

WASTE STREAM	9A980	Caesium Removal Plant Decommissioning.
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SITE Berkeley

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE LLW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025 = 3.5			
Future arisings:	1.4.2027 - 31.3.2028 16.4			
	1.4.2028 - 31.3.2038 13.1			
Total future arisings:	29.5			
Total waste volume:	33.1			

Number of waste packages in stock: At 1.4.2025..... - packages

Comment on arising rates: -

Additional information on quantities: Arisings are predicted by quantity survey and contamination levels advised by health physics. Volumes include a contingency of 5% by vol secondary wastes from handling / decontamination. The demolition will not start until all the tanks have been emptied.

Uncertainty factors on volumes:

Stock (upper):	x 1.20	Arisings (upper):	x 1.10
Stock (lower):	x 0.80	Arisings (lower):	x 0.90

WASTE SOURCE This waste stream consists of steel components from dismantling plant and pipework in the CRP, concrete from the CRP structure, and secondary waste arising from decommissioning and handling operations. Activation and fission product, as well as actinide, contamination is expected.

PHYSICAL CHARACTERISTICS

General description: Mainly pipework and tanks that had been in contact with ion exchange material and sludge, and contaminated building rubble. If necessary items will be reduced in size to fit containers. Includes some secondary waste. Volume of 1.9m3 added to incorporate streams 9A938 (CRP Resin Tank SRST1) and 9A939 (CRP Sludge Tank) that were set to historic.

Changes since waste generated: -

Bulk density (t/m³): ~ 1.5

Comment on density: -

CHEMICAL COMPOSITION

General description and components (%wt): 64.5% Steel & Ferrous, 12% copper, 20% concrete, 1% plastic, 1% biodegradable non-putrescible, 1% rubber, 1% insulation.

Chemical state: Neutral

Sheet metal proportion / thickness: Items will have been cut for packaging. Thicknesses are likely to vary from a few mm to about 25 mm.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	~ 52.9	Tanks, pumps, deplanting material	
Other ferrous metals.....	~ 11.6	Ventilation equipment, deplanting materials, drums, valves, couplings	
Iron.....	~ 0.30	-	
Aluminium.....	~ 0.01	Surface Area = 1 m2, Sheets, hoover body	
Beryllium.....	0	-	
Cobalt.....	-	-	
Copper.....	~ 12.0	Cabling	
Lead.....	0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	-	-	
Titanium.....	-	-	
Uranium.....	0	-	
Zinc.....	0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	NE	"Other" metals not identified	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	~ 0	-	
Paper, cotton.....		-	
Wood.....		-	
Halogenated plastics.....	NE	-	
Total non-halogenated plastics.....	~ 1.0	-	
Condensation polymers.....	~ 0	-	
Others.....	~ 1.0	-	
Organic ion exchange materials.....	TR	-	
Total rubber.....	~ 1.0	-	
Halogenated rubber.....	~ 0.50	-	
Non-halogenated rubber.....	~ 0.50	-	
Hydrocarbons.....		-	
Oil or grease.....		-	
Fuel.....		-	
Asphalt/Tarmac (cont.coal tar).....		-	
Asphalt/Tarmac (no coal tar).....		-	
Bitumen.....		-	
Others.....		-	
Other organics.....	NE	-	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	NE	-	
Inorganic sludges and flocs.....	NE	-	
Soil.....	NE	-	
Brick/Stone/Rubble.....	NE	-	
Cementitious material.....	~ 20.0	-	
Sand.....		-	
Glass/Ceramics.....	~ 0.20	man made mineral fibre insulation	
Graphite.....	NE	-	
Desiccants/Catalysts.....		-	
Asbestos.....	0	-	
Non/low friable.....		-	
Moderately friable.....		-	
Highly friable.....		-	
Free aqueous liquids.....	TR	-	
Free non-aqueous liquids.....	= 0	-	
Powder/Ash.....	= 0	-	

COMPONENTS OF MATERIALS, WASTE PROPERTIES, MATERIALS NOT CONTRIBUTING TO MASS

Inorganic anions (%wt):

	(%wt)	Type(s) and comment
Fluoride.....	NE	-
Chloride.....	NE	-
Iodide.....	NE	-
Cyanide.....	= 0	-
Carbonate.....	NE	-
Nitrate.....	NE	-
Nitrite.....	NE	-
Phosphate.....	NE	-
Sulphate.....	NE	-
Sulphide.....	NE	-

