WASTE STREAM	9D42	FED Magnox - R2

SITE Hinkley Point A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m^3)
Stocks: At 1.4.2025	= 113.0
Future arisings:	
Total future arisings:	**0.0**
Total waste volume:	**113.0**

OR

Conditioned (m^3)	Packaged (m^3)

Number of waste packages in stock: At 1.4.2025…… - packages

Comment on arising rates: -

Additional information on quantities: In calculating the volumes it has been assumed that the waste has a bulk density of 0.5t/m3.

Uncertainty factors on volumes:
Stock (upper): x 1.10 Arisings (upper): x -
Stock (lower): x 0.90 Arisings (lower): x -

WASTE SOURCE Removal of splitters from fuel elements prior to dispatch of the elements to Sellafield.

PHYSICAL CHARACTERISTICS

General description: The waste consists of Magnox metal and swarf. Sludge is decribed in waste stream 9D70. Individual components may weigh up to about 100 g and be approx. 2 mm x 25 mm x (75-900) mm. Nimonic springs will also be present (see waste stream 9D44).There are no large items in the waste which will require special handling.

Changes since waste generated: -

Bulk density (t/m³): = 0.50

Comment on density: The bulk density of the waste ranges from 0.1 to 1.7 t/m3 with an average density of 0.5 t/m3. The packing factor will be variable.

CHEMICAL COMPOSITION

General description and components (%wt): Magnox Metal (Zr 55) (99.5% wt), zirconium alloy (0.5% wt) in fuel element top end fittings. Activation of trace components within the Magnox. Fission product and actinide contamination. Magnesium carbonate and hydroxide may also be present.

Chemical state: Alkali

Sheet metal proportion / thickness: No bulk metal items expected.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel……	= 0	-	
Other ferrous metals……	= 0	-	
Iron……		-	
Aluminium……	= 0	-	
Beryllium……	TR	-	
Cobalt……		-	
Copper……	= 0	-	
Lead……	= 0	-	
Magnox/Magnesium……	= 99.5	Magnox alloy Zr 55, contains 0.55 wt% zirconium as an alloying constituent.	
Nickel……		-	
Titanium……		-	
Uranium……		-	
Zinc……	= 0	-	
Zircaloy/Zirconium……	= 0.50	-	
Other metals……	TR	Manganese	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
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	-	
Hydrocarbons		-	
Oil or grease		-	
Fuel		-	
Asphalt/Tarmac (cont.coal tar)		-	
Asphalt/Tarmac (no coal tar)		-	
Bitumen		-	
Others		-	
Other organics	TR	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	= 0	-	
Inorganic sludges and flocs	NE	-	
Soil	= 0	-	
Brick/Stone/Rubble	= 0	-	
Cementitious material	= 0	-	
Sand		-	
Glass/Ceramics	= 0	-	
Graphite	TR	-	
Desiccants/Catalysts		-	
Asbestos	= 0	-	
Non/low friable		-	
Moderately friable		-	
Highly friable		-	
Free aqueous liquids	TR	-	
Free non-aqueous liquids	= 0	-	
Powder/Ash	TR	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
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:

	(%wt)	Type(s) and comment
Combustible metals	~ 99.5	-
Low flash point liquids	= 0	-
Explosive materials	= 0	-
Phosphorus	= 0	-
Hydrides	= 0	-
Biological etc. materials	= 0	-
Biodegradable materials	0	-
Putrescible wastes	= 0	-
Non-putrescible wastes		-
Corrosive materials	= 0	-
Pyrophoric materials	= 0	-
Generating toxic gases	= 0	-
Reacting with water	~ 99.5	-
Higher activity particles		-
Soluble solids as bulk chemical compounds		-

Hazardous substances / non hazardous pollutants: -

	(%wt)	Type(s) and comment
Acrylamide		-
Benzene		-
Chlorinated solvents		-
Formaldehyde		-
Organometallics		-
Phenol		-
Styrene		-
Tri-butyl phosphate		-
Other organophosphates		-
Vinyl chloride		-
Arsenic		-
Barium		-
Boron	0	-
Boron (in Boral)		-
Boron (non-Boral)		-
Cadmium		-
Caesium		-
Selenium		-
Chromium		-
Molybdenum		-
Thallium		-
Tin		-
Vanadium		-
Mercury compounds		-
Others		-

Complexing agents (%wt): Yes

	(%wt)	Type(s) and comment
EDTA		-
DPTA		-
NTA		-
Polycarboxylic acids		-
Other organic complexants		-
Total complexing agents	TR	-

Physical components:

	Number	Type(s) and comment
Sources		-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1		-
EEE Type 2		-
EEE Type 3		-
EEE Type 4		-
EEE Type 5		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction		
Decay storage		
Low force compaction		
Supercompaction (HFC)		
Incineration		
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment		
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation	On-site	100.0
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		

Comments on planned treatments: -

Conditioning method: Loading of solids into standard 210-litre drums. Compacted drum 'pucks' pre-loaded into Mortuary Tubes in RCB.

