WASTE STREAM 9G66 Miscellaneous Contaminated Items

SITE	Trawsfynydd
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.....	2.0 m³
Total future arisings:		0 m³
Total waste volume:		2.0 m³

Comment on volumes: The ILW component of this waste stream can be found in waste stream 9G64.

Uncertainty factors on volumes:

Stock (upper):	x 1.2	Arisings (upper)	x
Stock (lower):	x 0.8	Arisings (lower)	x

WASTE SOURCE The wastes in this stream have not been identified or characterised but are known to have arisen during the reactor and cooling ponds operation and maintenance.

PHYSICAL CHARACTERISTICS

General description: The waste is predominantly redundant metallic equipment and material usually arising from irradiated fuel handling and pond operations. Component dimensions are generally up to one metre. Large components may be cut up prior to packaging in standard waste containers.

Physical components (%vol): Principally metal components.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: The assumption of 1 t/m3 as the average bulk density may be subject to revision. It is known that specific items such as steel plate will have bulk density nearer 7 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt): The waste may be principally carbon steel (>50%). Other components have not been assessed. Fission products, actinides and other activation products will be present as contaminants.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Tritium may be present as water or in the form of other inorganic or organic compounds.
C-14: Chemical form of carbon 14 has not been determined but may be graphite.
Se-79: The chemical form of selenium has not been determined.
Tc-99: The chemical form of technetium has not been determined.
Ra: Radium isotope content is insignificant.
Th: 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): -

	(%wt)	Type(s) / Grade(s) with proportions	% of total C14 activity
Stainless steel.....	NE		
Other ferrous metals.....	>50.0	carbon steel	
Iron.....			
Aluminium.....	NE		
Beryllium.....			

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Cobalt		
Copper	NE	
Lead	NE	
Magnox/Magnesium	NE	
Nickel		
Titanium		
Uranium		
Zinc	NE	
Zircaloy/Zirconium	NE	
Other metals	NE	The waste is composed mainly of carbon steel (>50%); the presence of "other" metals has not been assessed.

Organics (%wt): Not assessed. Note that it can be difficult to differentiate between PVC, polythene and other plastics when in wasteform. Polythene is present as packaging in many instances. halogenated plastics and rubbers are not assessed but not expected to be in excess of trace quantities.

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulosics	NE		
Paper, cotton	NE		
Wood	NE		
Halogenated plastics	NE		
Total non-halogenated plastics	NE		
Condensation polymers	NE		
Others	NE		
Organic ion exchange materials			
Total rubber	NE		
Halogenated rubber	NE		
Non-halogenated rubber	NE		
Hydrocarbons			
Oil or grease			
Fuel			
Asphalt/Tarmac (cont.coal tar)			
Asphalt/Tarmac (no coal tar)			
Bitumen			
Others			
Other organics	NE		

Other materials (%wt): -

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials	0		
Inorganic sludges and flocs	0		
Soil	NE		
Brick/Stone/Rubble	NE		
Cementitious material	NE		

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Sand	
Glass/Ceramics	NE
Graphite	NE
Desiccants/Catalysts	
Asbestos	NE
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	0
Free non-aqueous liquids	0
Powder/Ash	0

Inorganic anions (%wt): None greater than 5%.

	(%wt)	Type(s) and comment
Fluoride	<5.0	
Chloride	<5.0	
Iodide	<5.0	
Cyanide	0	
Carbonate	<5.0	
Nitrate	<5.0	
Nitrite	<5.0	
Phosphate	<5.0	
Sulphate	<5.0	
Sulphide	<5.0	

Materials of interest for waste acceptance criteria: The possible presence of materials likely to represent a fire or other non-radiological hazard has not been fully assessed.

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

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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.....		
Electronic Electrical Equipment (EEE)		
EEE Type 1.....		
EEE Type 2.....		
EEE Type 3.....		
EEE Type 4.....		
EEE Type 5.....		

Complexing agents (%wt): Yes

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

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Potential for the waste to contain discrete items: No. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

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		
Recyling / reuse		
Other / various		13.0
None		87.0

Comment on planned treatments: 13% of this waste stream is expected to be sent to Landfill as VLLW.

Disposal Routes:

Disposal Route	Stream volume %	Disposal density t/m3
Expected to be consigned to the LLW Repository	87.0	
Expected to be consigned to a Landfill Facility	13.0	
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		

Classification codes for waste expected to be consigned to a landfill facility: 17 04 05

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:

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Container	Stream volume %	Waste loading m³	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	87.0	10	< 1

Other information: The volume of waste in this stream will not fill one box. It is likely that this waste will be placed in a container with other LLW.

Waste Planned for Disposal at the LLW Repository:

Container voidage: The waste is expected to be grouted. In-accessible voidage is not expected.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste does not have a current WCH.

Waste consigned for disposal to LLWR in year of generation: No. The timing of the consignment of the waste for disposal cannot be determined at present.

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: The waste usually arises from the irradiated fuel handling and pond operations. Components that have been associated with fuel pond operations are likely to be of high activity. Fission products, actinides and other activation products will be present.

Uncertainty: Activity best estimate (taken from a waste stream of similar origin) thought to be accurate to within two orders of magnitude, but not fully assessed.

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

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2022	Bands and Code	Future arisings	Bands and Code
H 3	3.56E-06	D D 2			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	4.00E-08	D D 2			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36	3E-09	D D 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	9.46E-08	D D 2			Pb 210		8		
Co 60	4.14E-07	D D 2			Bi 208		8		
Ni 59	4E-09	D D 2			Bi 210m		8		
Ni 63	2.76E-07	D D 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	2.25E-05	D D 2			Th 227		8		
Zr 93	2E-09	D D 2			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	4E-09	D D 2		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99	1E-08	D D 2			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234	4.07E-09	D D 2		
Ag 108m	<9.80E-09	D 3			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238	4E-09	D D 2		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238	1.81E-06	D D 2		
Sn 123		8			Pu 239	1.00E-06	D D 2		
Sn 126		8			Pu 240	2.00E-06	D D 2		
Sb 125		8			Pu 241	4.49E-06	D D 2		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	4.04E-06	D D 2		
Te 127m		8			Am 242m	9.43E-09	D D 2		
I 129		8			Am 243	4.00E-09	D D 2		
Cs 134		8			Cm 242	7.78E-09	D D 2		
Cs 135		8			Cm 243	3.03E-09	D D 2		
Cs 137	2.27E-05	D D 2			Cm 244	2.53E-08	D D 2		
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	4.20E-09	D D 2			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151	9.12E-08	D D 2			Other a				
Eu 152		8			Other b/g				
Eu 154	7.58E-08	D D 2			**Total a**	**8.9E-06**	**D D 2**	**0**	
Eu 155	5.43E-09	D D 2			**Total b/g**	**5.43E-05**	**D D 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