Materials of interest for waste acceptance criteria:

	(%wt)	Type(s) and comment
Combustible metals.....	= 0	-
Low flash point liquids.....	= 0	-
Explosive materials.....	= 0	-
Phosphorus.....	= 0	-
Hydrides.....	= 0	-
Biological etc. materials.....	= 0	-
Biodegradable materials.....	1.0	-
Putrescible wastes.....	= 0	-
Non-putrescible wastes.....	~ 1.0	-
Corrosive materials.....	= 0	-
Pyrophoric materials.....	= 0	-
Generating toxic gases.....	= 0	-
Reacting with water.....	= 0	-
Higher activity particles.....		-
Soluble solids as bulk chemical compounds.....		-

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	0	-
Benzene.....		-
Chlorinated solvents.....		-
Formaldehyde.....		-
Organometallics.....		-
Phenol.....		-
Styrene.....		-
Tri-butyl phosphate.....		-
Other organophosphates.....		-
Vinyl chloride.....		-
Arsenic.....		-
Barium.....		-
Boron.....		-
Boron (in Boral).....		-
Boron (non-Boral).....		-
Cadmium.....		-
Caesium.....		-
Selenium.....		-
Chromium.....		-
Molybdenum.....		-
Thallium.....		-
Tin.....		-
Vanadium.....		-
Mercury compounds.....		-
Others.....		-

Complexing agents (%wt):

No		
	(%wt)	Type(s) and comment
EDTA.....	= 0	-
DPTA.....		-
NTA.....		-
Polycarboxylic acids.....		-
Other organic complexants.....		-
Total complexing agents.....		-

Physical components:

	Number	Type(s) and comment
Sources.....	P	-
Electronic & Electrical Equipment (EEE)		-
EEE Type 1.....		-
EEE Type 2.....		-
EEE Type 3.....		-
EEE Type 4.....		-
EEE Type 5.....		-

TREATMENT, PACKAGING AND DISPOSAL

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

Treatment	On-site / Off-site	Stream volume %
Size reduction		=
Decay storage		
Low force compaction		
Supercompaction (HFC)	Off-site	~ 0.5
Incineration	Off-site	~ 9.0
Drying/dewatering/liquid separation		
Tie down/fixatives/strippable coating/painting application		
Decontamination		
Metal treatment	Off-site	~ 68.0
Recycling / reuse		
Thermal treatment, including vitrification		
Encapsulation		
Polymer encapsulation		
Other physical treatment		
Other chemical treatment		
Containerisation		
Treatment not yet determined		
None		~ 22.5

Comments on planned treatments:

14% to go as VLLW.

Conditioning method:

-

Conditioning plants:

Plant Name	Location

Likely conditioning matrix:

-

Further information on the conditioning matrix:

-

Waste Packaging:

Likely container type:	Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
	1/2 Height WAMAC IP-2 ISO (TC08)	0.5	21.6	18.8	1	-
	1/2 Height IP-2 Disposal/Re-usable ISO (TC01/TC02)	8.5	10.0	18.3	1	-

Range in container waste loading: -

Other information on packaging and conditioning: -

Conditioned density (t/m³): -

Conditioned density comment: -

Management Routes:

Disposal Route	Stream volume %	Raw density t/m³	Start date
Expected to be consigned to a Near Site, Near Surface Disposal Facility (Scotland)			
Expected to be Non-NSD HAW managed under Scottish Government's policy			
Expected to be disposed to LLW Vaults NRS Dounreay			
Expected to be consigned to the Geological Disposal Facility			
Expected to be consigned to a Near Surface Disposal Facility			
Expected to be consigned to the LLW Repository	= 9.0	1.5	
Expected to be consigned to a Landfill Facility	= 14.0	1.5	
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility	= 9.0	0.40	
Expected to be consigned to a Metal Treatment Facility	= 68.0	1.4	
Expected to be Out of Scope			
Expected to be recycled / reused			
Disposal route not known			

Classification codes for waste expected to be consigned to a landfill facility: 17 04 05, 17 01 01, 17 06 03*

Opportunities for alternative disposal routing: No

Baseline Management Route	Opportunity Management Route	Stream volume (%)	Opportunity Confidence	Comment
-	-	-	-	-

RADIOACTIVITY

Source: Contamination of steel pipework, vessels and concrete structure.

Uncertainty: The values quoted were derived by calculation and are indicative of the activities that are expected.

