

<b>WASTE STREAM</b>	<b>9C24</b>	<b>FED Magnox (lugs and splitters)</b>
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**SITE** Dungeness A  
**SITE OWNER** Nuclear Decommissioning Authority  
**WASTE CUSTODIAN** Magnox Limited  
**WASTE TYPE** ILW

**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	1.0 m <sup>3</sup>
Total future arisings:		0 m <sup>3</sup>
Total waste volume:		1.0 m <sup>3</sup>
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x
	Stock (lower): x 0.8	Arisings (lower) x

**WASTE SOURCE** FED found inside fuel skips in R1 & R2 ponds. The waste consists of Magnox metal, swarf and sludge which may be contaminated by fission products and actinides. Components may weigh up to about 10g and be approximately 4 mm x 15 mm x 100 mm. There are no large items in the waste which will require special handling.

**PHYSICAL CHARACTERISTICS**

General description: FED Magnox  
 Physical components (%vol): Magnox (mainly AL 80 and MN 80), magnesium hydroxide and magnesium carbonate will be present (>99.9% wt).  
 Sealed sources: -  
 Bulk density (t/m<sup>3</sup>): 0.65  
 Comment on density: The bulk density of 0.65 t/m<sup>3</sup> taken from an average of measured values in NNL Analysis report EX09284/06/10/04 and NNL Analysis report EX09284/06/10/03 for samples taken from R1 and R2 ponds.

**CHEMICAL COMPOSITION**

General description and components (%wt): Magnox metal, magnesium carbonate and magnesium hydroxide. Activation of trace components within the Magnox (>99% wt in total including impurities). Fission product and actinide contamination.  
 Chemical state: -  
 Chemical form of radionuclides: H-3: The tritium is expected to be present as surface contamination, possibly as water, but perhaps in the form of other inorganic or organic compounds.  
 C-14: The carbon-14 will probably be present as graphite.  
 Tc-99: The chemical form of technetium has not been determined.  
 Ra: Chemical form of Uranium isotopes has not been determined but may be oxides.  
 Np: The chemical form of neptunium has not been determined.  
 Pu: Chemical form of plutonium isotopes has not been determined but may be oxides.  
 Metals and alloys (%wt): The waste is predominantly lugs, which will be typically 4 mm by 15 mm by 100 mm.  
 Stainless steel.....  
 Other ferrous metals.....  
 Iron..... TR  
 Aluminium.....  
 Beryllium..... TR  
 Cobalt.....  
 Copper.....  
 Lead.....  
 Magnox/Magnesium..... >99.0  
 AL 80 and MN 80 alloys, which have 0.8 wt% aluminium and manganese respectively. Impurities may include beryllium.

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	Nickel.....	
	Titanium.....	
	Uranium.....	
	Zinc.....	TR
	Zircaloy/Zirconium.....	
	Other metals.....	
Organics (%wt):	-	
	Total cellulose.....	0
	Paper, cotton.....	
	Wood.....	
	Halogenated plastics .....	
	Total non-halogenated plastics.....	0
	Condensation polymers.....	
	Others.....	
	Organic ion exchange materials....	
	Total rubber.....	0
	Halogenated rubber .....	
	Non-halogenated rubber.....	
	Hydrocarbons.....	
	Oil or grease .....	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics.....	
Other materials (%wt):	-	
	Inorganic ion exchange materials.	
	Inorganic sludges and flocs.....	
	Soil.....	
	Brick/Stone/Rubble.....	
	Cementitious material.....	
	Sand.....	
	Glass/Ceramics.....	
	Graphite.....	
	Desiccants/Catalysts.....	
	Asbestos.....	
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	
	Free non-aqueous liquids.....	
	Powder/Ash.....	

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Inorganic anions (%wt):

-

Fluoride.....

Chloride.....

Iodide.....

Cyanide.....

Carbonate.....

Nitrate.....

Nitrite.....

Phosphate.....

Sulphate.....

Sulphide.....

Materials of interest for  
waste acceptance criteria:

-

Combustible metals..... >99.0

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..... >99.0

Active particles.....

Soluble solids as bulk chemical  
compounds.....

Hazardous substances /  
non hazardous pollutants:

-

Acrylamide.....

Benzene.....

Chlorinated solvents.....

Formaldehyde.....

Organometallics.....

Phenol.....

Styrene.....

Tri-butyl phosphate.....

Other organophosphates.....

Vinyl chloride.....

Arsenic.....

Barium.....

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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):

EDTA.....  
 DPTA.....  
 NTA.....  
 Polycarboxylic acids.....  
 Other organic complexants.....  
 Total complexing agents.....

**PACKAGING AND CONDITIONING**

Conditioning method: To be placed into DCIC and dried as necessary, due to small volume likely to be co-disposed of with other MCI such as 9C38, 9C40, 9C41 or 9C43.

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m<sup>3</sup>/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m<sup>3</sup>/y incoming waste): -

Other information: Likely to be co-disposed of with other MCI such as 9C38, 9C40, 9C41 or 9C43. As such no containers allocated to this stream.

Likely container type:	Container	Waste packaged (%vol)	Waste loading (m <sup>3</sup> )	Payload (m <sup>3</sup> )	Number of packages

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: Other information: -

Conditioned density (t/m<sup>3</sup>): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

**RADIOACTIVITY**

Source: -

Uncertainty: The source of the waste is the removal of lugs from fuel elements prior to dispatch of the elements to Sellafield. Activation of trace nuclides in the Magnox and contamination by fission products and actinides will be main sources of activity.

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 values quoted are derived from samples taken and analysed in NNL Analysis report EX09284/06/10/04 and NNL Analysis report EX09284/06/10/03. Summarised in M/EF/DNA/EAN/0002/19 (table 1).

Other information: -

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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	4.37E-03	CC 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4E-05	CC 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	2.29E-07	CC 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	7.23E-05	CC 2			Pb 210		8		
Co 60	1.6E-04	CC 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	8.15E-04	CC 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	2.72E-04	CC 2			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	2.07E-07	CC 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	6.61E-08	CC 2		
Ag 108m	5.1E-06	CC 2			U 235	3.63E-09	CC 2		
Ag 110m		8			U 236	3.63E-09	CC 2		
Cd 109		8			U 238	5.25E-08	CC 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.13E-04	CC 2		
Sn 123		8			Pu 239	1E-04	CC 2		
Sn 126		8			Pu 240	1E-04	CC 2		
Sb 125	2.24E-06	CC 2			Pu 241	4.85E-03	CC 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	4.33E-04	CC 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	1.88E-06	CC 2			Cm 242	2.68E-06	CC 2		
Cs 135		8			Cm 243	1.43E-05	CC 2		
Cs 137	8.77E-04	CC 2			Cm 244	1.43E-05	CC 2		
Ba 133	1.7E-06	CC 2			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	8.99E-06	CC 2			Other b/g		CC 2		
Eu 154	1.48E-04	CC 2			<b>Total a</b>	<b>7.77E-04</b>	<b>CC 2</b>	<b>0</b>	
Eu 155	4.41E-05	CC 2			<b>Total b/g</b>	<b>1.17E-02</b>	<b>CC 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