WASTE STREAM 9D39 FED Nimonic R1

SITE Hinkley Point A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

Stocks:	At 1.4.2013.....	~0.4 m³
Total future arisings:		0 m³
Total waste volume:		0.4 m³
Comment on volumes:	There could be up to about 130,000 springs in the vault.	
Uncertainity factors on volumes:	Stock (upper): x 1.05	Arisings (upper) x
	Stock (lower): x 0.95	Arisings (lower) x

WASTE SOURCE Nimonic springs are incorporated into Magnox fuel element top fittings and are removed during fuel element desplittering.

PHYSICAL CHARACTERISTICS

General description:	Springs are about 33 mm long, 10 mm in diameter and weigh about 5 g. There are no large items present in the waste which may require special handling.
Physical components (%vol):	Nimonic springs (~100 vol%).
Bulk density (t/m³):	~0.82
Comment on density:	-

CHEMICAL COMPOSITION

General description and components (%wt):	Nimonic (~100%).
Chemical state:	The waste is not acidic, alkaline, oxidising or reducing.
Chemical form of radionuclides:	H-3: Tritium will probably be present as surface contamination, possibly as water but perhaps as other inorganic or organic compounds. C-14: Carbon 14 is likely to be present in the form of graphite contamination. Cl-36: Chlorine 36 will probably be present in the form of graphite contamination. Se-79: The selenium content is insignificant. Tc-99: The chemical form of technetium has not been determined. Ra: Radium isotope content is insignificant. Th: The 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): The Nimonic is 100% type 80A. Bulk metal items are not present in the waste.

Stainless steel.....	0	Bronze.....	0
Other ferrous metals.....	0	Inconel.....	0
Aluminium.....	0	Nimonic.....	100.0
Copper.....	0	Stellite.....	0
Lead.....	0	Boral.....	0
Zinc.....	0	Dural.....	0
Magnox/Magnesium.....	0	Monel.....	0
Zircaloy.....	0	Uranium.....	
Brass.....	0	Beryllium.....	0
		Other metals (below).....	0

Other metals: -

Inorganic anions (%wt): None of the inorganic anions in the table is expected to be present at greater than trace concentration.

Fluoride.....	TR	Nitrate.....	TR
Chloride.....	TR	Nitrite.....	TR
Iodide.....	0	Phosphate.....	TR
Cyanide.....	0	Sulphate.....	TR
Carbonate.....	TR	Sulphide.....	0

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Listed substances:	Not present.
Hazardous and problematic materials (%wt):	There are no materials identified in the waste likely to represent a fire or other non-radiological hazard.

Combustible metals.....	0	Strong oxidising agents.....	0
Low flash point liquids.....	0	Pyrophoric materials.....	0
Explosive materials.....	0	Generating toxic gases.....	0
Phosphorus.....	0	Reacting with water.....	0
Hydrides.....	0	Asbestos.....	0
Putrescible wastes.....	0	Free aqueous liquids.....	P
Biological etc. materials.....	0	Free non-aqueous liquids.....	0
Powder.....	0		

Asbestos types and proportions:	-
Complexing agents (%wt):	Not yet determined. Only trace quantities, if any, are expected.

Complexing agents.....	TR

Organics (%wt): Organics may be present in trace quantities.

Total cellulosics.....	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
Other organics.....	TR

Halogenated plastics and rubber (%wt):	No halogenated plastics or rubbers present.
Other materials (%wt):	Traces of graphite may be present.

Inorganic ion exchange materials..	0
Inorganic sludges and flocs.....	0
Soil.....	0
Rubble.....	0
Concrete, cement and sand.....	0
Glass.....	0
Ceramics.....	0
Graphite.....	TR

PACKAGING AND CONDITIONING

Conditioning method:	-
Plant Name:	-
Location:	Hinkley Point A Site
Plant startup date:	2019
Total capacity (m^3/y incoming waste):	-
Target start date for packaging this stream:	2020
Throughput for this stream (m^3/y incoming waste):	-
Other information:	-

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Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Container displacement volume (m^3)
Other (MOSAIK with 90mm shielding. Displacement volume 1.32m3.)	100.0	~0.2	0.222	

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix: -

Other information: -

Conditioned density (t/m^3): -

Conditioned density comment: -

Other information on conditioning: -

RADIOACTIVITY

Source: Nimonic springs originally incorporated into Magnox fuel element top end fittings and removed during fuel element desplittering. There will be activation products in the Nimonic and contamination by fission products and actinides.

