

**WASTE STREAM****9G66****Miscellaneous Contaminated Items****SITE** Trawsfynydd**SITE OWNER** Nuclear Decommissioning Authority**WASTE CUSTODIAN** Magnox Limited**WASTE TYPE** LLW**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	2.0 m <sup>3</sup>

Total future arisings:		0 m <sup>3</sup>
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Total waste volume:		2.0 m <sup>3</sup>
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Comment on volumes: The ILW component of this waste stream can be found in waste stream 9G64.

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

**WASTE SOURCE** The wastes in this stream have not been identified or characterised but are known to have arisen during the reactor and cooling ponds operation and maintenance.

**PHYSICAL CHARACTERISTICS**

General description: The waste is predominantly redundant metallic equipment and material usually arising from irradiated fuel handling and pond operations. Component dimensions are generally up to one metre. Large components may be cut up prior to packaging in standard waste containers.

Physical components (%vol): Principally metal components.

Sealed sources: -

Bulk density (t/m<sup>3</sup>): ~1

Comment on density: The assumption of 1 t/m<sup>3</sup> as the average bulk density may be subject to revision. It is known that specific items such as steel plate will have bulk density nearer 7 t/m<sup>3</sup>.

**CHEMICAL COMPOSITION**

General description and components (%wt): The waste may be principally carbon steel (>50%). Other components have not been assessed. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium may be present as water or in the form of other inorganic or organic compounds.

C-14: Chemical form of carbon 14 has not been determined but may be graphite.

Se-79: The chemical form of selenium has not been determined.

Tc-99: The chemical form of technetium has not been determined.

Ra: Radium isotope content is insignificant.

Th: Thorium isotope content is insignificant.

U: 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: Chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt):

-  
Stainless steel..... NE

Other ferrous metals..... >50.0 Carbon steel

Iron.....

Aluminium..... NE

Beryllium.....

Cobalt.....

Copper..... NE

Lead..... NE

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Magnox/Magnesium..... NE  
 Nickel.....  
 Titanium.....  
 Uranium.....  
 Zinc..... NE  
 Zircaloy/Zirconium..... NE  
 Other metals..... NE

The waste is composed mainly of carbon steel (>50%); the presence of "other" metals has not been assessed.

## Organics (%wt):

Not assessed. Note that it can be difficult to differentiate between PVC, polythene and other plastics when in wasteform. Polythene is present as packaging in many instances. halogenated plastics and rubbers are not assessed but not expected to be in excess of trace quantities.

Total cellulosics..... NE  
     Paper, cotton..... NE  
     Wood..... NE  
 Halogenated plastics ..... NE  
 Total non-halogenated plastics..... NE  
     Condensation polymers..... NE  
     Others..... NE  
 Organic ion exchange materials....  
 Total rubber..... NE  
     Halogenated rubber ..... NE  
     Non-halogenated rubber..... NE  
 Hydrocarbons.....  
     Oil or grease .....  
     Fuel.....  
     Asphalt/Tarmac (cont.coal tar)...  
     Asphalt/Tarmac (no coal tar)....  
     Bitumen.....  
     Others.....  
 Other organics..... NE

## Other materials (%wt):

-  
 Inorganic ion exchange materials. 0  
 Inorganic sludges and flocs..... 0  
 Soil..... NE  
 Brick/Stone/Rubble..... NE  
 Cementitious material..... NE  
 Sand.....  
 Glass/Ceramics..... NE  
 Graphite..... NE  
 Desiccants/Catalysts.....  
 Asbestos..... NE  
     Non/low friable.....

