

<b>WASTE STREAM</b>	<b>9G36/C</b>	<b>Conditioned Miscellaneous Activated Components</b>
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**SITE** Trawsfynydd

**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Magnox Limited

**WASTE TYPE** ILW

**WASTE VOLUMES**

		Conditioned	Packaged
Stocks:	At 1.4.2019.....	~43.2 m <sup>3</sup>	52.3 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>	0 m <sup>3</sup>
Total waste volume:		43.2 m <sup>3</sup>	52.3 m <sup>3</sup>
Number of waste packages in stock:	At 1.4.2019.....	16 package(s)	
Comment on volumes:	All of this waste stream has now been conditioned.		
Uncertainty factors on volumes:	Stock (upper):	x 1.0	Arisings (upper) x
	Stock (lower):	x 1.0	Arisings (lower) x

**WASTE SOURCE** Redundant or defective components removed from the reactor core.

**PHYSICAL CHARACTERISTICS**

**General description:** The waste comprises miscellaneous activated components, principally absorber bars, held in mild steel baskets and encapsulated in PFA/OPC and packaged in 3m<sup>3</sup> stainless steel boxes. The waste is conditioned and packaged.

**Physical components (%wt):** Steel components constitute approximately 65% wt, reactor grade A graphite constitutes approximately 5% wt and PFA/OPC grout about 30% wt.

**Sealed sources:** -

**Bulk density (t/m<sup>3</sup>):** ~3.5

**Comment on density:** -

**CHEMICAL COMPOSITION**

**General description and components (%wt):** Steel components constitute approximately 65% wt, reactor grade A graphite constitutes approximately 5% wt and PFA/OPC grout about 30% wt.

**Chemical state:** Alkali

**Chemical form of radionuclides:**  
H-3: The chemical form of tritium has not been determined but may be present as water or as other inorganic or organic compounds.  
C-14: Carbon 14 will 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: The radium isotope content is insignificant.  
Th: The thorium isotope content is insignificant.  
U: The uranium isotope content is insignificant.  
Np: The neptunium content is insignificant.  
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

**Metals and alloys (%wt):** Contains flux flattening bars 855 mm x 70 mm diameter containing graphite and steel pellets approximately 25 mm x 25 mm diameter. Flux flattening bars comprise the bulk of the waste.

Stainless steel.....	NE	
Other ferrous metals.....	~65.0	Carbon steel is present. Reactor grade A.
Iron.....		
Aluminium.....	NE	
Beryllium.....	NE	
Cobalt.....		

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**Conditioned Miscellaneous Activated Components**

	Copper.....	NE	
	Lead.....	NE	
	Magnox/Magnesium.....	0	
	Nickel.....		
	Titanium.....		
	Uranium.....		
	Zinc.....	NE	
	Zircaloy/Zirconium.....	NE	
	Other metals.....	NE	"Other" metals are not assessed.
Organics (%wt):	Only trace quantities present, if any. There are no halogenated plastics or rubbers present.		
	Total cellulose.....	0	
	Paper, cotton.....	0	
	Wood.....	0	
	Halogenated plastics .....	0	
	Total non-halogenated plastics.....	0	
	Condensation polymers.....	0	
	Others.....	0	
	Organic ion exchange materials....	0	
	Total rubber.....	0	
	Halogenated rubber .....	0	
	Non-halogenated rubber.....	0	
	Hydrocarbons.....		
	Oil or grease .....		
	Fuel.....		
	Asphalt/Tarmac (cont.coal tar)...		
	Asphalt/Tarmac (no coal tar)....		
	Bitumen.....		
	Others.....		
	Other organics.....	TR	
Other materials (%wt):	-		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	30.0	PFA/OPC grout
	Sand.....		
	Glass/Ceramics.....	0	
	Graphite.....	~5.0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		

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	Free aqueous liquids.....	0
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0
Inorganic anions (%wt):	Not fully assessed. There will be aluminates and silicates associated with the grout.	
	Fluoride.....	NE
	Chloride.....	NE
	Iodide.....	NE
	Cyanide.....	0
	Carbonate.....	NE
	Nitrate.....	NE
	Nitrite.....	NE
	Phosphate.....	NE
	Sulphate.....	NE
	Sulphide.....	NE
Materials of interest for waste acceptance criteria:	No materials likely to pose a fire or other non-radiological hazard have been identified.	
	Combustible metals.....	0
	Low flash point liquids.....	0
	Explosive materials.....	0
	Phosphorus.....	0
	Hydrides.....	0
	Biological etc. materials.....	0
	Biodegradable materials.....	
	Putrescible wastes.....	0
	Non-putrescible wastes.....	
	Corrosive materials.....	0
	Pyrophoric materials.....	0
	Generating toxic gases.....	0
	Reacting with water.....	0
	Active particles.....	
	Soluble solids as bulk chemical compounds.....	
Hazardous substances / non hazardous pollutants:	None expected.	
	Acrylamide.....	
	Benzene.....	
	Chlorinated solvents.....	
	Formaldehyde.....	
	Organometallics.....	
	Phenol.....	
	Styrene.....	
	Tri-butyl phosphate.....	
	Other organophosphates.....	

**WASTE STREAM****9G36/C****Conditioned Miscellaneous Activated Components**

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): No  
 EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents..... 0

**PACKAGING AND CONDITIONING**

Container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages
	3m <sup>3</sup> box (round corners)	100.0	2.7	2.7	16

Container type comment: The waste has been conditioned.  
 Range in container waste volume: There is no significant variability in the volume of waste per container.  
 Other information on containers: The container material is stainless steel.  
 Conditioned density (t/m<sup>3</sup>): ~3.5  
 Conditioned density comment: -  
 Other information on conditioning: The waste was conditioned in 2001 to 2003.

**RADIOACTIVITY**

Source: Irradiated components removed from the reactor.

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Uncertainty:	The values quoted were derived from radionuclide fingerprints which are considered to be accurate to a factor of 4.
Definition of total alpha and total beta/gamma:	No alpha activity has been identified. The alpha activity is considered to be insignificant.
Measurement of radioactivities:	Estimates are based upon theoretical assessments supported by measurements.
Other information:	-

**WASTE STREAM 9G36/C Conditioned Miscellaneous Activated Components**

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	1.81E-02	BB 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		8			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	1E-05	BB 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-01	BB 2			Pb 210		8		
Co 60	3.06E-01	BB 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	5.64E-01	BB 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		8			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		8			Th 234		8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238		8		
Sn 123		8			Pu 239		8		
Sn 126		8			Pu 240		8		
Sb 125		8			Pu 241		8		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241		8		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134		8			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137		8			Cm 244		8		
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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152		8			Other b/g				
Eu 154		8			<b>Total a</b>	<b>0</b>			<b>0</b>
Eu 155		8			<b>Total b/g</b>	<b>1.09E+00</b>	<b>BB 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