

WASTE STREAM	5B360	Contaminated Oils and Solvents ILW
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SITE Dounreay

SITE OWNER Nuclear Decommissioning Authority

WASTE CUSTODIAN Nuclear Restoration Services Ltd (NRS)

WASTE TYPE ILW

WASTE VOLUMES

	Reported (m ³)	OR	Conditioned (m ³)	Packaged (m ³)
Stocks:	At 1.4.2025	= 197.2		
Future arisings:	1.4.2026 - 31.3.2027	< 0.1		
	1.4.2027 - 31.3.2028	< 0.1		
	1.4.2028 - 31.3.2029	< 0.1		
	1.4.2029 - 31.3.2030	< 0.1		
	1.4.2030 - 31.3.2031	= 0.9		
	1.4.2031 - 31.3.2032	= 1.4		
	1.4.2032 - 31.3.2033	= 1.4		
	1.4.2033 - 31.3.2034	= 1.4		
	1.4.2034 - 31.3.2035	= 1.4		
	1.4.2035 - 31.3.2036	= 1.4		
	1.4.2036 - 31.3.2037	= 1.4		
	1.4.2037 - 31.3.2038	= 1.4		
	1.4.2038 - 31.3.2039	= 1.4		
	1.4.2039 - 31.3.2040	= 0.5		
	1.4.2040 - 31.3.2041	< 0.1		
	1.4.2041 - 31.3.2042	< 0.1		
	1.4.2042 - 31.3.2043	< 0.1		
	1.4.2043 - 31.3.2044	< 0.1		
	1.4.2044 - 31.3.2045	< 0.1		
	1.4.2045 - 31.3.2046	< 0.1		
	1.4.2046 - 31.3.2047	< 0.1		
	1.4.2047 - 31.3.2048	< 0.1		
	1.4.2048 - 31.3.2049	< 0.1		
	1.4.2049 - 31.3.2050	< 0.1		
	1.4.2050 - 31.3.2051	< 0.1		
	1.4.2051 - 31.3.2052	< 0.1		
Total future arisings:		12.8		
Total waste volume:		210.0		

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

Comment on arising rates: Arisings from various ILW liquids across site. Arisings rates are based on NRS Dounreay's Lifetime Plan 2024 as generated at December 2023. Stocks consist of waste liquor in the storage tanks in the HALS and Evaporation Plant plus the solvent storage tank.

Additional information on quantities: Arisings consist of reprocessing solvents stored in tanks and miscellaneous oils/solvents generated within facilities. There are also very small quantities of Mercury.

Uncertainty factors on volumes: Stock (upper): x 1.20 Arisings (upper): x 1.20
Stock (lower): x 0.80 Arisings (lower): x 0.80

WASTE SOURCE Fuel reprocessing and miscellaneous types of oils/solvents from experiments/operations.

PHYSICAL CHARACTERISTICS

General description: The waste contains a variety of solvents and liquids held mainly in the HALS and Evaporation plant. There are no large items in the waste.

Changes since waste generated: Most liquids are held in tanks. Some of the solvent is held in stainless steel drums.

Bulk density (t/m³): = 0.97

Comment on density: Based on LLW Plant Washings

CHEMICAL COMPOSITION

General description and components (%wt): Mercury (TR), Other Liquid (90.33%), Solvent (6.62%), Stainless steel (3.05%),

Chemical state: Neutral

Sheet metal proportion / thickness: This waste is unsuitable for further treatment. Therefore the proportion of sheet metal has not been assessed.

Metals and alloys (%wt):

	(%wt)	Type(s) / Grades(s) with proportions	% of total C14 activity
Stainless steel.....	= 3.0	316 Stainless steel container	
Other ferrous metals.....	= 0	-	
Iron.....	= 0	-	
Aluminium.....	= 0	-	
Beryllium.....	= 0	-	
Cobalt.....	= 0	-	
Copper.....	= 0	-	
Lead.....	= 0	-	
Magnox/Magnesium.....	= 0	-	
Nickel.....	= 0	-	
Titanium.....	= 0	-	
Uranium.....	= 0	-	
Zinc.....	= 0	-	
Zircaloy/Zirconium.....	= 0	-	
Other metals.....	= 0.01	Mercury 0.01%,	

Organics (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Total cellulotics.....	= 0	-	
Paper, cotton.....	= 0	-	
Wood.....	= 0	-	
Halogenated plastics.....	= 0	-	
Total non-halogenated plastics.....	= 0	-	
Condensation polymers.....	NE	-	
Others.....	NE	-	
Organic ion exchange materials.....	= 0	-	
Total rubber.....	= 0	-	
Halogenated rubber.....	NE	-	
Non-halogenated rubber.....	NE	-	
Hydrocarbons.....	= 0	-	
Oil or grease.....	= 0	-	
Fuel.....	NE	-	
Asphalt/Tarmac (cont.coal tar).....	= 0	-	
Asphalt/Tarmac (no coal tar).....	= 0	-	
Bitumen.....	= 0	-	
Others.....	NE	-	
Other organics.....	= 0	Lightly contaminated TBP/OK reprocessing solvent, and other lightly contaminated liquids including solvents and oils.	