Conditioning plants:

Plant Name	Location
HPA MILWEP	Hinkley Point A

Likely conditioning matrix: Unknown

Further information on the conditioning matrix: -

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m^3)	Payload (m^3)	Number of packages	Estimated start date for packaging
6 m^3 concrete box (SD)	100.0	5.4	5.8	22	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m^3): -
Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m^3	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)	100.0		
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility:

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: The source of the waste is the removal of splitters 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.

Uncertainty: The values quoted are indicative of the activities that might be expected.

Measurement of radioactivities: Values were derived from measurements, calculations of induced activity and estimates of likely contamination. Allowance has been made for zirconium alloy in top end fittings.

Chemical form of radionuclides:

H-3: Most tritium is expected to be present as surface contamination, possibly as water but perhaps in the form of other inorganic compounds or as organic compounds.
C-14: Carbon 14 will probably be present as graphite.
Cl-36: Chlorine 36 incorporated in the Magnox may be associated with barium impurity (barium chloride). Other chlorine 36 may be associated with surface contamination.
Se-79: The selenium content is insignificant.
Tc-99: The chemical form of technetium has not been determined.
I-129: -
Ra: The radium isotope content is insignificant.
Th: The thorium isotope content is insignificant.
U: The chemical form of uranium isotopes may be uranium oxides.
Np: The chemical form of neptunium has not been determined.
Pu: The chemical form of plutonium isotopes may be plutonium oxides.

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	3.13E-03	C C 2			Gd 153		8		
Be 10	2.02E-07	C C 2			Ho 163	1.80E-08	C C 2		
C 14	1.24E-04	C C 2			Ho 166m	2.34E-05	C C 2		
Na 22		8			Tm 170		8		
Al 26	2.89E-05	C C 2			Tm 171		8		
Cl 36	1.93E-05	C C 2			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40	< 2.80E-06	C 3			Hf 182		8		
Ca 41	1.60E-07	C C 2			Pt 193		8		
Mn 53		8			Tl 204	4.24E-07	C C 2		
Mn 54	< 1.20E-09	C 3			Pb 205		8		
Fe 55	1.25E-06	C C 2			Pb 210		8		
Co 60	1.13E-04	C C 2			Bi 208		8		
Ni 59	1.63E-05	C C 2			Bi 210m		8		
Ni 63	1.45E-03	C C 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	7.65E-04	C C 2			Th 227		8		
Zr 93	3.40E-09	C C 2			Th 228	4.42E-07	C C 2		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m	2.58E-06	C C 2			Th 232		8		
Nb 94	6.67E-08	C C 2			Th 234	< 1.55E-07	C 3		
Mo 93	6.40E-09	C C 2			Pa 231		8		
Tc 97		8			Pa 233	8.06E-07	C C 2		
Tc 99	1.47E-05	C C 2			U 232	4.69E-07	C C 2		
Ru 106	2.42E-08	C C 2			U 233	< 2.80E-07	C 3		
Pd 107		8			U 234	2.26E-07	C C 2		
Ag 108m	1.92E-06	C C 2			U 235	5.25E-09	C C 2		
Ag 110m		8			U 236	< 2.46E-09	C 3		
Cd 109	< 6.31E-08	C 3			U 238	1.55E-07	C C 2		
Cd 113m	1.87E-05	C C 2			Np 237	< 8.06E-07	C 3		
Sn 119m		8			Pu 236		8		
Sn 121m	1.28E-05	C C 2			Pu 238	4.35E-05	C C 2		
Sn 123		8			Pu 239	6.82E-05	C C 2		
Sn 126		8			Pu 240	6.99E-05	C C 2		
Sb 125	1.58E-09	C C 2			Pu 241	9.71E-04	C C 2		
Sb 126		8			Pu 242	7.25E-07	C C 2		
Te 125m		8			Am 241	2.76E-04	C C 2		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134		8			Cm 242		8		
Cs 135		8			Cm 243	1.24E-07	C C 2		
Cs 137	1.05E-04	C C 2			Cm 244	1.37E-06	C C 2		
Ba 133	8.84E-07	C C 2			Cm 245		8		
La 137	1.72E-09	C C 2			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144	< 1.39E-09	C 3			Cf 249		8		
Pm 145	2.05E-07	C C 2			Cf 250		8		
Pm 147	2.38E-06	C C 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	3.92E-04	C C 2			Unsp a				
Eu 152	3.57E-06	C C 2			Unsp b/g				
Eu 154	2.03E-05	C C 2			**Total a**	**4.62E-04**	*	**0**	*
Eu 155	4.92E-08	C C 2			**Total b/g**	**7.22E-03**	*	**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 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
* Total calculated from the 114 declared radionuclides