

WASTE STREAM	9G106	Ponds LLW
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SITE Trawsfynydd

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m ³
Future arisings -	1.4.2019 - 31.3.2024.....	~687.0 m ³
Total future arisings:		687.0 m ³
Total waste volume:		687.0 m ³

Comment on volumes: The rate of arising of this stream will not be uniform over the period of Care and Maintenance Preparations.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 1.2
 Stock (lower): x Arisings (lower) x 0.8

WASTE SOURCE Preparations for Safestore construction and removal of pond area and associated plant.

PHYSICAL CHARACTERISTICS

General description: Metal, glass, rubber, concrete, rubble, plastic and contaminated soil. Contaminated sludges and HEPA filters are also likely to arise within this waste stream. Lightly contaminated items too large for 200l drums will be disposed of in half height ISO containers. Contaminated soil will also be disposed directly into half height ISO containers.

Physical components (%wt): Composition is typically metal, concrete/rubble, soil, plastics, rubber, wood, asbestos, and oil soaked materials/oily sludge. This breakdown is likely to change as decommissioning progresses.

Sealed sources: -

Bulk density (t/m³): 1.09

Comment on density: WCH mass divided by volume

CHEMICAL COMPOSITION

General description and components (%wt): The waste also comprises metals (~46%), concrete/rubble (~12%), soil (~21%), plastics (~8%), rubber (~3%), wood (~2%), other organics (~8%) and asbestos (<0.1%).

Chemical state: Neutral

Chemical form of radionuclides: H-3: Most tritium is expected to be present as water but some may be in the form of other inorganic compounds or as organic compounds.
 C-14: Carbon 14 will probably be present as graphite.
 Cl-36: The 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 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):

Not assessed.		
Stainless steel.....	1.2	Deplanted steel and containers
Other ferrous metals.....	10.8	Mild steel
Iron.....		
Aluminium.....	2.0	deplanted metal
Beryllium.....		
Cobalt.....		
Copper.....	1.3	Deplanted metal

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	Lead.....	0.70	Deplanted lead shielding
	Magnox/Magnesium.....		
	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....		
	Zircaloy/Zirconium.....		
	Other metals.....	29.5	
Organics (%wt):	The waste contains halogenated plastic as PVC, non-halogenated plastic as polythene, halogenated rubber as neoprene and non-halogenated rubber as silicone. Other organics may be present as oils and oily sludge.		
	Total cellulose.....	2.1	
	Paper, cotton.....		
	Wood.....	2.1	
	Halogenated plastics	2.0	Deplanted pipework
	Total non-halogenated plastics.....	6.0	
	Condensation polymers.....	0	
	Others.....	6.0	Soft secondary waste plastic
	Organic ion exchange materials....		
	Total rubber.....	3.0	
	Halogenated rubber	1.5	
	Non-halogenated rubber.....	1.5	
	Hydrocarbons.....	8.4	
	Oil or grease		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....	8.4	Oil soaked materials/oily sludge
	Other organics.....		
Other materials (%wt):	-		
	Inorganic ion exchange materials.		
	Inorganic sludges and flocs.....		
	Soil.....	21.1	
	Brick/Stone/Rubble.....		
	Cementitious material.....	11.6	Concrete/rubble
	Sand.....		
	Glass/Ceramics.....		
	Graphite.....		
	Desiccants/Catalysts.....		
	Asbestos.....	<0.10	
	Non/low friable.....	<0.10	Asbestos contamination is likely to be present within this wastestream and it is assumed that there is less than 0.1% by

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weight based on historical monitoring. Amosite, chrysotile and crocidolite all present in the waste stream

	Moderately friable.....	0	
	Highly friable.....	0	
	Free aqueous liquids.....		
	Free non-aqueous liquids.....		
	Powder/Ash.....		
Inorganic anions (%wt):	Fluorides, carbonates, chlorides, sulphates, phosphates may be present in trace quantities. Other anions may be aluminates and silicates associated with the cement encapsulating the oily sludge.		
	Fluoride.....	TR	
	Chloride.....	TR	
	Iodide.....	0	
	Cyanide.....	0	
	Carbonate.....	TR	
	Nitrate.....	0	
	Nitrite.....	0	
	Phosphate.....	TR	
	Sulphate.....	TR	
	Sulphide.....	0	
Materials of interest for waste acceptance criteria:	Asbestos may be present in very small quantities (from thermal insulation).		
	Combustible metals.....		
	Low flash point liquids.....		
	Explosive materials.....		
	Phosphorus.....		
	Hydrides.....		
	Biological etc. materials.....		
	Biodegradable materials.....		
	Putrescible wastes.....		
	Non-putrescible wastes.....		
	Corrosive materials.....		
	Pyrophoric materials.....		
	Generating toxic gases.....		
	Reacting with water.....	P	100m2
	Active particles.....		
	Soluble solids as bulk chemical compounds.....		
Hazardous substances / non hazardous pollutants:	Asbestos (<<1% wt). Lead may be present in trace quantities.		
	Acrylamide.....		
	Benzene.....		
	Chlorinated solvents.....		
	Formaldehyde.....		

