

WASTE STREAM	4B06	Desiccants and Catalysts
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SITE Hunterston B

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	260.0 m ³
Future arisings -	1.4.2019 - 31.3.2025.....	0 m ³
	1.4.2025 - 31.3.2026.....	34.0 m ³
Total future arisings:		34.0 m ³
Total waste volume:		294.0 m ³

Comment on volumes: Waste volumes will be variable depending on station operating conditions.

Uncertainty factors on volumes: Stock (upper): x 1.25 Arisings (upper) x 1.5
Stock (lower): x 0.75 Arisings (lower) x 0.5

WASTE SOURCE Exhausted desiccants and catalysts that have been used for the drying and recombination of carbon dioxide reactor coolant. Small amounts of steel balls and charcoal.

PHYSICAL CHARACTERISTICS

General description: The waste consists of exhausted 'Mobil sorbead' desiccant with charcoal (the desiccant material consists of silica beads of a flowing nature) together with catalyst (material consists of a granular alumina-platinum alloy and steel shielding spheres). There are no large items associated with the waste.

Physical components (%wt): Catalyst (~1.3%), shielding spheres (steel) (~2.9%), desiccant (~93.7%), shielding spheres (ceramic) (0.9%), charcoal (1.1%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: The average density of this waste stream (desiccant and catalyst) is estimated to be 1t/m³.

CHEMICAL COMPOSITION

General description and components (%wt): Silica gel, very small quantities of charcoal, cylindrical pellets of platinum on alumina (catalyst), and ceramic and steel balls. Alumina-platinum catalyst (1.3%), steel (2.9%), silica gel (93.7%), charcoal (1.1%), ceramic (0.9%). The use of charcoal in the desiccant has been discontinued.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritiated water absorbed onto desiccant.
C-14: May be present as Graphite contamination
Cl-36: Not determined
Se-79: Not expected to be significant
Tc-99: Not expected to be significant
I-129: Not expected to be significant
Ra: Not expected to be significant
Th: Not expected to be significant
U: Not expected to be significant
Np: Not expected to be significant
Pu: Not expected to be significant

Metals and alloys (%wt):

Stainless steel.....	0
Other ferrous metals.....	~2.9
Iron.....	0
Aluminium.....	0
Beryllium.....	0
Cobalt.....	0
Copper.....	0

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	Lead.....	0	
	Magnox/Magnesium.....	0	
	Nickel.....	0	
	Titanium.....	0	
	Uranium.....	0	
	Zinc.....	0	
	Zircaloy/Zirconium.....	0	
	Other metals.....	NE	Platinum on alumina
Organics (%wt):	This waste contains no organic materials.		
	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.....	0	
	Oil or grease	0	
	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.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	
	Sand.....	0	
	Glass/Ceramics.....	0.90	
	Graphite.....	1.1	Charcoal
	Desiccants/Catalysts.....	95.0	
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	

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	Free non-aqueous liquids.....	0	
	Powder/Ash.....	0	
Inorganic anions (%wt):	None of the listed inorganic anions are expected to be present at greater than trace concentrations.		
	Fluoride.....	TR	
	Chloride.....	TR	
	Iodide.....	TR	
	Cyanide.....	0	
	Carbonate.....	TR	
	Nitrate.....	TR	
	Nitrite.....	NE	
	Phosphate.....	TR	
	Sulphate.....	TR	
	Sulphide.....	TR	
Materials of interest for waste acceptance criteria:	Carbon fines (<1%wt) filtered by desiccant are a spontaneous combustion hazard at >150 degrees C. in air.		
	Combustible metals.....	0	
	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.....	0	
	Corrosive materials.....	0	
	Pyrophoric materials.....	0	
	Generating toxic gases.....	0	
	Reacting with water.....	0	
	Active particles.....	0	Not expected to be present
	Soluble solids as bulk chemical compounds.....	0	
Hazardous substances / non hazardous pollutants:	This waste is not expected to contain any listed substances.		
	Acrylamide.....	NE	
	Benzene.....	NE	
	Chlorinated solvents.....	NE	
	Formaldehyde.....	NE	
	Organometallics.....	NE	
	Phenol.....	NE	
	Styrene.....	NE	
	Tri-butyl phosphate.....	NE	
	Other organophosphates.....	NE	

