

WASTE STREAM	3J27	Miscellaneous Activated Components & Fuel Stringer Debris - Debris Vault 2
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SITE Dungeness B

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE ILW; SPD3

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	306.2 m ³
Future arisings -	1.4.2019 - 31.3.2028.....	102.6 m ³
	1.4.2028 - 31.3.2030.....	104.9 m ³
Total future arisings:		207.5 m ³
Total waste volume:		513.7 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 1.75
Stock (lower): x 0.75 Arisings (lower) x 0.25

WASTE SOURCE Graphite, stainless steel and nimonic components resulting from the dismantling of fuel stringers.

PHYSICAL CHARACTERISTICS

General description: Tie-bars, central inertial collectors (CICs), Spring Collet Assemblies, Graphite Sleeves, other items, including additional high activity components in steel tins, may also be present.

Physical components (%wt): Graphite items from the dismantling of fuel stringers, steel and nimonic. Breakdown is not assessed.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): -0.95

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Graphite items from the dismantling of fuel stringers, steel and nimonic. Breakdown is not assessed.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Diffused into materials
C-14: Contamination by activated graphite
Cl-36: Incorporated into steels
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 Assessed
Np: Not expected to be significant
Pu: Not Assessed

Metals and alloys (%wt): -

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

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	Nickel.....	P
	Titanium.....	NE
	Uranium.....	NE
	Zinc.....	NE
	Zircaloy/Zirconium.....	NE
	Other metals.....	NE
Organics (%wt):	To be further assessed.	
	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	
	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.....	
	Graphite.....	P
	Desiccants/Catalysts.....	0
	Asbestos.....	0
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids.....	0
	Free non-aqueous liquids.....	0
	Powder/Ash.....	0

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Inorganic anions (%wt):

Not estimated, but are not expected to be present at greater than 1%wt.

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	NE
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for
waste acceptance criteria:

Whilst it is difficult to ignite, graphite will eventually burn 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.....	P
Soluble solids as bulk chemical compounds.....	0

Hazardous substances /
non hazardous pollutants:

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

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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..... TR

Expect only trace quantities, if any.

PACKAGING AND CONDITIONING

Conditioning method: The waste will be conditioned to satisfy the disposal requirements which are effective at the time of retrieval/conditioning. It is currently assumed that the waste will be placed in "baskets" in the waste packages and will be encapsulated.

Plant Name: None.

Location: Dungeness B Power Station.

Plant startup date: About 2113.

Total capacity (m³/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m³/y incoming waste): -

Other information: All of the waste is expected to be retrieved and conditioned when a conditioning campaign is undertaken. The total plant process rate is not estimated.

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m ³)	Payload (m ³)	Number of packages
4m box (100mm concrete shielding)	100.0	~12.2	~14.3	43

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Likely container type comment: -

Range in container waste volume: -

Other information on containers: Stainless steel.

Likely conditioning matrix: BFS/OPC

Other information: -

Conditioned density (t/m³): ~3.0

Conditioned density comment: The density of the encapsulated waste is expected to be approximately 3 t/m³.

Other information on conditioning: Waste will be retained on site pending Final Site Clearance, to let nuclides such as Co-60 undergo considerable radioactive decay. Baskets of different Final Site Clearance ILW wastes may be in the same waste package.

Opportunities for alternative disposal routing: No

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: Components resulting from the dismantling of fuel stringers. Activation of nuclides within the, graphite, steel and the Nimonic will be the main sources of activity.

Uncertainty: Specific activity is a function of station operating history. The values quoted are indicative of the activities that might be 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 assessments.