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Organometallics.....
 Phenol.....
 Styrene.....
 Tri-butyl phosphate.....
 Other organophosphates.....
 Vinyl chloride.....
 Arsenic.....
 Barium.....
 Boron.....
 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): Yes
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents..... TR

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off site	Stream volume %
Low force compaction	On-site	5.3
Supercompaction (HFC)	Off-site	5.3
Incineration	Off-site	26.1
Solidification		
Decontamination		
Metal treatment	Off-site	0.50
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		68.1

Comment on planned treatments:

24% of the stream is planned to be disposed of as VLLW to landfill

Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	49.4
Expected to be consigned to a Landfill Facility	24.0
Expected to be consigned to an On-Site Disposal Facility	
Expected to be consigned to an Incineration Facility	26.1
Expected to be consigned to a Metal Treatment Facility	0.50
Expected to be consigned as Out of Scope	
Expected to be recycled / reused	
Disposal route not known	

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
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			

Waste Packaging for Disposal:

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO			
2/3 Height IP-2 ISO			
1/2 Height WAMAC IP-2 ISO	~5.3	43.2	< 1
1/2 Height IP-2 Disposal/Re-usable ISO	~44.1	10	31
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information:

Data has been presented as though the waste will be in dedicated containers. It is likely that this waste will be placed in a container with other LLW. 43.2m³ loading volume is calculated based on the fact that you can low force compact two times the normal volume of waste into a 200 litre/0.2m³ drum (400 litres/0.4m³), you can then fit 36 drums (14.4m³) 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 (43.2m³).

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Container voidage:	Significant inaccessible voidage is not expected.
Waste Characterisation Form (WCH):	The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste has a current WCH.
Waste consigned for disposal to LLWR in year of generation:	Yes. The waste is expected to be consigned for disposal in the year of generation.
Potential for the waste to contain discrete items:	-

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:	Activity is from a mixture of fission and activation products and actinides. Tritium is also present.
Uncertainty:	The values quoted are derived from available measurements and are indicative of the activities that might be expected.
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 WCH - 1MXN-3TRA-0-WCH-0-3872 decayed by two years for RWI 2019
Other information:	-

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Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3			1.9E-04	CC 1	Gd 153				8
Be 10				8	Ho 163				8
C 14			1.42E-05	CC 1	Ho 166m				8
Na 22				8	Tm 170				8
Al 26				8	Tm 171				8
Cl 36			1.11E-06	CC 1	Lu 174				8
Ar 39				8	Lu 176				8
Ar 42				8	Hf 178n				8
K 40				8	Hf 182				8
Ca 41				8	Pt 193				8
Mn 53				8	Tl 204				8
Mn 54				8	Pb 205				8
Fe 55			1.33E-05	CC 1	Pb 210				8
Co 60			7.1E-06	CC 1	Bi 208				8
Ni 59				8	Bi 210m				8
Ni 63			1.67E-05	CC 1	Po 210				8
Zn 65				8	Ra 223				8
Se 79				8	Ra 225				8
Kr 81				8	Ra 226				8
Kr 85				8	Ra 228				8
Rb 87				8	Ac 227				8
Sr 90			1.86E-04	CC 1	Th 227				8
Zr 93				8	Th 228				8
Nb 91				8	Th 229				8
Nb 92				8	Th 230				8
Nb 93m				8	Th 232				8
Nb 94			5.81E-08	CC 1	Th 234		8.72E-09	CC 2	8
Mo 93				8	Pa 231				8
Tc 97				8	Pa 233				8
Tc 99			9.26E-09	CC 1	U 232				8
Ru 106				8	U 233				8
Pd 107				8	U 234		8.08E-09	CC 1	8
Ag 108m			1.1E-07	CC 1	U 235				8
Ag 110m				8	U 236				8
Cd 109				8	U 238		8.72E-09	CC 1	8
Cd 113m				8	Np 237				8
Sn 119m				8	Pu 236				8
Sn 121m				8	Pu 238		5.06E-06	CC 1	8
Sn 123				8	Pu 239		4.59E-06	CC 1	8
Sn 126				8	Pu 240		6.05E-06	CC 1	8
Sb 125			1.1E-08	CC 1	Pu 241		5.52E-05	CC 1	8
Sb 126				8	Pu 242				8
Te 125m			2.76E-09	8	Am 241		2.21E-05	CC 1	8
Te 127m				8	Am 242m				8
I 129				8	Am 243				8
Cs 134			2.07E-09	CC 1	Cm 242				8
Cs 135				8	Cm 243		2.68E-08	CC 1	8
Cs 137			1.19E-04	CC 1	Cm 244		5.53E-07	CC 1	8
Ba 133			4.51E-08	CC 1	Cm 245		1.79E-08	CC 1	8
La 137				8	Cm 246		1.79E-08	CC 1	8
La 138				8	Cm 248				8
Ce 144				8	Cf 249				8
Pm 145				8	Cf 250				8
Pm 147			7.49E-08	CC 1	Cf 251				8
Sm 147				8	Cf 252				8
Sm 151			9.36E-08	CC 1	Other a				8
Eu 152			1.5E-07	CC 1	Other b/g				8
Eu 154			1.18E-06	CC 1	Total a	0	3.84E-05	CC 1	8
Eu 155			1.79E-07	CC 1	Total b/g	0	6.05E-04	CC 1	8

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