Accuracy: Specific activity is a function of Station operating history. The values quoted are indicative of the activities that might be expected.

Definition of total alpha and total beta/gamma: Totals shown on table of radionuclide activities are the sums of the listed alpha or beta/gamma emitting radionuclides plus 'other alpha' or 'other beta/gamma.'

Measurement of specific activities: Induced activity has been calculated and fission product and actinide contamination levels have been based upon measurements of the activity of Magnox samples.

Other information: The Nimonic springs are expected to be of high activity. Other beta/gamma nuclides in stocks include (in TBq/m3) Al26 (2E-4).

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Nuclide	Average specific activity, TBq/m³				Nuclide	Average specific activity, TBq/m³			
	Waste at 1.4.2013	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2013	Bands and Code	Future arisings	Bands and Code
H 3	2.14E-03	C C 2			Ho 163		8		
Be 10		8			Ho 166m		8		
C 14	6E-06	C C 2			Tm 170		8		
Cl 36	2E-04	C C 2			Tm 171		8		
Ar 39		8			Lu 174		8		
Ar 42		8			Lu 176		8		
K 40		8			Hf 178n		8		
Ca 41		8			Hf 182		8		
Mn 53		8			Pt 193		8		
Mn 54	3.1E-05	C C 2			Tl 204		8		
Fe 55	4.29E+00	C C 2			Pb 205		8		
Co 60	2.27E+02	C C 2			Pb 210		8		
Ni 59	1E+01	C C 2			Bi 208		8		
Ni 63	1.92E+03	C C 2			Bi 210m		8		
Zn 65		8			Po 210		8		
Se 79		8			Ra 223		8		
Kr 81		8			Ra 225		8		
Kr 85		8			Ra 226		8		
Rb 87		8			Ra 228		8		
Sr 90	4.34E-05	C C 2			Ac 227		8		
Zr 93	2E-09	C C 2			Th 227		8		
Nb 91		8			Th 228		8		
Nb 92		8			Th 229		8		
Nb 93m		8			Th 230		8		
Nb 94		8			Th 232		8		
Mo 93		8			Th 234	<3E-08	C 3		
Tc 97		8			Pa 231		8		
Tc 99	1E-08	C C 2			Pa 233	<4.04E-09	C 3		
Ru 106		8			U 232		8		
Pd 107		8			U 233		8		
Ag 108m		8			U 234	3.04E-08	C C 2		
Ag 110m		8			U 235		8		
Cd 109		8			U 236	4E-09	C C 2		
Cd 113m		8			U 238	3E-08	C C 2		
Sn 119m		8			Np 237	4.04E-09	C C 2		
Sn 121m		8			Pu 236		8		
Sn 123		8			Pu 238	1.9E-05	C C 2		
Sn 126		8			Pu 239	1E-05	C C 2		
Sb 125		8			Pu 240	2E-05	C C 2		
Sb 126		8			Pu 241	5.25E-04	C C 2		
Te 125m		8			Pu 242	1E-08	C C 2		
Te 127m		8			Am 241	2.56E-05	C C 2		
I 129		8			Am 242m	9.71E-08	C C 2		
Cs 134	5.33E-08	C C 2			Am 243	3E-08	C C 2		
Cs 135		8			Cm 242	8.01E-08	C C 2		
Cs 137	6.09E-05	C C 2			Cm 243	2.61E-08	C C 2		
Ba 133		8			Cm 244	3.18E-07	C C 2		
La 137		8			Cm 245		8		
La 138		8			Cm 246		8		
Ce 144		8			Cm 248		8		
Pm 145		8			Cf 249		8		
Pm 147	4.1E-07	C C 2			Cf 250		8		
Sm 147		8			Cf 251		8		
Sm 151	8.59E-08	C C 2			Cf 252		8		
Eu 152	2.2E-09	C C 2			Other a		8		
Eu 154	3.09E-07	C C 2			Other b/g	2E-04	C C 2		
Eu 155	4.32E-08	C C 2			**Total a**	**7.51E-05**	**C C 2**	**0**	
Gd 153		8			**Total b/g**	**2.16E+03**	**C C 2**	**0**	

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 the average specific activity.

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