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	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	0
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0
Inorganic anions (%wt):	None greater than 5%.	
	Fluoride.....	<5.0
	Chloride.....	<5.0
	Iodide.....	<5.0
	Cyanide.....	0
	Carbonate.....	<5.0
	Nitrate.....	<5.0
	Nitrite.....	<5.0
	Phosphate.....	<5.0
	Sulphate.....	<5.0
	Sulphide.....	<5.0
Materials of interest for waste acceptance criteria:	The possible presence of materials likely to represent a fire or other non-radiological hazard has not been fully assessed.	
	Combustible metals.....	NE
	Low flash point liquids.....	0
	Explosive materials.....	0
	Phosphorus.....	0
	Hydrides.....	0
	Biological etc. materials.....	NE
	Biodegradable materials.....	
	Putrescible wastes.....	0
	Non-putrescible wastes.....	
	Corrosive materials.....	NE
	Pyrophoric materials.....	0
	Generating toxic gases.....	NE
	Reacting with water.....	NE
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	
Hazardous substances / non hazardous pollutants:	-	
	Acrylamide.....	
	Benzene.....	
	Chlorinated solvents.....	
	Formaldehyde.....	
	Organometallics.....	
	Phenol.....	
	Styrene.....	

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**Miscellaneous Contaminated Items**

- 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**

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		13.0
None		87.0

Comment on planned treatments:

13% of this waste stream is expected to be sent to Landfill as VLLW.

**WASTE STREAM****9G66****Miscellaneous Contaminated Items****Disposal Routes:**

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	87.0
Expected to be consigned to a Landfill Facility	13.0
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	

**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 <sup>3</sup>	Number of packages
1/3 Height IP-1 ISO	87.0	10	< 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: The volume of waste in this stream will not fill one box. It is likely that this waste will be placed in a container with other LLW.

**Waste Planned for Disposal at the LLW Repository:**

Container voidage: The waste is expected to be grouted. In-accessible voidage is not expected.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC). The waste does not have a current WCH.

Waste consigned for disposal to LLWR in year of generation: No. The timing of the consignment of the waste for disposal cannot be determined at present.

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: -

**WASTE STREAM****9G66****Miscellaneous Contaminated Items****RADIOACTIVITY**

Source:	The waste usually arises from the irradiated fuel handling and pond operations. Components that have been associated with fuel pond operations are likely to be of high activity. Fission products, actinides and other activation products will be present.
Uncertainty:	Activity best estimate (taken from a waste stream of similar origin) thought to be accurate to within two orders of magnitude, but not fully assessed.
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:	Figures were derived by estimation based upon available information.
Other information:	Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected.

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**Miscellaneous Contaminated Items**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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	4.22E-06	DD 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.00E-08	DD 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	3E-09	DD 2			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	2.02E-07	DD 2			Pb 210		8		
Co 60	6.13E-07	DD 2			Bi 208		8		
Ni 59	4E-09	DD 2			Bi 210m		8		
Ni 63	2.82E-07	DD 2			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	2.42E-05	DD 2			Th 227		8		
Zr 93	2E-09	DD 2			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234	4E-09	DD 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	1E-08	DD 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	4.06E-09	DD 2		
Ag 108m	<9.85E-09	D 3			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	4E-09	DD 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.86E-06	DD 2		
Sn 123		8			Pu 239	1.00E-06	DD 2		
Sn 126		8			Pu 240	2.00E-06	DD 2		
Sb 125		8			Pu 241	5.19E-06	DD 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	4.04E-06	DD 2		
Te 127m		8			Am 242m	9.57E-09	DD 2		
I 129		8			Am 243	4.00E-09	DD 2		
Cs 134		8			Cm 242	7.89E-09	DD 2		
Cs 135		8			Cm 243	3.25E-09	DD 2		
Cs 137	2.44E-05	DD 2			Cm 244	2.84E-08	DD 2		
Ba 133		8			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	9.28E-09	DD 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	9.33E-08	DD 2			Other a				
Eu 152		8			Other b/g				
Eu 154	9.66E-08	DD 2			<b>Total a</b>	<b>8.94E-06</b>	<b>DD 2</b>	<b>0</b>	
Eu 155	8.33E-09	DD 2			<b>Total b/g</b>	<b>5.93E-05</b>	<b>DD 2</b>	<b>0</b>	

**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