Other materials (%wt):

	(%wt)	Type(s) and comment	% of total C14 activity
Inorganic ion exchange materials.....	= 0	-	
Inorganic sludges and flocs.....	= 0	-	
Soil.....	= 0	-	
Brick/Stone/Rubble.....	= 0	-	
Cementitious material.....	= 0	-	
Sand.....	= 0	-	
Glass/Ceramics.....	= 0	-	
Graphite.....	= 0	-	
Desiccants/Catalysts.....	= 0	-	
Asbestos.....	= 0	-	
Non/low friable.....	NE	-	
Moderately friable.....	NE	-	
Highly friable.....	NE	-	
Free aqueous liquids.....	= 90.3	-	
Free non-aqueous liquids.....	= 6.6	Solvent 6.62%,	
Powder/Ash.....	= 0	-	

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

Inorganic anions (%wt):

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

Materials of interest for waste acceptance criteria:

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

Hazardous substances / non hazardous pollutants:

	(%wt)	Type(s) and comment
Acrylamide.....	NE	-
Benzene.....	= 0	-
Chlorinated solvents.....	NE	-
Formaldehyde.....	NE	-
Organometallics.....	NE	-
Phenol.....	NE	-
Styrene.....	NE	-
Tri-butyl phosphate.....	NE	-
Other organophosphates.....	NE	-
Vinyl chloride.....	NE	-
Arsenic.....	= 0	-
Barium.....	NE	-
Boron.....	= 0	-
Boron (in Boral).....	NE	-
Boron (non-Boral).....	NE	-
Cadmium.....	= 0	-
Caesium.....	NE	-
Selenium.....	= 0	-
Chromium.....	= 0	-
Molybdenum.....	= 0	-
Thallium.....	NE	-
Tin.....	= 0	-
Vanadium.....	= 0	-
Mercury compounds.....	= 0.01	-
Others.....	NE	-

Complexing agents (%wt):

Not yet determined		
	(%wt)	Type(s) and comment
EDTA.....	NE	-
DPTA.....	NE	-
NTA.....	NE	-
Polycarboxylic acids.....	NE	-
Other organic complexants.....	NE	The waste contains tributyl phosphate.
Total complexing agents.....	NE	-

Physical components:

	Number	Type(s) and comment
Sources.....	= 0	-
Electronic & Electrical Equipment (EEE)		
EEE Type 1.....	= 0	-
EEE Type 2.....	= 0	-
EEE Type 3.....	= 0	-
EEE Type 4.....	= 0	-
EEE Type 5.....	= 0	-

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) Incineration Drying/dewatering/liquid separation Tie down/fixatives/strippable coating/painting application Decontamination Metal treatment Recycling / reuse Thermal treatment, including vitrification Encapsulation Polymer encapsulation Other physical treatment Other chemical treatment Containerisation Treatment not yet determined None	On-site	= 100.0

Comments on planned treatments:

The waste will be treated to result in an acceptable product.

Conditioning method:

The waste will be treated to result in an acceptable product. Current strategy indicates that the waste will be transferred to a temporary cementation plant for cementation into 500 L drums.

Conditioning plants:

Plant Name	Location
Mobile Conditioning plant	Dounreay

Likely conditioning matrix:

Unknown

Further information on the conditioning matrix:

The conditioning factor is likely to be 2.0

Waste Packaging:

Likely container type:

Container	Waste packaged (vol%)	Waste loading (m³)	Payload (m³)	Number of packages	Estimated start date for packaging
500 l drum (paddle)	100.0	0.25	0.50	838	-

Range in container waste loading: Not yet determined

Other information on packaging and conditioning:

-

Conditioned density (t/m³):

~ 1.7

Conditioned density comment:

Likely to be around 1.7 once conditioned and cemented

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)	= 100.0		
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			
Expected to be consigned to a Landfill Facility			
Expected to be disposed On-Site			
Expected to be managed by In-Situ Disposal			
Expected to be consigned to an Incineration Facility			
Expected to be consigned to a Metal Treatment Facility			
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:

Opportunities for alternative disposal routing: No

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

RADIOACTIVITY

Source: Aqueous plus solvent wastes from DMTR, DFR and PFR Reprocessing

Uncertainty: Consignor's data used to develop specific activities. However, the number of consignments is limited, increasing the scope of uncertainty. Also, no LoC data is available for this waste at this time.

