## WASTE STREAM 5B343 Other Facilities Decommissioning LLW

**SITE** Dounreay

**SITE OWNER** Nuclear Decommissioning Authority

**WASTE CUSTODIAN** Dounreay Site Restoration Limited

**WASTE TYPE** LLW

**WASTE VOLUMES**

| | | Reported |
|---|---|---|
| Stocks: | At 1.4.2019..... | 0 m³ |
| Future arisings - | 1.4.2019 - 31.3.2027..... | 677.0 m³ |
| Total future arisings: | | 677.0 m³ |
| Total waste volume: | | 677.0 m³ |

Comment on volumes: This waste stream covers the decommissioning wastes from facilities not specifically covered in the inventory. Arisings are dependent on the decommissioning programmes. Arisings have been revised in line with the Predictive Waste Inventory exercise. Stocks have been removed as these will be captured under 5B15 and 5B16. It should be noted that the DSRL Site Programme is currently under review and the future arisings dates are subject to change. These wastes arise from the decommissioning of a variety of facilities.

Uncertainty factors on volumes:

| | | | |
|---|---|---|---|
| Stock (upper): | x | Arisings (upper) | x 1.2 |
| Stock (lower): | x | Arisings (lower) | x 0.8 |

**WASTE SOURCE** Decommissioning of a range of active facilities.

### PHYSICAL CHARACTERISTICS

General description: Plant equipment, pipework, ducting and structures. Items will be size reduced where practicable during decommissioning.

Physical components (%wt): Aluminium (0.05%), Cementitious material (e.g. concrete) (65.20%), Glass (0.02%), Mild Steel (17.21%), Plastic (0.33%), Rubber (0.06%), Sources (0.03%), Stainless steel (16.08%), Sweepings (0.15%), WEEE containing hazardous components (0.07%), WEEE not containing hazardous components (0.03%),

Sealed sources: Not yet determined.

Bulk density (t/m³): 0.75

Comment on density: The Bulk Density is based on Consignor's records

### CHEMICAL COMPOSITION

General description and components (%wt): Aluminium (0.05%), Cementitious material (e.g. concrete) (65.20%), Glass (0.02%), Inorganic sludges and flocs (0.76%), Mild Steel (17.21%), Plastic (0.33%), Rubber (0.06%), Sources (0.03%), Stainless steel (16.08%), Sweepings (0.15%), WEEE containing hazardous components (0.07%), WEEE not containing hazardous components (0.03%),

Chemical state: Neutral

Chemical form of radionuclides:
H-3: Likely to be present at low concentrations.
C-14: Likely to be present at low concentrations.
Cl-36: Unlikely to be present.
Se-79: Likely to be present at low concentrations.
Tc-99: Likely to be present at low concentrations.
I-129: Likely to be present at low concentrations.
Ra: Likely to be present at low concentrations.
Th: Likely to be present at low concentrations.
U: Likely to be present as oxide, nitrate and metal.
Np: Likely to be present at low concentrations.
Pu: Likely to be present as oxide or nitrate.

Metals and alloys (%wt): Both bulk and sheet metals are likely to be present, proportions not specified.

| | | | |
|---|---|---|---|
| | Stainless steel | NE | Assumed M316 |
| | Other ferrous metals | <17.2 | Ferrous metals include stainless steel, proportions unknown at present. |
| | Iron | | |
| | Aluminium | 0.05 | |
| | Beryllium | NE | |
| | Cobalt | NE | |
| | Copper | NE | |
| | Lead | NE | |
| | Magnox/Magnesium | NE | |
| | Nickel | NE | |
| | Titanium | | |
| | Uranium | P | |
| | Zinc | NE | |
| | Zircaloy/Zirconium | NE | |
| | Other metals | 0.17 | Other metals not specified. |
| Organics (%wt): | PVC and neoprene are likely to be present. | | |
| | Total cellulosics | | |
| | Paper, cotton | | |
| | Wood | | |
| | Halogenated plastics | <0.15 | PVC |
| | Total non-halogenated plastics | <0.16 | |
| | Condensation polymers | NE | |
| | Others | <0.16 | |
| | Organic ion exchange materials | 0 | |
| | Total rubber | <0.06 | |
| | Halogenated rubber | 0.03 | Neoprene |
| | Non-halogenated rubber | <0.03 | |
| | Hydrocarbons | | |
| | Oil or grease | | |
| | Fuel | | |
| | Asphalt/Tarmac (cont.coal tar) | | |
| | Asphalt/Tarmac (no coal tar) | | |
| | Bitumen | | |
| | Others | | |
| | Other organics | 0.78 | |
| Other materials (%wt): | Asbestos is likely to be present. | | |
| | Inorganic ion exchange materials. | 0 | |
| | Inorganic sludges and flocs | 0 | |
| | Soil | 0 | |
| | Brick/Stone/Rubble | NE | |
| | Cementitious material | <65.3 | |

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|---|---|---|

| | | |
|---|---|---|
| | Sand | |
| | Glass/Ceramics | 0.02 |
| | Graphite | 0 |
| | Desiccants/Catalysts | 0 |
| | Asbestos | P |
| | Non/low friable | |
| | Moderately friable | |
| | Highly friable | |
| | Free aqueous liquids | 0 |
| | Free non-aqueous liquids | 0 |
| | Powder/Ash | 0 |
| Inorganic anions (%wt): | Inorganic anions may be present at up to 3%. | |
| | 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: | - | |
| | Combustible metals | |
| | Low flash point liquids | 0 |
| | Explosive materials | 0 |
| | Phosphorus | 0 |
| | Hydrides | |
| | Biological etc. materials | 0 |
| | Biodegradable materials | 0 |
| | Putrescible wastes | 0 |
| | Non-putrescible wastes | 0 |
| | Corrosive materials | |
| | Pyrophoric materials | 0 |
| | Generating toxic gases | |
| | Reacting with water | |
| | Active particles | NE |
| | Soluble solids as bulk chemical compounds | 0 |