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Vinyl chloride..... NE
 Arsenic..... NE
 Barium..... NE
 Boron..... NE
 Cadmium..... NE
 Caesium..... NE
 Selenium..... NE
 Chromium..... NE
 Molybdenum..... NE
 Thallium..... NE
 Tin..... NE
 Vanadium..... NE
 Mercury compounds..... NE
 Others..... NE

Electronic Electrical Equipment (EEE)

EEE Type 1..... 0
 EEE Type 2..... 0
 EEE Type 3..... 0
 EEE Type 4..... 0
 EEE Type 5..... 0

Complexing agents (%wt):

Not yet determined
 EDTA..... NE
 DPTA..... NE
 NTA..... NE
 Polycarboxylic acids..... NE
 Other organic complexants..... NE
 Total complexing agents..... NE

Expect only trace quantities, if any.

LAW TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: This waste is ILW at the time of arising. The waste is stored temporarily to allow decay of short lived radionuclides, following this, the desiccant is transferred to Winfrith for decontamination to LLW. Waste will be despatched when activity levels permit treatment to LLW levels.

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

Treatment	On-site / Off site	Stream volume %
Low force compaction		
Supercompaction (HFC)		
Incineration		
Solidification	Off-site	100.0
Decontamination	Off-site	100.0
Metal treatment		
Size reduction		
Decay storage	On-site	100.0
Recycling / reuse		
Other / various		
None		

Comment on planned treatments:

The waste will be decay stored and then decontaminated to LLW and encapsulated.

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 m ³	Number of packages
1/3 Height IP-1 ISO	100.0	~11.99	25
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:

A conditioning factor of approximately 1.23 assumed.

Waste Consigned to the LLW Repository:

Container voidage:

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Waste Characterisation Form (WCH):

The waste does not meet the LLWR's Waste Acceptance Criteria (WAC).

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Does not meet WAC until desiccant is washed and decontaminated.

Waste consigned for disposal to LLWR in year of generation:

No. Waste is ILW when generated and needs decontaminating to LLW.

Potential for the waste to contain discrete items:

No

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: Contamination by tritium and activation products will be the main sources of activity.

Uncertainty: Present estimates 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: Theoretical assessment and limited sampling.

Other information: The specific activity will vary with the history of the plant. Other beta/gamma nuclides of arisings and stocks (in TBq/m³) include S35 (2E-1, 3E-3).

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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	9.3E-02	C C 2	1.3E-01	C C 2	Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	*2E-04	C B 2	*2E-04	C B 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54		5		5	Pb 205				
Fe 55					Pb 210				
Co 60	2E-04	C C 2	4E-04	C C 2	Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65		5		5	Ra 223				
Se 79					Ra 225				
Kr 81					Ra 226				
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90					Th 227				
Zr 93					Th 228				
Nb 91					Th 229				
Nb 92					Th 230				
Nb 93m					Th 232				
Nb 94					Th 234				
Mo 93					Pa 231				
Tc 97					Pa 233				
Tc 99					U 232				
Ru 106					U 233				
Pd 107					U 234				
Ag 108m					U 235				
Ag 110m					U 236				
Cd 109					U 238				
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239				
Sn 126					Pu 240				
Sb 125					Pu 241				
Sb 126					Pu 242				
Te 125m					Am 241				
Te 127m					Am 242m				
I 129					Am 243				
Cs 134					Cm 242				
Cs 135					Cm 243				
Cs 137		5		5	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144					Cf 249				
Pm 145					Cf 250				
Pm 147					Cf 251				
Sm 147					Cf 252				
Sm 151					Other a		8		8
Eu 152					Other b/g	3.5E-03	C C 2	1.7E-01	C C 2
Eu 154					Total a	0	8	0	8
Eu 155					Total b/g	9.69E-02	C C 2	3.01E-01	C C 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