

WASTE STREAM	9C14	Desiccant
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SITE Dungeness A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	6.3 m ³
Future arisings -	1.4.2019 - 31.3.2020.....	3.1 m ³
Total future arisings:		3.1 m ³
Total waste volume:		9.4 m ³
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.2	Arisings (upper) x 1.2
	Stock (lower): x 0.8	Arisings (lower) x 0.8

WASTE SOURCE Desiccant from reactor gas drier system.

PHYSICAL CHARACTERISTICS

General description: Desiccant beads in the reactor gas drier units. Some catalyst may be present. There are no large items that may require special handling.
Physical components (%wt): Activated alumina desiccant including any residual moisture and some catalyst (>99% wt). Materials deposited on the desiccant (<1%wt).
Sealed sources: -
Bulk density (t/m³): 0.6
Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Alumina desiccant (and some catalyst) (>99% wt), materials deposited on the desiccant (<1% wt).
Chemical state: Neutral
Chemical form of radionuclides: H-3: Tritium is present as tritiated liquor.
C-14: Carbon 14 may be present as graphite dust.
Cl-36: The chemical form of chlorine 36 has not been assessed.
Pu: The chemical form of plutonium isotopes has not been determined but may be plutonium oxides.

Metals and alloys (%wt):

Stainless steel.....	0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	0
Beryllium.....	0
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	
Uranium.....	0
Zinc.....	0
Zircaloy/Zirconium.....	0

WASTE STREAM

9C14 Desiccant

Other metals..... <1.0

Some platinum maybe present if the desiccant does contain catalyst. The activated alumina is made of aluminium hydroxide.

Organics (%wt):

Organic materials may be deposited on the desiccant.

- Total cellulose..... 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..... NE

Other materials (%wt):

-
- Inorganic ion exchange materials. 0
- Inorganic sludges and flocs..... NE
- Soil..... 0
- Brick/Stone/Rubble..... 0
- Cementitious material..... 0
- Sand.....
- Glass/Ceramics..... 0
- Graphite..... NE
- Desiccants/Catalysts..... 99.0
- Asbestos..... 0
 - Non/low friable.....
 - Moderately friable.....
 - Highly friable.....
- Free aqueous liquids..... 0
- Free non-aqueous liquids..... 0
- Powder/Ash..... 0

Alumina desiccant (and some catalyst)

Inorganic anions (%wt):

Not fully assessed.

WASTE STREAM**9C14 Desiccant**

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:

No material likely to present a fire or other non-radiological hazard has been identified.

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:

None expected.

Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	
Boron.....	

WASTE STREAM**9C14 Desiccant**

- 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
- EDTA.....
- DPTA.....
- NTA.....
- Polycarboxylic acids.....
- Other organic complexants.....
- Total complexing agents..... ~1.0

LAW TREATMENT, PACKAGING AND DISPOSAL**Waste that is currently ILW:** -

Planned on-site / off-site treatments(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		100.0

Comment on planned treatments:

Wash & Burn - hence no containers for disposal

WASTE STREAM 9C14 Desiccant

Disposal Routes:

Disposal Route	Stream volume %
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	100.0

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: (Not applicable to this waste stream)

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 Consigned to the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): -

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

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:

Inaccessible voidage: -

Other information: -

RADIOACTIVITY

WASTE STREAM**9C14 Desiccant**

Source:	The main source of activity is expected to be tritium.
Uncertainty:	Activity estimates are thought to be accurate to within a factor of 10.
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:	Estimated from available data.
Other information:	-

WASTE STREAM 9C14 Desiccant

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	5.39E-02	CC 2	9.45E-02	CC 2	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	2.00E-04	CC 2	2E-04	CC 2	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36	1E-04	CC 2	1E-04	CC 2	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Tl 204		8		8
Mn 54		8	4E-08	CC 2	Pb 205		8		8
Fe 55	<3.68E-06	C 3	<4.66E-05	C 3	Pb 210		8		8
Co 60	2.12E-06	CC 2	7.89E-06	CC 2	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	2.78E-06	CC 2	2.98E-06	CC 2	Po 210		8		8
Zn 65		8	<7.09E-08	C 3	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	<7.69E-08	C 3	<9.76E-08	C 3	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8	<3.02E-07	C 3	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m		8		8	U 235		8		8
Ag 110m		8	<7.26E-08	C 3	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	9.2E-09	CC 2	9.95E-09	CC 2
Sn 123		8		8	Pu 239	1E-08	CC 2	1E-08	CC 2
Sn 126		8		8	Pu 240	2E-08	CC 2	2E-08	CC 2
Sb 125	<6.31E-09	C 3	<7.78E-08	C 3	Pu 241	5.89E-07	CC 2	9.53E-07	CC 2
Sb 126		8		8	Pu 242		8		8
Te 125m	<1.58E-09	C 3	<2.04E-08	C 3	Am 241	4.3E-08	CC 2	3.15E-08	CC 2
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134	<2.03E-09	C 3	<5.72E-08	C 3	Cm 242		8	1.48E-09	CC 2
Cs 135		8		8	Cm 243		8		8
Cs 137	2.32E-07	CC 2	2.93E-07	CC 2	Cm 244	1.31E-09	CC 2	1.92E-09	CC 2
Ba 133	2.92E-08	CC 2	5.62E-08	CC 2	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8	<8.22E-08	C 3	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	<5.52E-09	C 3	<7.68E-08	C 3	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Other a				
Eu 152	<1.13E-07	C 3	<1.9E-07	C 3	Other b/g			5.61E-05	CC 2
Eu 154	<4.12E-08	C 3	<9.23E-08	C 3	Total a	8.35E-08	CC 2	7.49E-08	CC 2
Eu 155	<1.69E-08	C 3	<6.93E-08	C 3	Total b/g	5.42E-02	CC 2	9.49E-02	CC 2

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