Measurement of radioactivities: -

Chemical form of radionuclides: H-3: Any tritium is expected to be present as water, but some may be in the form of other inorganic compounds or as organic compounds.

C-14: -

Cl-36: The chlorine 36 content is insignificant.

Se-79: -

Tc-99: -

I-129: -

Ra: -

Th: -

U: -

Np: -

Pu: Chemical form of plutonium has not been determined but may be plutonium oxides.

WASTE STREAM 9A980 Caesium Removal Plant Decommissioning.									
Nuclide	Mean radioactivity, TBq/m³				Nuclide	Mean radioactivity, TBq/m³			
	Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code		Waste at 1.4.2025	Bands and Code	Future Arisings	Bands and Code
H 3	4.62E-06	C C 1	4.13E-06	C C 1	Gd 153		8		8
Be 10		8		8	Ho 163		8		8
C 14	5.93E-07	C C 1	5.93E-07	C C 1	Ho 166m		8		8
Na 22		8		8	Tm 170		8		8
Al 26		8		8	Tm 171		8		8
Cl 36		8		8	Lu 174		8		8
Ar 39		8		8	Lu 176		8		8
Ar 42		8		8	Hf 178n		8		8
K 40		8		8	Hf 182		8		8
Ca 41		8		8	Pt 193		8		8
Mn 53		8		8	Ti 204		8		8
Mn 54		8		8	Pb 205		8		8
Fe 55	1.06E-08	C C 1	6.36E-09	C C 1	Pb 210		8		8
Co 60	8.83E-08	C C 1	6.81E-08	C C 1	Bi 208		8		8
Ni 59		8		8	Bi 210m		8		8
Ni 63	5.12E-07	C C 1	5.05E-07	C C 1	Po 210		8		8
Zn 65		8		8	Ra 223		8		8
Se 79		8		8	Ra 225		8		8
Kr 81		8		8	Ra 226		8		8
Kr 85		8		8	Ra 228		8		8
Rb 87		8		8	Ac 227		8		8
Sr 90	3.00E-04	C C 1	2.86E-04	C C 1	Th 227		8		8
Zr 93		8		8	Th 228		8		8
Nb 91		8		8	Th 229		8		8
Nb 92		8		8	Th 230		8		8
Nb 93m		8		8	Th 232		8		8
Nb 94		8		8	Th 234		8		8
Mo 93		8		8	Pa 231		8		8
Tc 97		8		8	Pa 233		8		8
Tc 99		8		8	U 232		8		8
Ru 106		8		8	U 233		8		8
Pd 107		8		8	U 234		8		8
Ag 108m		8		8	U 235		8		8
Ag 110m		8		8	U 236		8		8
Cd 109		8		8	U 238		8		8
Cd 113m		8		8	Np 237		8		8
Sn 119m		8		8	Pu 236		8		8
Sn 121m		8		8	Pu 238	2.08E-06	C C 1	2.05E-06	C C 1
Sn 123		8		8	Pu 239	4.18E-06	C C 1	4.18E-06	C C 1
Sn 126		8		8	Pu 240	5.53E-06	C C 1	5.53E-06	C C 1
Sb 125		8		8	Pu 241	4.86E-05	C C 1	4.41E-05	C C 1
Sb 126		8		8	Pu 242		8		8
Te 125m		8		8	Am 241	1.95E-05	C C 1	1.95E-05	C C 1
Te 127m		8		8	Am 242m		8		8
I 129		8		8	Am 243		8		8
Cs 134		8		8	Cm 242		8		8
Cs 135		8		8	Cm 243		8		8
Cs 137	1.65E-03	C C 1	1.58E-03	C C 1	Cm 244		8		8
Ba 133		8		8	Cm 245		8		8
La 137		8		8	Cm 246		8		8
La 138		8		8	Cm 248		8		8
Ce 144		8		8	Cf 249		8		8
Pm 145		8		8	Cf 250		8		8
Pm 147	6.29E-09	C C 1	3.71E-09	C C 1	Cf 251		8		8
Sm 147		8		8	Cf 252		8		8
Sm 151		8		8	Unsp a				
Eu 152		8		8	Unsp b/g				
Eu 154	2.81E-07	C C 2	2.39E-07	C C 2	Total a	3.13E-05	*	3.13E-05	*
Eu 155		8		8	Total b/g	2.01E-03	*	1.91E-03	*

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 the 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
* Total calculated from the 114 declared radionuclides