		
Other materials (%wt):	-		

WASTE STREAM	9H912	Flask Handling Area and AETP LLW
---------------------	--------------	---

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials..	0		
Inorganic sludges and flocs.....	0		
Soil.....	~1.0		
Brick/Stone/Rubble.....	~8.0		
Cementitious material.....			
Sand.....			
Glass/Ceramics.....	~0.50	fibreglass plant items, gaskets, lagging.	
Graphite.....	0		
Desiccants/Catalysts.....			
Asbestos.....	~1.5		
Non/low friable.....	~0.50	Asbestos contaminated plant items and gaskets. Equal proportions of white/blue/brown asbestos are assumed.	
Moderately friable.....	~0.50	Insulating boards, chrysotile	
Highly friable.....	~0.50	Asbestos contaminated plant items and gaskets. Equal proportions of white/blue/brown asbestos are assumed.	
Free aqueous liquids.....	0		
Free non-aqueous liquids.....	0		
Powder/Ash.....	0		

Inorganic anions (%wt): Trace quantities of inorganic anions are anticipated.

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

Materials of interest for waste acceptance criteria: No materials likely to pose a fire or other non-radiological hazard have been identified.

	(%wt)	Type(s) and comment
Combustible metals.....	0	
Low flash point liquids.....	0	
Explosive materials.....	0	
Phosphorus.....	0	
Hydrides.....	0	

WASTE STREAM	9H912	Flask Handling Area and AETP LLW
---------------------	--------------	---

Biological etc. materials.....	0	
Biodegradable materials.....	18.5	
Putrescible wastes.....	0	
Non-putrescible wastes.....	~18.5	
Corrosive materials.....	0	
Pyrophoric materials.....	0	
Generating toxic gases.....	0	
Reacting with water.....	P	146m2
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

Hazardous substances /
non hazardous pollutants: None expected

	(%wt)	Type(s) and comment
Acrylamide.....		
Benzene.....		
Chlorinated solvents.....		
Formaldehyde.....		
Organometallics.....		
Phenol.....		
Styrene.....		
Tri-butyl phosphate.....		
Other organophosphates.....		
Vinyl chloride.....		
Arsenic.....		
Barium.....	TR	Light bulbs (<1m3).
Boron.....	0	
Boron (in Boral).....		
Boron (non-Boral).....		
Cadmium.....		
Caesium.....		
Selenium.....		
Chromium.....	P	Nickel and chromium will be present in stainless steel.
Molybdenum.....		
Thallium.....		
Tin.....	~0.50	Paint tins.
Vanadium.....		
Mercury compounds.....		
Others.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....	P	10 items of a mixture of VDU, electronic circuit boards, fans that have been stripped from control panels and telephones

WASTE STREAM 9H912 Flask Handling Area and AETP LLW

EEE Type 2.....
 EEE Type 3..... P 5 items of corded drills
 EEE Type 4..... P 25 items of mainly fluorescent light tubes
 EEE Type 5.....

Complexing agents (%wt): Yes

(%wt) Type(s) and comment
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants..... TR Citrates (decon-90) and Phosphoric acid (jenolite/Kamco)
 Total complexing agents..... TR

Potential for the waste to contain discrete items: No. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)	Off-site	~7.4
Incineration	Off-site	67.0
Solidification		
Decontamination		
Metal treatment	Off-site	16.0
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		9.6

Comment on planned treatments:

7.8% to landfill as VLLW

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	9.2	0.58
Expected to be consigned to a Landfill Facility	7.8	0.58
Expected to be consigned to an On-Site Disposal Facility		
Expected to be consigned to an Incineration Facility	67.0	0.40
Expected to be consigned to a Metal Treatment Facility	16.0	1.4
Expected to be consigned as 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 04 07, 17 06 01*

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

WASTE STREAM 9H912 Flask Handling Area and AETP LLW

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:

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO	~7.4	21.6	< 1
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			

Other information: Data have been presented as though the waste will be in dedicated containers. It is likely that this waste will be placed in containers with other LLW. 21.6m³ loading volume is calculated based on the fact that you can fit 36 off (200 litre/0.2m³) drums (7.2m³) into a ½ height ISO, each drum can be super-compacted to a 1/3 of its original volume so therefore we can get 3 x the amount of un-compacted drums into the final disposal container (21.6m³)

Waste Planned for Disposal at the LLW Repository:

Container voidage: Significant in-accessible voidage is not expected.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste has a current WCH. Inventory information is consistent with the current WCH.

Waste consigned for disposal to LLWR in year of generation: Yes.

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: Contamination by activation products and fission products.

WASTE STREAM**9H912****Flask Handling Area and AETP LLW**

Uncertainty:	Activity estimates are as shown in the radionuclide table.
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:	The specific activities have been taken from the WCH 1MXN-3WYL-0-WCH-4606 V4 with reference activity date of 20/03/2021 as the mid point of the validity period of the WCH. A single fingerprint is to be used over the three year WCH validity period for consignments of waste with reference date of 20/03/2021. This has been decayed for one year for RWI 2022.
Other information:	-

WASTE STREAM 9H912 Flask Handling Area and AETP LLW

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	2E-06	CC 1	2E-06	CC 1	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	6.89E-08	CC 1	6.89E-08	CC 1	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	1.31E-08	CC 1	1.31E-08	CC 1	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		8		8	Pb 205		8		8
Fe 55	6.05E-07	CC 1	6.05E-07	CC 1	Pb 210		8		8
Co 60	2.25E-07	CC 2	2.25E-07	CC 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	1.7E-07	CC 1	1.7E-07	CC 1	Po 210		8		8
Zn 65		8		8	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	2.76E-06	CC 1	2.76E-06	CC 1	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	2.04E-09	CC 2	2.04E-09	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	4.93E-09	CC 2	4.93E-09	CC 2	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m	1.29E-08	CC 2	1.29E-08	CC 2	U 235		8		8
Ag 110m		8		8	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	9.72E-08	CC 1	9.72E-08	CC 1
Sn 123		8		8	Pu 239	1.05E-07	CC 1	1.05E-07	CC 1
Sn 126		8		8	Pu 240	1.37E-07	CC 1	1.37E-07	CC 1
Sb 125	6.05E-09	CC 2	6.05E-09	CC 2	Pu 241	4.89E-06	CC 1	4.89E-06	CC 1
Sb 126		8		8	Pu 242		8		8
Te 125m	1.49E-09	8	1.49E-09	8	Am 241	4.1E-07	CC 1	4.1E-07	CC 1
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	3.33E-08	CC 2	3.33E-08	CC 2	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	2.26E-06	CC 2	2.26E-06	CC 2	Cm 244	1.89E-08	CC 2	1.89E-08	CC 2
Ba 133	2.6E-09	CC 2	2.6E-09	CC 2	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144	1.3E-09	CC 2	1.3E-09	CC 2	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	2.52E-07	CC 1	2.52E-07	CC 1	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	5.99E-09	CC 2	5.99E-09	CC 2	Other b/g				
Eu 154	7.66E-08	CC 2	7.66E-08	CC 2	Total a	7.68E-07	CC 2	7.68E-07	CC 2
Eu 155	3.36E-08	CC 2	3.36E-08	CC 2	Total b/g	1.34E-05	CC 2	1.34E-05	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