

**WASTE STREAM****7E22****Submarine Refitting Wastes (Soft Trash)****SITE** Rosyth Royal Dockyard**SITE OWNER** Ministry of Defence**WASTE CUSTODIAN** Babcock International Group**WASTE TYPE** LLW**WASTE VOLUMES**

		Reported
Stocks:	At 1.4.2019.....	0 m <sup>3</sup>
Future arisings -	1.4.2019 - 31.3.2020.....	<2.0 m <sup>3</sup>
	1.4.2020 - 31.3.2021.....	<2.0 m <sup>3</sup>
	1.4.2021 - 31.3.2031.....	<20.0 m <sup>3</sup>
Total future arisings:		24.0 m <sup>3</sup>
Total waste volume:		24.0 m <sup>3</sup>

Comment on volumes: Waste arisings at Rosyth will continue at a low level through to 2031 when radioactive waste will have been removed from site and when final decommissioning of the site will be complete. The data are accurate information based upon current waste records. Predicted data based upon timing of future operations associated with radioactive material at Rosyth.

Uncertainty factors on volumes: Stock (upper): x Arisings (upper) x 2.0  
 Stock (lower): x Arisings (lower) x 0.2

**WASTE SOURCE** Radioactive waste management and decommissioning.**PHYSICAL CHARACTERISTICS**

General description: Low level mixed trash consisting of paper, polythene and protective clothing. There are no large items in the waste. The waste has been segregated for disposal using off-site incineration.

Physical components (%wt): Paper/polythene (82%), plastic/rubber (gloves/hoses etc.) (18%).

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m<sup>3</sup>): 0.1

Comment on density: The uncompacted density of this waste is 0.1 t/m<sup>3</sup>.

**CHEMICAL COMPOSITION**

General description and components (%wt): The waste consists of cellulose, in the form of paper and polythene. Cellulose (41%), polythene (41%), rubber (18%).

Chemical state: Neutral

Chemical form of radionuclides: C-14: Trace quantities of carbon-14 are present in metal salts e.g. carbonates.

Metals and alloys (%wt): -

Stainless steel.....	0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	
Beryllium.....	0
Cobalt.....	
Copper.....	
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	
Titanium.....	0
Uranium.....	0

**WASTE STREAM****7E22****Submarine Refitting Wastes (Soft Trash)**

	Zinc.....	0	
	Zircaloy/Zirconium.....	0	
	Other metals.....	0	No metals included as "others".
Organics (%wt):	-		
	Total cellulosics.....	41.0	
	Paper, cotton.....	41.0	
	Wood.....	0	
	Halogenated plastics .....	0	
	Total non-halogenated plastics.....	41.0	
	Condensation polymers.....	0	
	Others.....	41.0	Polythene.
	Organic ion exchange materials....	0	
	Total rubber.....	18.0	
	Halogenated rubber .....	0	
	Non-halogenated rubber.....	18.0	
	Hydrocarbons.....		
	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.....	0	
	Soil.....	0	
	Brick/Stone/Rubble.....	0	
	Cementitious material.....	0	
	Sand.....		
	Glass/Ceramics.....		
	Graphite.....	0	
	Desiccants/Catalysts.....		
	Asbestos.....	0	
	Non/low friable.....		
	Moderately friable.....		
	Highly friable.....		
	Free aqueous liquids.....	0	
	Free non-aqueous liquids.....	0	
	Powder/Ash.....		
Inorganic anions (%wt):	There are no inorganic anions present in the waste.		

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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:

There are no hazardous materials present in the waste.

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
Soluble solids as bulk chemical compounds.....	0

Hazardous substances / non hazardous pollutants:

There are no heavy metals present in the waste.

Acrylamide.....	
Benzene.....	0
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	0
Styrene.....	
Tri-butyl phosphate.....	0
Other organophosphates.....	
Vinyl chloride.....	0
Arsenic.....	0
Barium.....	
Boron.....	0

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Cadmium..... 0  
 Caesium.....  
 Selenium..... 0  
 Chromium..... 0  
 Molybdenum..... 0  
 Thallium.....  
 Tin..... 0  
 Vanadium..... 0  
 Mercury compounds.....  
 Others..... 0

## 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

There are no organic complexing agents in the waste.

**TREATMENT, PACKAGING AND DISPOSAL**

Planned on-site / off-site treatment(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction	On-site	100.0
Supercompaction (HFC)		
Incineration	Off-site	100.0
Solidification		
Decontamination		
Metal treatment		
Size reduction		
Decay storage		
Recycling / reuse		
Other / various		
None		

Comment on planned treatments:

Bags of soft waste will be segregated to remove non-radioactive waste. Bags of LLW will be in-drum compacted into 200 litre drums followed by transfer of drums off-site for incineration.

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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:** (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m <sup>3</sup>	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			

Other information: Soft LLW is consigned to an incinerator facility. It may be low force compacted into drums on-site.

**Waste Planned for Disposal at the LLW Repository:** (Not applicable to this waste stream)

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

Potential for the waste to contain discrete items: -

**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: -

**RADIOACTIVITY**

Source:	The activity arises mainly from activation products.
Uncertainty:	The assessment of the variability of the activity in the packaged waste is based on the measured activities of the radionuclides in nineteen samples of soft trash wastes.
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:	Specific activity data is derived in accordance with the current waste stream characterisation document, as provided to Regulators. Cobalt-60 activity is estimated using historic disposal data. Other radionuclides are derived by applying a generic fingerprint for 7E22.
Other information:	-

**WASTE STREAM**

**7E22**

**Submarine Refitting Wastes (Soft Trash)**

Nuclide	Mean radioactivity, TBq/m <sup>3</sup>				Nuclide	Mean radioactivity, TBq/m <sup>3</sup>			
	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			2.10E-10	B D 2	Gd 153				
Be 10					Ho 163				
C 14			4.12E-05	B D 2	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			2.64E-07	B D 2	Pb 210				
Co 60			2.5E-04	B D 2	Bi 208				
Ni 59					Bi 210m				
Ni 63			7.25E-06	C C 2	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			3.03E-09	B D 2	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					<b>Total a</b>	<b>0</b>		<b>0</b>	
Eu 155					<b>Total b/g</b>	<b>0</b>		<b>2.99E-04</b>	<b>B D 2</b>

**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