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|---|---|---|

| | | | |
|---|---|---|---|
| Hazardous substances / non hazardous pollutants: | Lead and asbestos are expected to be present, but the quantities have not been determined. | | |
| | 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..... | TR | Decontamination agents such as DECON 90 are likely to be present in trace amounts. |
| | Total complexing agents..... | TR | |

## WASTE STREAM 5B343 Other Facilities Decommissioning LLW

**TREATMENT, PACKAGING AND DISPOSAL**

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

| Treatment | On-site / Off site | Stream volume % |
|---|---|---|
| Low force compaction | | |
| Supercompaction (HFC) | On-site | 6.0 |
| Incineration | | |
| Solidification | On-site | 100.0 |
| Decontamination | | |
| Metal treatment | | |
| Size reduction | | |
| Decay storage | | |
| Recyling / reuse | | |
| Other / various | | |
| None | | |

Comment on planned treatments: Uncompacted drums will be supercompacted before being placed in HHISOs. The waste will be encapsulated before final disposal. DSRL is investigating the feasibility of alternative waste treatment routes but no decision has been made on their use yet.

**Disposal Routes:**

| 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 | 100.0 |
| 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 | |

**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 | 100.0 | 10 | 68 |
| 2m box (no shielding) | | | |
| 4m box (no shielding) | | | |
| Other | | | |

Other information: The waste will consist of large uncompactable items and 200 litre drums that have already been compacted. DSRL is investigating the feasibility of alternative LLW Disposal Container.

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**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 radioactivity arises from contamination of a range of active facilities. |
| Uncertainty: | Best estimate available, within a factor of 10 for arisings. |
| 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: | Based on consignor's records on Data Management System |
| Other information: | There are no unlisted radionuclides present at significant concentrations. Specific activity has been re-evaluated since 2016. The PWI gathers radiological information through averaging all historical consignments from the other facilities decommissioning. This is an alternate strategy to what may have been previously used in UKRWI. |

## WASTE STREAM 5B343 Other Facilities Decommissioning LLW

| 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 | | | 1.06E-09 | C C 2 | Gd 153 | | | | |
| Be 10 | | | | | Ho 163 | | | | |
| C 14 | | | 2.23E-09 | C C 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 | | | | | Pb 210 | | | | |
| Co 60 | | | 9.51E-07 | C C 2 | Bi 208 | | | | |
| Ni 59 | | | | | Bi 210m | | | | |
| Ni 63 | | | 1.56E-08 | 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 | | | 1.34E-05 | C C 2 | Th 227 | | | | |
| Zr 93 | | | | | Th 228 | | | | |
| Nb 91 | | | | | Th 229 | | | | |
| Nb 92 | | | | | Th 230 | | | | |
| Nb 93m | | | | | Th 232 | | | | |
| Nb 94 | | | 1.51E-18 | C C 2 | Th 234 | | | | |
| Mo 93 | | | | | Pa 231 | | | | |
| Tc 97 | | | | | Pa 233 | | | | |
| Tc 99 | | | | | U 232 | | | 1.04E-08 | C C 2 |
| Ru 106 | | | | | U 233 | | | | |
| Pd 107 | | | | | U 234 | | | 3.50E-07 | C C 2 |
| Ag 108m | | | | | U 235 | | | 9.5E-09 | C C 2 |
| Ag 110m | | | | | U 236 | | | 1.09E-08 | C C 2 |
| Cd 109 | | | | | U 238 | | | 1.17E-08 | C C 2 |
| Cd 113m | | | | | Np 237 | | | | |
| Sn 119m | | | | | Pu 236 | | | | |
| Sn 121m | | | | | Pu 238 | | | 3.85E-06 | C C 2 |
| Sn 123 | | | | | Pu 239 | | | 2.59E-06 | C C 2 |
| Sn 126 | | | | | Pu 240 | | | 1.98E-06 | C C 2 |
| Sb 125 | | | | | Pu 241 | | | 3.92E-05 | C C 2 |
| Sb 126 | | | | | Pu 242 | | | 6.66E-19 | C C 2 |
| Te 125m | | | | | Am 241 | | | 4.00E-06 | C C 2 |
| Te 127m | | | | | Am 242m | | | | |
| I 129 | | | | | Am 243 | | | | |
| Cs 134 | | | | | Cm 242 | | | | |
| Cs 135 | | | | | Cm 243 | | | | |
| Cs 137 | | | 1.15E-05 | C C 2 | Cm 244 | | | 1.10E-09 | C C 2 |
| Ba 133 | | | | | Cm 245 | | | | |
| La 137 | | | | | Cm 246 | | | | |
| La 138 | | | | | Cm 248 | | | | |
| Ce 144 | | | | | Cf 249 | | | | |
| Pm 145 | | | | | Cf 250 | | | | |
| Pm 147 | | | 2.46E-07 | C C 2 | Cf 251 | | | | |
| Sm 147 | | | | | Cf 252 | | | | |
| Sm 151 | | | | | Other a | | | | |
| Eu 152 | | | | | Other b/g | | | | |
| Eu 154 | | | 2.29E-07 | C C 2 | **Total a** | **0** | | **1.28E-05** | **C C 2** |
| Eu 155 | | | 1.31E-07 | C C 2 | **Total b/g** | **0** | | **6.56E-05** | **C C 2** |

**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