WASTE STREAM 9R19 Graphite Samples

SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Magnox Limited

WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	<< 0.1 m³
Total future arisings:		0 m³
Total waste volume:		<< 0.1 m³

Comment on volumes: -

Uncertainty factors on volumes:

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

WASTE SOURCE Graphite trepanning and core samples taken for research studies.

PHYSICAL CHARACTERISTICS

General description: Graphite samples up to several cm in length. Total weight estimated to be approximately 12 kg.

Physical components (%vol): Graphite (100%).

Sealed sources: -

Bulk density (t/m³): ~1

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): Graphite (100%).

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Tritium may be chemically bound with the graphite.
C-14: The carbon-14 will be present as graphite.
Cl-36: The chlorine 36 will probably be chemically bound to the graphite. Some may be linked chemically with impurities in the graphite.
U: There may be traces of uranium as metal or oxide.
Pu: There may be traces of plutonium as metal or oxide.

Metals and alloys (%wt): There are no sheet metallic items present.

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

WASTE STREAM 9R19 Graphite Samples

Organics (%wt):	None expected.	
	Total cellulosics	NE
	Paper, cotton	
	Wood	
	Halogenated plastics	NE
	Total non-halogenated plastics	NE
	Condensation polymers	
	Others	
	Organic ion exchange materials	NE
	Total rubber	NE
	Halogenated rubber	
	Non-halogenated rubber	
	Hydrocarbons	
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	NE
Other materials (%wt):	Expect only graphite.	
	Inorganic ion exchange materials.	NE
	Inorganic sludges and flocs	NE
	Soil	0
	Brick/Stone/Rubble	0
	Cementitious material	0
	Sand	
	Glass/Ceramics	0
	Graphite	100.0
	Desiccants/Catalysts	
	Asbestos	0
	Non/low friable	
	Moderately friable	
	Highly friable	
	Free aqueous liquids	0
	Free non-aqueous liquids	0
	Powder/Ash	TR
Inorganic anions (%wt):	None of the inorganic anions listed in the table is expected to be present at greater than trace concentrations.	

WASTE STREAM 9R19 Graphite Samples

Fluoride	TR	Detected at trace levels in inactive graphite material.
Chloride	NE	
Iodide	NE	
Cyanide	0	
Carbonate	NE	
Nitrate	NE	
Nitrite	0	
Phosphate	TR	Detected at trace levels in inactive graphite material.
Sulphate	TR	Detected at trace levels in inactive graphite material.
Sulphide	NE	

Materials of interest for waste acceptance criteria: No materials likely to pose a fire or other non-radiological hazard have been identified. Graphite presents a low fire risk; it is difficult but not impossible to ignite.

Combustible metals	0	
Low flash point liquids	0	
Explosive materials	0	
Phosphorus	TR	Detected at trace levels in inactive graphite material.
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	TR	Detected at trace levels in inactive graphite material.

WASTE STREAM 9R19 Graphite Samples

Barium.....

Boron.....

Cadmium.....

Caesium.....

Selenium.....

Chromium.....

Molybdenum.....

Thallium.....

Tin.....

Vanadium.....

Mercury compounds.....

Others..... TR

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt):

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants.....

Total complexing agents..... NE

PACKAGING AND CONDITIONING

Conditioning method: To be co-packaged with 9R02, 9R10, 9R13, 9R17, 9R101, 9R112, 9R118. Packages are assigned to 9R02 & 9R101.

Plant Name: -

Location: -

Plant startup date: -

Total capacity (m^3/y incoming waste): -

Target start date for packaging this stream: -

Throughput for this stream (m^3/y incoming waste): -

Other information: -

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m^3)	Payload (m^3)	Number of packages

WASTE STREAM 9R19 Graphite Samples

Likely container type comment:	-
Range in container waste volume:	-
Other information on containers:	-
Likely conditioning matrix:	
Other information:	-
Conditioned density (t/m³):	~
Conditioned density comment:	-
Other information on conditioning:	-
Opportunities for alternative disposal routing:	

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source:	Activation of graphite and impurities.
Uncertainty:	-
Definition of total alpha and total beta/gamma:	Total beta/gamma is defined as the sum of the listed activities of all nuclides other than alpha emitters. Activity estimates for individual alpha emitting nuclides have not been provided but an estimate of total alpha activity is given.
Measurement of radioactivities:	-
Other information:	-

WASTE STREAM 9R19 Graphite Samples

Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	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					Gd 153				
Be 10					Ho 163				
C 14					Ho 166m				
Na 22					Tm 170				
Al 26					Tm 171				
Cl 36					Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41					Pt 193				
Mn 53					Tl 204				
Mn 54					Pb 205				
Fe 55					Pb 210				
Co 60					Bi 208				
Ni 59					Bi 210m				
Ni 63					Po 210				
Zn 65					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					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				
Eu 152					Other b/g				
Eu 154					**Total a**	**NE**		**0**	
Eu 155					**Total b/g**	**NE**		**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