Measurement of radioactivities: Based on PWI Estimates. This combines the consignment data from each relevant facility.

Chemical form of radionuclides: H-3: Likely to be present as water.
C-14: Likely to be present.
Cl-36: Not known to be present.
Se-79: -
Tc-99: -
I-129: Likely to be present.
Ra: Not known to be present.
Th: Not known to be present.
U: Likely to be present
Np: Likely to be present
Pu: Likely to be present.

WASTE STREAM 5B360 Contaminated Oils and Solvents ILW									
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	= 9.22E-06	C C 2	= 9.22E-06	C C 2	Gd 153				
Be 10	= 2.55E-11	C C 2	= 2.55E-11	C C 2	Ho 163	= 2.34E-11	C C 2	= 2.34E-11	C C 2
C 14	= 1.42E-06	C C 2	= 1.42E-06	C C 2	Ho 166m	= 2.51E-09	C C 2	= 2.51E-09	C C 2
Na 22					Tm 170				
Al 26					Tm 171	= 4.32E-13	C C 2	= 4.32E-13	C C 2
Cl 36	= 2.78E-10	C C 2	= 2.78E-10	C C 2	Lu 174	= 3.75E-12	C C 2	= 3.75E-12	C C 2
Ar 39	= 4.29E-06	C C 2	= 4.29E-06	C C 2	Lu 176	= 9.55E-15	C C 2	= 9.55E-15	C C 2
Ar 42	= 6.24E-14	C C 2	= 6.24E-14	C C 2	Hf 178n	= 4.20E-10	C C 2	= 4.20E-10	C C 2
K 40	= 3.47E-12	C C 2	= 3.47E-12	C C 2	Hf 182	= 1.53E-16	C C 2	= 1.53E-16	C C 2
Ca 41	= 4.90E-09	C C 2	= 4.90E-09	C C 2	Pt 193	= 1.50E-08	C C 2	= 1.50E-08	C C 2
Mn 53	= 6.72E-13	C C 2	= 6.72E-13	C C 2	Ti 204	= 1.69E-08	C C 2	= 1.69E-08	C C 2
Mn 54	= 6.19E-12	C C 2	= 6.19E-12	C C 2	Pb 205	= 3.94E-13	C C 2	= 3.94E-13	C C 2
Fe 55	= 6.50E-07	C C 2	= 6.50E-07	C C 2	Pb 210	= 1.80E-12	C C 2	= 1.80E-12	C C 2
Co 60	= 8.03E-05	C C 2	= 8.03E-05	C C 2	Bi 208	= 2.63E-12	C C 2	= 2.63E-12	C C 2
Ni 59	= 2.06E-06	C C 2	= 2.06E-06	C C 2	Bi 210m	= 4.57E-13	C C 2	= 4.57E-13	C C 2
Ni 63	= 1.03E-04	C C 2	= 1.03E-04	C C 2	Po 210	= 1.40E-12	C C 2	= 1.40E-12	C C 2
Zn 65					Ra 223	= 6.82E-11	C C 2	= 6.82E-11	C C 2
Se 79	= 6.52E-11	C C 2	= 6.52E-11	C C 2	Ra 225	= 1.43E-12	C C 2	= 1.43E-12	C C 2
Kr 81	= 3.03E-11	C C 2	= 3.03E-11	C C 2	Ra 226	= 2.90E-11	C C 2	= 2.90E-11	C C 2
Kr 85	= 1.93E-08	C C 2	= 1.93E-08	C C 2	Ra 228	= 1.18E-12	C C 2	= 1.18E-12	C C 2
Rb 87	= 3.14E-12	C C 2	= 3.14E-12	C C 2	Ac 227	= 7.08E-11	C C 2	= 7.08E-11	C C 2
Sr 90	= 1.23E-03	C C 2	= 1.23E-03	C C 2	Th 227	= 6.83E-11	C C 2	= 6.83E-11	C C 2
Zr 93	= 3.73E-11	C C 2	= 3.73E-11	C C 2	Th 228	= 7.89E-10	C C 2	= 7.89E-10	C C 2
Nb 91	= 1.35E-08	C C 2	= 1.35E-08	C C 2	Th 229	= 1.44E-12	C C 2	= 1.44E-12	C C 2
Nb 92	= 2.04E-12	C C 2	= 2.04E-12	C C 2	Th 230	= 2.23E-08	C C 2	= 2.23E-08	C C 2