Other information: Estimates have been based on theoretical assessments. Other beta/gamma nuclides (in TBq/m³) expected in the arisings and stocks are: - S35 (1E-1, 1E-3); Ca45 (1E-1, 2E-3); Cr51 (2E+3, 8E-1); Co58 (2E+2, 1E+0); Sr89 (2E-6, 6E-9); Zr95 (4E-2, 2E-4); Nb95 (2E+0, 2E-3); Ta182 (1E-3, 1E-5); Sc46 (1E-2, 9E-5); Fe59 (3E+1, 7E-2); Sr85 (2E-6, 1E-8); Sn113 (9E-6, 1E-7) Sb124 (5E-8, 2E-10); Sm145 (5E-7, 3E-8) and W181 (5E-7, 8E-9).

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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	7E-03	DD 2	1E-02	DD 2	Gd 153				
Be 10	2E-07	DD 2	2E-07	DD 2	Ho 163				
C 14	5E-02	DD 2	5E-02	DD 2	Ho 166m				
Na 22		4		4	Tm 170				
Al 26		4		4	Tm 171				
Cl 36	2E-05	DD 2	2E-05	DD 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41	5E-05	DD 2	5E-05	DD 2	Pt 193				
Mn 53					Tl 204				
Mn 54	2E+00	DD 2	5E+01	DD 2	Pb 205				
Fe 55	1E+02	DD 2	5E+02	DD 2	Pb 210	8		8	
Co 60	2E+02	DD 2	4E+02	DD 2	Bi 208				
Ni 59	5E-01	DD 2	5E-01	DD 2	Bi 210m				
Ni 63	5E+01	DD 2	5E+01	DD 2	Po 210	8		8	
Zn 65	2E-05	DD 2	4E-04	DD 2	Ra 223				
Se 79		8		8	Ra 225				
Kr 81					Ra 226	8		8	
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90		8		8	Th 227				
Zr 93	3E-07	DD 2	3E-07	DD 2	Th 228				
Nb 91					Th 229	8		8	
Nb 92					Th 230	8		8	
Nb 93m	4E-04	DD 2	4E-04	DD 2	Th 232	8		8	
Nb 94	4E-02	DD 2	4E-02	DD 2	Th 234				
Mo 93	5E-03	DD 2	5E-03	DD 2	Pa 231	8		8	
Tc 97					Pa 233				
Tc 99		8		8	U 232				
Ru 106		8		8	U 233	8		8	
Pd 107		8		8	U 234	8		8	
Ag 108m	3E-03	DD 2	3E-03	DD 2	U 235	8		8	
Ag 110m	2E-01	DD 2	5E+00	DD 2	U 236	8		8	
Cd 109	7E-04	DD 2	1E-02	DD 2	U 238	8		8	
Cd 113m	4E-08	DD 2	5E-08	DD 2	Np 237	8		8	
Sn 119m	2E-08	DD 2	4E-07	DD 2	Pu 236				
Sn 121m		8		8	Pu 238	8		8	
Sn 123	2E-07	DD 2	9E-06	DD 2	Pu 239	8		8	
Sn 126		8		8	Pu 240	8		8	
Sb 125					Pu 241	8		8	
Sb 126					Pu 242	8		8	
Te 125m					Am 241	8		8	
Te 127m					Am 242m	8		8	
I 129		8		8	Am 243	8		8	
Cs 134		8		8	Cm 242	8		8	
Cs 135		8		8	Cm 243	8		8	
Cs 137		8		8	Cm 244	8		8	
Ba 133	7E-08	DD 2	1E-07	DD 2	Cm 245	8		8	
La 137					Cm 246	8		8	
La 138					Cm 248				
Ce 144		8		8	Cf 249				
Pm 145					Cf 250				
Pm 147		8		8	Cf 251				
Sm 147					Cf 252				
Sm 151	2E-06	DD 2	2E-06	DD 2	Other a	8		8	
Eu 152	3E-03	DD 2	4E-03	DD 2	Other b/g	2E+00	2	2E+03	2
Eu 154	8E-04	DD 2	2E-03	DD 2	Total a	<1E-09	8	<1E-09	8
Eu 155	2E-04	DD 2	4E-04	DD 2	Total b/g	3.55E+02	DD 2	3.01E+03	DD 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