

WASTE STREAM	9F19	Miscellaneous Drummed Contaminated and Activated Items
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SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

Is the waste subject to Scottish Policy: No

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2022.....	48.0 m ³
Total future arisings:		0 m ³
Total waste volume:		48.0 m ³
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 The waste is redundant equipment and material usually arising from reactor operation, irradiated fuel handling and pond operations.

PHYSICAL CHARACTERISTICS

General description: The majority of drummed waste is contained in 120-litre drums with a small percentage in 200-litre drums. There are no large items. Special handling requirements have not been assessed.

Physical components (%vol): Drummed combustible (100%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 0.4

Comment on density: The bulk density of the waste ranges from 0.2 t/m³ to 0.5 t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): A mixture of combustible materials in 120-litre and 200-litre steel drums. Waste generally comprises paper, cloth, wood, steel, glass and polythene bags.

Chemical state: Neutral

Chemical form of radionuclides: H-3: The chemical form of tritium may be water or other inorganic or organic compounds.
C-14: The chemical form of carbon 14 may be 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 chemical form of uranium isotopes has not been determined but may be uranium oxides.
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): Approximately 45% by weight is mild steel drums of 1 mm thickness.

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	0		
Other ferrous metals.....	~45.0		
Iron.....			
Aluminium.....	<0.10		
Beryllium.....	0		
Cobalt.....			

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Copper.....	<0.10		
Lead.....	<0.10		
Magnox/Magnesium.....	TR		Trace amounts of Magnox possible due to contamination with fuel.
Nickel.....			
Titanium.....			
Uranium.....			
Zinc.....	0		
Zircaloy/Zirconium.....	0		
Other metals.....	0		There are no "other" metals present.

Organics (%wt): Not fully assessed. Non-halogenated plastic present as polythene. There may be traces of oil and grease. The waste includes cellulosic materials. Halogenated rubber may be present as viton and neoprene.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics.....	~45.0		
Paper, cotton.....	~30.0		
Wood.....	~15.0		
Halogenated plastics	NE		
Total non-halogenated plastics.....	~5.0		
Condensation polymers.....	NE		
Others.....	~5.0	Non-halogenated plastic present as polythene.	
Organic ion exchange materials....	0		
Total rubber.....	NE		
Halogenated rubber	NE	Possibly viton and neoprene	
Non-halogenated rubber.....	NE		
Hydrocarbons.....			
Oil or grease	TR		
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.....	0		
Soil.....	0		
Brick/Stone/Rubble.....	0		
Cementitious material.....	0		
Sand.....			
Glass/Ceramics.....	0		

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Graphite.....	0
Desiccants/Catalysts.....	
Asbestos.....	0
Non/low friable.....	
Moderately friable.....	
Highly friable.....	
Free aqueous liquids.....	0
Free non-aqueous liquids.....	TR
Powder/Ash.....	NE

Inorganic anions (%wt): Not fully assessed although it is recognised that carbonates will be present.

	(%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: The possible presence of materials likely to represent a fire or other non-radiological hazard is highly improbable. However, it should be recognised that some of the waste is combustible if exposed to a source of ignition.

	(%wt)	Type(s) and comment
Combustible metals.....	TR	
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.....	TR	
Higher activity particles.....		
Soluble solids as bulk chemical compounds.....		

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non hazardous pollutants:

Lead might be present but in very small quantities, if any.

(%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.....

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt): No

(%wt) Type(s) and comment

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids.....

Other organic complexants.....

Total complexing agents..... 0

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Potential for the waste to contain discrete items:

Not yet determined. n/a, DI concept applies only to Disposal at LLWR; by definition LLWR will not accept materials suitable for Incineration

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 None	Off-site	55.0
	Off-site	45.0

Comment on planned treatments:

It is expected that 45% of this waste stream will be sent for Metal Recycling

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
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	55.0	0.40
Expected to be consigned to a Metal Treatment Facility	45.0	1.4
Expected to be consigned as Out of Scope		
Expected to be recycled / reused		
Disposal route not known		

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

Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2022/23	2023/24	2024/25
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			

Opportunities for alternative disposal routing: -

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Estimated Date that Opportunity will be realised	Opportunity Confidence	Comment
-	-	-	-	-	-

Waste Packaging for Disposal: (Not applicable to this waste stream)

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Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO			
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: -

Waste Planned for Disposal at the LLW Repository: (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

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: -

RADIOACTIVITY

Source: Combustible wastes. Components that have been associated with fuel route operations are likely to be of high activity.

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

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.

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Nuclide	Mean radioactivity, TBq/m ³			Nuclide	Mean radioactivity, TBq/m ³		
	Waste at 1.4.2022	Bands and Code	Future arisings		Waste at 1.4.2022	Bands and Code	Future arisings
H 3	1.72E-04	CC 2		Gd 153		8	
Be 10		8		Ho 163		8	
C 14	2.00E-05	CC 2		Ho 166m		8	
Na 22		8		Tm 170		8	
Al 26		8		Tm 171		8	
Cl 36	5E-05	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	1.97E-06	CC 2		Pb 210		8	
Co 60	6.94E-06	CC 2		Bi 208		8	
Ni 59		8		Bi 210m		8	
Ni 63	4.50E-05	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	1.39E-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	7E-08	CC 2	
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	7.00E-08	CC 2	
Ag 108m		8		U 235		8	
Ag 110m		8		U 236		8	
Cd 109		8		U 238	7E-08	CC 2	
Cd 113m		8		Np 237		8	
Sn 119m		8		Pu 236		8	
Sn 121m		8		Pu 238	1.78E-06	CC 2	
Sn 123		8		Pu 239	3E-06	CC 2	
Sn 126		8		Pu 240	3.00E-06	CC 2	
Sb 125		8		Pu 241	3.88E-05	CC 2	
Sb 126		8		Pu 242		8	
Te 125m		8		Am 241	1.12E-05	CC 2	
Te 127m		8		Am 242m		8	
I 129		8		Am 243		8	
Cs 134	6.50E-09	CC 2		Cm 242		8	
Cs 135		8		Cm 243	4.25E-09	CC 2	
Cs 137	2.13E-04	CC 2		Cm 244	4.51E-08	CC 2	
Ba 133	1.12E-08	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	7.60E-09	CC 2		Cf 251		8	
Sm 147		8		Cf 252		8	
Sm 151		8		Other a			
Eu 152	9.18E-08	CC 2		Other b/g			
Eu 154	1.19E-07	CC 2		Total a	1.91E-05	CC 2	0
Eu 155	8.33E-09	CC 2		Total b/g	6.87E-04	CC 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 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