WASTE STREAM 9F02 Ion Exchange Material

SITE Sizewell A

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	2.0 m³
Total future arisings:		0 m³
Total waste volume:		2.0 m³

Comment on volumes: Waste was pumped into store when the Station was commissioned to prove the transfer process. No further arisings are anticipated.

Uncertainty factors on volumes:				
	Stock (upper):	x 1.1	Arisings (upper)	x
	Stock (lower):	x 0.9	Arisings (lower)	x

WASTE SOURCE Spent ion exchange materials arising from the treatment of pond waters.

PHYSICAL CHARACTERISTICS

General description: The ion exchange material flooded with water would be expected to have a voidage of about 0.3, i.e. about 0.3 of the volume of a bed of settled flooded ion exchange material would be interstitial water. There are no large items which may require special handling.

Physical components (%vol): Ion Exchange material 100 %. There is interstitial water.

Sealed sources: -

Bulk density (t/m³): ~1.1

Comment on density: The bulk density of the waste, flooded with water, will probably be about 1.1 t/m3.

CHEMICAL COMPOSITION

General description and components (%wt): Composition appropriate to proprietary ion exchange materials, which are organic in nature. The ion exchange material is immersed in water. Proprietary ion exchange materials: IRA 120 (polystyrene based), IRA 94S (polystyrene based), (together 75% wt), and water (25% wt).

Chemical state: Acid

Chemical form of radionuclides:
H-3: The tritium content is expected to be insignificant.
C-14: The carbon-14 isotope content is insignificant.
Cl-36: The chlorine-36 isotope content is insignificant.
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 uranium isotope content is insignificant.
Np: The neptunium content is insignificant.
Pu: The plutonium isotope content is insignificant.

Metals and alloys (%wt): There are no sheet or bulk metal items present.

Stainless steel.....	NE
Other ferrous metals.....	NE
Iron.....	
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	
Copper.....	NE
Lead.....	NE
Magnox/Magnesium.....	NE
Nickel.....	

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	Titanium.....		
	Uranium.....		
	Zinc.....	NE	
	Zircaloy/Zirconium.....	NE	
	Other metals.....	NE	Not assessed.
Organics (%wt):	Proprietary ion exchange materials which are organic (polystyrene based) in nature are present, (IRA 120 and IRA 94S). No halogenated plastics or rubbers are present.		
	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....	~75.0	Proprietary ion exchange materials: IRA 120 (polystyrene based), IRA 94S (polystyrene based), (together 75% wt).
	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.....	NE	
Other materials (%wt):	Graphite may be present in trace quantities.		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs.....	0	
	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.....	25.0	Water (25% wt).

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	Free non-aqueous liquids..... 0
	Powder/Ash..... 0
Inorganic anions (%wt):	Not fully assessed.
	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 material is combustible when dry and if it burns it will evolve toxic gases.
	Combustible metals..... 0
	Low flash point liquids..... 0
	Explosive materials..... 0
	Phosphorus..... 0
	Hydrides..... 0
	Biological etc. materials..... 0
	Biodegradable materials.....
	Putrescible wastes..... 0
	Non-putrescible wastes.....
	Corrosive materials..... 0
	Pyrophoric materials..... 0
	Generating toxic gases..... 0
	Reacting with water..... 0
	Active particles.....
	Soluble solids as bulk chemical compounds.....
Hazardous substances / non hazardous pollutants:	Not estimated.
	Acrylamide.....
	Benzene.....
	Chlorinated solvents.....
	Formaldehyde.....
	Organometallics.....
	Phenol.....
	Styrene.....
	Tri-butyl phosphate.....
	Other organophosphates.....
	Vinyl chloride.....

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Arsenic.....

Barium.....

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): No

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents..... 0

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 None	On-site	100.0

Comment on planned treatments: The waste will be encapsulated in cement in 200 litre drums unless it can be disposed of as non-active material. The drums of encapsulated waste will be put in a half height ISO container for disposal at the LLWR.

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Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	100.0
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	

Upcoming (2019/20-2021/22) Waste Routing (if expected to change from above):

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
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			

Waste Packaging for Disposal:

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	100.0	~2.4	< 1
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: The drums of encapsulated waste will be put in a half height ISO container for disposal at the LLWR. The volume of conditioned waste in this stream will be insufficient to fill one HHISO. It is likely that other waste will be used to fill the container. The loading, fully using a container, would be 2.4 cubic metres of resin.

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): The waste does not have a current WCH.

Waste consigned for disposal to LLWR in year of generation: No. The waste will probably be consigned for disposal once FED retrieval has been completed.This will allow the water level in the cells to be dropped to aid retrieval

Potential for the waste to contain discrete items: -

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

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Inaccessible voidage:	-
Other information:	-

RADIOACTIVITY

Source:	Spent ion exchange materials arising from the treatment of pond water. Contamination by fission products, actinides and some activation products.
Uncertainty:	The values quoted for the stocks are indicative of the activities that may occur. Minor activity was picked up from SVS cell water.
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:	Judgement made on the basis of the assumed history of the material.
Other information:	-

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Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code	Nuclide	Mean radioactivity, TBq/m³ Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3		8			Gd 153		8		
Be 10		8			Ho 163		8		
C 14		8			Ho 166m		8		
Na 22		8			Tm 170		8		
Al 26		8			Tm 171		8		
Cl 36		8			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		8			Pb 210		8		
Co 60	1.44E-06	C C 2			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63		8			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		8			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		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238		8		
Sn 123		8			Pu 239		8		
Sn 126		8			Pu 240		8		
Sb 125		8			Pu 241		8		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241	3.92E-05	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		8		
Cs 137	4.56E-03	C C 2			Cm 244		8		
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		8			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152		8			Other b/g				
Eu 154		8			**Total a**	**3.92E-05**	**C C 2**	**0**	
Eu 155		8			**Total b/g**	**4.56E-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 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