WASTE STREAM 2S311 Other Facilities Decommissioning LLW

SITE Windscale

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Sellafield Limited

WASTE TYPE LLW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	0.5 m³
Future arisings -	1.4.2027 - 31.3.2047.....	2444.5 m³
Total future arisings:		2444.5 m³
Total waste volume:		2445.0 m³

Comment on volumes: Waste arisings are due to the decommissioning of several facilities and hence are not constant. The volume may change significantly according to decommissioning, decontamination and segregation techniques applied.

Uncertainty factors on volumes:

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

WASTE SOURCE Decommissioning waste from redundant facilities. These include PIE facilities, Redundant Flasks, and Packaging plant.

PHYSICAL CHARACTERISTICS

General description: Concrete, lead shielding bricks, pipework and redundant plant with small amounts of cellulosic and plastic material. No large items have been identified.

Physical components (%vol): Sufficient data is not available to characterise waste.

Sealed sources: -

Bulk density (t/m³): ~1.97

Comment on density: The density varies depending on waste characteristics however, approx. 80% of the waste is concrete (~1.8t/m³) with the remainder being largely steel with smaller quantities of lead.

CHEMICAL COMPOSITION

General description and components (%wt): Steel (19%), lead (1%), concrete (80%).

Chemical state: Alkali

Chemical form of radionuclides: H-3: As gas or tritiated water trapped within concrete matrix.

Metals and alloys (%wt): Insufficient data at present.

Stainless steel.....	NE
Other ferrous metals.....	~19.0
Iron.....	
Aluminium.....	0
Beryllium.....	
Cobalt.....	0
Copper.....	0
Lead.....	<1.0
Magnox/Magnesium.....	0
Nickel.....	0
Titanium.....	
Uranium.....	P
Zinc.....	0
Zircaloy/Zirconium.....	0

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	Other metals	<1.0	Other metals include tungsten at <1% by weight.
Organics (%wt):	Small quantities (< 1%) of cellulose, in the form of Sisal Kraft Paper and wood, and plastic material will be present. Halogenated plastics - PVC. Halogenated rubber - neoprene.		
	Total cellulosics	<1.0	
	Paper, cotton	<1.0	
	Wood	<1.0	
	Halogenated plastics	<1.0	
	Total non-halogenated plastics	<1.0	
	Condensation polymers	NE	
	Others	NE	
	Organic ion exchange materials	0	
	Total rubber	P	
	Halogenated rubber	P	
	Non-halogenated rubber	P	
	Hydrocarbons		
	Oil or grease		
	Fuel		
	Asphalt/Tarmac (cont.coal tar)		
	Asphalt/Tarmac (no coal tar)		
	Bitumen		
	Others		
	Other organics	0	
Other materials (%wt):	Any sludges found, e.g. in pipes, will be immobilised.		
	Inorganic ion exchange materials.	0	
	Inorganic sludges and flocs	TR	
	Soil	0	
	Brick/Stone/Rubble	0	
	Cementitious material	80.0	
	Sand		
	Glass/Ceramics	0	
	Graphite	0	
	Desiccants/Catalysts		
	Asbestos	NE	
	Non/low friable		
	Moderately friable		
	Highly friable		
	Free aqueous liquids	NE	
	Free non-aqueous liquids	NE	
	Powder/Ash	0	
Inorganic anions (%wt):	Inorganic anions present as constituents of concrete.		

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

Materials of interest for waste acceptance criteria: Hazardous materials are not expected to be present, but requires confirmation.

Combustible metals	
Low flash point liquids	0
Explosive materials	0
Phosphorus	0
Hydrides	0
Biological etc. materials	0
Biodegradable materials	NE
Putrescible wastes	0
Non-putrescible wastes	NE
Corrosive materials	0
Pyrophoric materials	0
Generating toxic gases	0
Reacting with water	
Active particles	NE
Soluble solids as bulk chemical compounds	NE

Hazardous substances / non hazardous pollutants: Only bulk metals, such as lead, expected to be present.

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

Cadmium..... NE

Caesium.....

Selenium..... NE

Chromium..... NE

Molybdenum..... NE

Thallium.....

Tin..... NE

Vanadium..... NE

Mercury compounds.....

Others..... NE

Electronic Electrical Equipment (EEE)

EEE Type 1.....

EEE Type 2.....

EEE Type 3.....

EEE Type 4.....

EEE Type 5.....

Complexing agents (%wt): Not yet determined

EDTA.....

DPTA.....

NTA.....

Polycarboxylic acids……

Other organic complexants..... NE

Complexing agents are not expected to be present.

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		<20.0
Size reduction		
Decay storage		
Recyling / reuse		
Other / various		
None		80.0

Comment on planned treatments: This is dependant upon the origin of the waste and characterisation that will be carried out upon decommissioning. Disposal routes will depend upon the results obtained through characterisation. Based on current experience we have assumed the treatment methods set out in the table for the purposes of the 2019 UK Inventory.

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Disposal Routes:

Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository	80.0
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	<20.0
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 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	80.0	~10	196
2m box (no shielding)			
4m box (no shielding)			
Other			

Other information: The use of half height ISO containers will be considered for the denser items e.g. lead/steel in order to achieve an acceptable packing efficiency balanced against container weight limits.

Waste Planned for Disposal at the LLW Repository:

Container voidage: Inaccessible voidage will be <10%.

Waste Characterisation Form (WCH): The waste meets the LLWR's Waste Acceptance Criteria (WAC).
The waste does not have a current WCH.

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

Potential for the waste to contain discrete items: Potentially.

Non-Containerised Waste for In-Vault Grouting:

Stream volume (%): -

Waste stream variation: There is no existing waste stream variation for this waste

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

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RADIOACTIVITY

Source:	Overall the waste contains contributions from activated products, e.g Co60, fission products, e.g Cs137 and U and Pu isotopes.
Uncertainty:	More detailed information will be available upon characterisation.
Definition of total alpha and total beta/gamma:	Activity data based on activity data of waste stream 2A306.
Measurement of radioactivities:	Concrete coring has been undertaken in some areas, in other cases significant contamination is known but not yet fully characterised e.g. drains, cell/cave internals & roof areas.
Other information:	-

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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		6		6	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		6		6	U 233				
Pd 107					U 234				
Ag 108m					U 235		6		6
Ag 110m					U 236				
Cd 109					U 238		6		6
Cd 113m					Np 237				
Sn 119m					Pu 236				
Sn 121m					Pu 238				
Sn 123					Pu 239		6		6
Sn 126					Pu 240		6		6
Sb 125					Pu 241		6		6
Sb 126					Pu 242		6		6
Te 125m					Am 241		6		6
Te 127m					Am 242m				
I 129					Am 243				
Cs 134		6		6	Cm 242				
Cs 135					Cm 243				
Cs 137		6		6	Cm 244				
Ba 133					Cm 245				
La 137					Cm 246				
La 138					Cm 248				
Ce 144		6		6	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		6		6	**Total a**	**NE**		**NE**	
Eu 155					**Total b/g**	**NE**		**NE**	

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