Nb 93m	= 9.26E-05	C C 2	= 9.26E-05	C C 2	Th 232	= 1.19E-12	C C 2	= 1.19E-12	C C 2
Nb 94	= 1.17E-06	C C 2	= 1.17E-06	C C 2	Th 234	= 5.53E-07	C C 2	= 5.53E-07	C C 2
Mo 93	= 3.07E-06	C C 2	= 3.07E-06	C C 2	Pa 231	= 7.74E-10	C C 2	= 7.74E-10	C C 2
Tc 97	= 3.40E-13	C C 2	= 3.40E-13	C C 2	Pa 233	= 7.51E-11	C C 2	= 7.51E-11	C C 2
Tc 99	= 9.24E-08	C C 2	= 9.24E-08	C C 2	U 232	= 8.57E-10	C C 2	= 8.57E-10	C C 2
Ru 106	= 2.73E-11	C C 2	= 2.73E-11	C C 2	U 233	= 3.74E-10	C C 2	= 3.74E-10	C C 2
Pd 107	= 5.95E-14	C C 2	= 5.95E-14	C C 2	U 234	= 4.05E-04	C C 2	= 4.05E-04	C C 2
Ag 108m	= 3.31E-09	C C 2	= 3.31E-09	C C 2	U 235	= 5.96E-06	C C 2	= 5.96E-06	C C 2
Ag 110m					U 236	= 5.57E-05	C C 2	= 5.57E-05	C C 2
Cd 109	= 1.22E-15	C C 2	= 1.22E-15	C C 2	U 238	= 5.54E-07	C C 2	= 5.54E-07	C C 2
Cd 113m	= 1.54E-07	C C 2	= 1.54E-07	C C 2	Np 237	= 7.73E-11	C C 2	= 7.73E-11	C C 2
Sn 119m					Pu 236	= 2.34E-16	C C 2	= 2.34E-16	C C 2
Sn 121m	= 2.39E-08	C C 2	= 2.39E-08	C C 2	Pu 238	= 7.46E-06	C C 2	= 7.46E-06	C C 2
Sn 123					Pu 239	= 6.08E-06	C C 2	= 6.08E-06	C C 2
Sn 126	= 2.14E-16	C C 2	= 2.14E-16	C C 2	Pu 240	= 1.04E-05	C C 2	= 1.04E-05	C C 2
Sb 125	= 8.01E-10	C C 2	= 8.01E-10	C C 2	Pu 241	= 4.77E-03	C C 2	= 4.77E-03	C C 2
Sb 126	= 2.14E-16	C C 2	= 2.14E-16	C C 2	Pu 242	= 1.09E-10	C C 2	= 1.09E-10	C C 2
Te 125m	= 1.89E-10	C C 2	= 1.89E-10	C C 2	Am 241	= 6.48E-05	C C 2	= 6.48E-05	C C 2
Te 127m					Am 242m	= 5.66E-11	C C 2	= 5.66E-11	C C 2
I 129	= 2.20E-14	C C 2	= 2.20E-14	C C 2	Am 243	= 5.08E-15	C C 2	= 5.08E-15	C C 2
Cs 134	= 1.36E-05	C C 2	= 1.36E-05	C C 2	Cm 242	= 7.58E-11	C C 2	= 7.58E-11	C C 2
Cs 135	= 8.60E-14	C C 2	= 8.60E-14	C C 2	Cm 243	= 1.72E-10	C C 2	= 1.72E-10	C C 2
Cs 137	= 3.37E-03	C C 2	= 3.37E-03	C C 2	Cm 244	= 1.84E-06	C C 2	= 1.84E-06	C C 2
Ba 133	= 1.29E-07	C C 2	= 1.29E-07	C C 2	Cm 245	= 5.47E-18	C C 2	= 5.47E-18	C C 2
La 137	= 4.42E-10	C C 2	= 4.42E-10	C C 2	Cm 246	= 1.71E-19	C C 2	= 1.71E-19	C C 2
La 138	= 1.64E-16	C C 2	= 1.64E-16	C C 2	Cm 248	= 4.77E-25	C C 2	= 4.77E-25	C C 2
Ce 144					Cf 249				
Pm 145	= 2.39E-10	C C 2	= 2.39E-10	C C 2	Cf 250				
Pm 147	= 1.06E-04	C C 2	= 1.06E-04	C C 2	Cf 251				
Sm 147	= 2.58E-14	C C 2	= 2.58E-14	C C 2	Cf 252				
Sm 151	= 1.60E-04	C C 2	= 1.60E-04	C C 2	Unsp a				
Eu 152	= 3.13E-08	C C 2	= 3.13E-08	C C 2	Unsp b/g				
Eu 154	= 9.54E-05	C C 2	= 9.54E-05	C C 2	Total a	5.57E-04	*	5.57E-04	*
Eu 155	= 6.45E-05	C C 2	= 6.45E-05	C C 2	Total b/g	1.01E-02	*	1.01E-02	*

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