WASTE STREAM	3K319	Stage 3 Decommissioning: Miscellaneous Metals and Materials (Reactor and Non-Reactor) LLW

SITE Hartlepool

SITE OWNER EDFE NGL

WASTE CUSTODIAN EDFE NGL

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0 m³
Future arisings -	1.4.2019 - 31.3.2112.....	0 m³
	1.4.2112 - 31.3.2113.....	19.2 m³
	1.4.2113 - 31.3.2114.....	21.1 m³
	1.4.2114 - 31.3.2115.....	29.1 m³
	1.4.2115 - 31.3.2116.....	74.3 m³
	1.4.2116 - 31.3.2117.....	7.9 m³
Total future arisings:		151.7 m³
Total waste volume:		151.7 m³

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

Uncertainty factors on volumes:

Stock (upper):	x	Arisings (upper)	x 1.5
Stock (lower):	x	Arisings (lower)	x 0.5

WASTE SOURCE A variety of materials from plant dismantling.

PHYSICAL CHARACTERISTICS

General description: This waste stream contains metals and miscellaneous material such as inorganic sludges and flocs. Waste can be packaged in standard NDA packages.

Physical components (%vol): A variety of constituents including metallic items and inorganic sludge.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): ~1

Comment on density: The density is of the waste as prepared for packaging.

CHEMICAL COMPOSITION

General description and components (%wt): This waste stream contains metals and miscellaneous material such as inorganic sludges and flocs.

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Diffused into matrix
C-14: There may be some surface contamination as graphite.
Cl-36: The chlorine will be incorporated in steel components
Se-79: Selenium content not expected to be significant
Tc-99: Not determined
I-129: Not determined
Ra: Radium content is insignificant
Th: Thorium content is Insignificant
U: Not determined
Np: The neptunium content is insignificant
Pu: Not determined

Metals and alloys (%wt): -

Stainless steel.....	~25.0
Other ferrous metals.....	~25.0
Iron.....	NE
Aluminium.....	NE
Beryllium.....	NE
Cobalt.....	NE
Copper.....	NE

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	Lead	NE
	Magnox/Magnesium	NE
	Nickel	NE
	Titanium	NE
	Uranium	NE
	Zinc	NE
	Zircaloy/Zirconium	NE
	Other metals	NE
Organics (%wt):	None expected.	
	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	0
	Total rubber	0
	Halogenated rubber	0
	Non-halogenated rubber	0
	Hydrocarbons	NE
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	0
Other materials (%wt):	-	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs	~50.0
	Soil	0
	Brick/Stone/Rubble	0
	Cementitious material	0
	Sand	0
	Glass/Ceramics	0
	Graphite	0
	Desiccants/Catalysts	0
	Asbestos	NE
	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):	Not fully assessed.	
	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:	The presence or absence of asbestos has yet to be confirmed.	
	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.
	Soluble solids as bulk chemical compounds..... 0	
Hazardous substances / non hazardous pollutants:	If any, present in trace quantities only.	
	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	
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	NE	
EEE Type 2	NE	
EEE Type 3	NE	
EEE Type 4	NE	
EEE Type 5	NE	
Complexing agents (%wt):	Not yet determined	
EDTA	NE	
DPTA	NE	
NTA	NE	
Polycarboxylic acids	NE	
Other organic complexants	NE	Only trace quantities, if any.
Total complexing agents	NE	

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		100.0

Comment on planned treatments: It is likely that in line with the waste hierarchy, wastes will be treated preferentially by incineration, metal decontamination/melting, supercompaction, optimal packaging in disposal containers or immobilisation by encapsulation where necessary, prior to ultimate disposal. At present, insufficient information is available to determine the percentages.

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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:

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 2m box (no shielding) 4m box (no shielding) Other	100.0	~11.71	13

Other information: -

Waste Planned for Disposal at the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

Waste consigned for disposal to LLWR in year of generation: Yes.

Potential for the waste to contain discrete items: Yes

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: -

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RADIOACTIVITY

Source:	Activation of the materials and impurities. There may be some contamination.
Uncertainty:	Only very approximate estimates have been made of the total specific activities.
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:	Activation/decay calculations based on neutron flux and operating history.
Other information:	No radionuclides other than those listed are expected to be significant.

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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			1.12E-05	C C 2	Gd 153				
Be 10			8.04E-14	C C 2	Ho 163				
C 14			1.02E-05	C C 2	Ho 166m				
Na 22				4	Tm 170				
Al 26				4	Tm 171				
Cl 36			4.85E-08	C C 2	Lu 174				
Ar 39					Lu 176				
Ar 42					Hf 178n				
K 40					Hf 182				
Ca 41			9.27E-06	C C 2	Pt 193				
Mn 53					Tl 204				
Mn 54				5	Pb 205				
Fe 55			1.73E-14	C C 2	Pb 210				8
Co 60			1.55E-07	C C 2	Bi 208				
Ni 59			2.03E-06	C C 2	Bi 210m				
Ni 63			1.18E-04	C C 2	Po 210				8
Zn 65				5	Ra 223				
Se 79				8	Ra 225				
Kr 81					Ra 226				8
Kr 85					Ra 228				
Rb 87					Ac 227				
Sr 90				8	Th 227				
Zr 93			2.25E-13	C C 2	Th 228				
Nb 91					Th 229				8
Nb 92					Th 230				8
Nb 93m			1.75E-08	C C 2	Th 232				8
Nb 94			3.38E-08	C C 2	Th 234				
Mo 93			1.12E-07	C C 2	Pa 231				8
Tc 97					Pa 233				
Tc 99			2.31E-08	C C 2	U 232				
Ru 106				8	U 233				8
Pd 107				8	U 234				8
Ag 108m			1.52E-08	C C 2	U 235				8
Ag 110m				5	U 236				8
Cd 109				5	U 238				8
Cd 113m			4.21E-16	C C 2	Np 237				8
Sn 119m					Pu 236				
Sn 121m			4.00E-10	C C 2	Pu 238				8
Sn 123				5	Pu 239				8
Sn 126				8	Pu 240				8
Sb 125					Pu 241				8
Sb 126					Pu 242				8
Te 125m					Am 241				8
Te 127m					Am 242m				8
I 129				8	Am 243				8
Cs 134				8	Cm 242				8
Cs 135				8	Cm 243				8
Cs 137				6	Cm 244				8
Ba 133			1.49E-09	C C 2	Cm 245				8
La 137					Cm 246				8
La 138					Cm 248				
Ce 144				8	Cf 249				
Pm 145			9.8E-10	C C 2	Cf 250				
Pm 147				8	Cf 251				
Sm 147					Cf 252				
Sm 151			2.72E-06	C C 2	Other a				8
Eu 152			6.15E-07	C C 2	Other b/g				5
Eu 154			4.92E-09	C C 2	**Total a**	**0**		**<1E-09**	**8**
Eu 155				5	**Total b/g**	**0**		**1.55E-04**	**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