WASTE STREAM 2D93 Acidic Sample Waste in Analytical Services

SITE	Sellafield
SITE OWNER	Nuclear Decommissioning Authority
WASTE CUSTODIAN	Sellafield Limited
WASTE TYPE	ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	3.2 m³
Future arisings -	1.4.2019 - 31.3.2024.....	0.5 m³
Total future arisings:		0.5 m³
Total waste volume:		3.7 m³

Comment on volumes: The rate of waste arising from current analyses will reduce as operational plants come to the end of their life. However, there is likely to be an increase in analyses from new routes associated with wastes from legacy plant. Additionally, methods to dispose of the waste are being brought on line so an accelerated decrease in stocks held is expected in the next 2-5 years. The rate of disposals cannot be predicted at this time. Arisings are given at the current rate for the life time of the current plant (Analytical Services Facility). No arisings are attributed to future (Analytical Services Facility) replacement plants. This is due to uncertainty surrounding the nature of analytical methods to be used in the future, as it is hoped to introduce methods that reduce waste arisings, with the aim of having no liquid waste arisings. Despite continued arisings, disposals/processing of waste will outstrip arisings in the next few years. At the current time the uncertainties are highly unpredictable to the point of providing little benefit. The long term aim is for processing of legacy waste to be complete and for ongoing processing to be at the arising rate, i.e.the aim is to have no stocks held for which there is low uncertainty.

Uncertainty factors on volumes:				
	Stock (upper):	x 1.01	Arisings (upper)	x 1.5
	Stock (lower):	x 0.99	Arisings (lower)	x 0.5

WASTE SOURCE Analytical chemistry of site process samples.

PHYSICAL CHARACTERISTICS

General description: Aqueous solutions containing acid based samples from reprocessing and manufacturing processes together with analytical reagents in 2.5 litre bottles. Long term reactions between analytes and reagents mean the precise nature of species present is not understood in every instance.

Physical components (%vol): 100% aqueous sample waste (bottles considered separately through PCM waste route).

Sealed sources: -

Bulk density (t/m³): 1.1

Comment on density: Density is variable depending on solute type and concentration.

CHEMICAL COMPOSITION

General description and components (%wt): Most of the samples comprise plutonium dissolved in nitric acid. A wide range of other chemical species are present depending on reagents used for specific tests. In some instances there is a clear understanding of bottle contents due to accurate knowledge of analyses undertaken; in other instances this information is not available and the history of the bottle contents is highly uncertain. It is expected that a general GCMS analysis will be used to reduce the uncertainlty for such bottles to ensure appropriate disposal.

Chemical state: -

Chemical form of radionuclides: Pu: Dissolved plutonium nitrate and decay products.

Metals and alloys (%wt): -

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	Stainless steel	0
	Other ferrous metals	0
	Iron	
	Aluminium	0
	Beryllium	0
	Cobalt	0
	Copper	0
	Lead	0
	Magnox/Magnesium	0
	Nickel	0
	Titanium	
	Uranium	0
	Zinc	0
	Zircaloy/Zirconium	0
	Other metals	0
Organics (%wt):	Some organic species may be present in some packages.	
	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	
	Oil or grease	
	Fuel	
	Asphalt/Tarmac (cont.coal tar)	
	Asphalt/Tarmac (no coal tar)	
	Bitumen	
	Others	
	Other organics	0
Other materials (%wt):	Precipitate may be present.	
	Inorganic ion exchange materials.	0
	Inorganic sludges and flocs	0
	Soil	0
	Brick/Stone/Rubble	0
	Cementitious material	0
	Sand	
	Glass/Ceramics	0

Graphite	0
Desiccants/Catalysts	
Asbestos	0
Non/low friable	
Moderately friable	
Highly friable	
Free aqueous liquids	100.0
Free non-aqueous liquids	0
Powder/Ash	0

Inorganic anions (%wt): A number of anions are present in solution, species and concentration is highly variable between bottle types. Bottles with a high halide content are identified spcifically for the Lab 193 or manual method treatment routes.

Fluoride	0
Chloride	0
Iodide	0
Cyanide	0
Carbonate	0
Nitrate	0
Nitrite	0
Phosphate	0
Sulphate	0
Sulphide	0

Materials of interest for waste acceptance criteria: -

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	
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: -

Acrylamide	
Benzene	

Chlorinated solvents.....
Formaldehyde.....
Organometallics.....
Phenol.....
Styrene.....
Tri-butyl phosphate.....
Other organophosphates.....
Vinyl chloride.....
Arsenic.....
Barium.....
Boron.....
Cadmium.....
Caesium.....
Selenium.....
Chromium.....
Molybdenum.....
Thallium.....
Tin.....
Vanadium.....
Mercury compounds.....
Others.....
Electronic Electrical Equipment (EEE)
EEE Type 1.....
EEE Type 2.....
EEE Type 3.....
EEE Type 4.....
EEE Type 5.....

Complexing agents (%wt): No
EDTA.....
DPTA.....
NTA.....
Polycarboxylic acids……
Other organic complexants.....
Total complexing agents..... 0

PACKAGING AND CONDITIONING

Conditioning method:	Actinide removal.
Plant Name:	EARP.
Location:	-
Plant startup date:	The Magnox reprocessing feed to EARP commenced 2011.
Total capacity (m^3/y incoming waste):	-
Target start date for packaging this stream:	-

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

Other information: EARP via lads (Low Active drain segregated) filter house has a capacity of 30 bottles per week = 3.1m3/y. The LADS filter house provides filtration for effluents prior to entering EARP and a glovebox has been placed in this location to provide the entry point for B229 into the EARP process.

Likely container type:

Container	Waste packaged (%vol)	Waste loading (m³)	Payload (m³)	Number of packages
500 l drum	100.0	NE	0.5	NE

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: Discharges to the EARP process will be processed producing floc for encapsulation. The contribution of analytical waste will be negligible in relation to overall arisings from the EARP process. Non-radiological chemical species within process permeate and washings will be disposed through consented effluent routes.

Opportunities for alternative disposal routing:

Treatment	Stream volume (%)	Comment
-	-	-

RADIOACTIVITY

Source: Pu residues.

Uncertainty: Accurate within safeguards accountancy requirements.

Definition of total alpha and total beta/gamma: Derived from g Pu present in bottles.

Measurement of radioactivities: -

Other information: -

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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					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**	**3.36E+01**	**A A 2**	**3.81E+00**	**C C 2**
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