## WASTE STREAM 3S04 Sludges and Concentrates

**SITE** Sizewell B

**SITE OWNER** EDFE NGL

**WASTE CUSTODIAN** EDFE NGL

**WASTE TYPE** LLW

Is the waste subject to Scottish Policy: No

**WASTE VOLUMES**

| | | Reported |
|---|---|---|
| Stocks: | At 1.4.2022..... | 0 m³ |
| Future arisings - | 1.4.2022 - 31.3.2035..... | 1.0 m³ |
| | 1.4.2035 - 31.3.2043..... | 2.0 m³ |
| Total future arisings: | | 3.0 m³ |
| Total waste volume: | | 3.0 m³ |

Comment on volumes: Waste volumes will be variable depending on station operating conditions. Following planned shutdown in 2035 and defuelling operations, the fuel storage ponds and associated plant will continue in operation for a number of years before removal of the last cartridge filters etc.

Uncertainty factors on volumes:

| | | | |
|---|---|---|---|
| Stock (upper): | x | Arisings (upper) | x 1.5 |
| Stock (lower): | x | Arisings (lower) | x 0.5 |

**WASTE SOURCE** Principally miscellaneous wet wastes and sludges from active drains etc.

### PHYSICAL CHARACTERISTICS

General description: There are no large items that require special handling.

Physical components (%vol): Sludge and Concentrate (100 vol%). No other constituents have been identified.

Sealed sources: The waste does not contain sealed sources.

Bulk density (t/m³): 1.4

Comment on density: Density is expected to lie between 1.2 and 2.0 t/m³.

### CHEMICAL COMPOSITION

General description and components (%wt): To be determined. Predominantly radioactive effluent plant sludges, detritus. Possible contamination with boric acid. Organic material may also be present.

Chemical state: Acid

Chemical form of radionuclides:
H-3: Tritiated water.
C-14: Trace quantities may be present in liquids.
Ra: Not expected to be present in any measurable quantity.
U: Trace quantities may be present.
Pu: Trace quantities may be present.

Metals and alloys (%wt): -

| | (%wt) | Type(s) / Grade(s) with proportions | % of total C14 activity |
|---|---|---|---|
| Stainless steel..... | TR | | |
| Other ferrous metals..... | TR | | |
| Iron..... | TR | | |
| Aluminium..... | | | |
| Beryllium..... | 0 | | |
| Cobalt..... | 0 | | |
| Copper..... | | | |
| Lead..... | 0 | | |
| Magnox/Magnesium..... | 0 | | |

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| | |
|---|---|
| Nickel | |
| Titanium | 0 |
| Uranium | 0 |
| Zinc | 0 |
| Zircaloy/Zirconium | TR |
| Other metals | TR |

Organics (%wt): Oil and grease may be present in trace quantities. None.

| | (%wt) | Type(s) and comment | % of total C14 activity |
|---|---|---|---|
| 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 | NE | | |
| Oil or grease | NE | | |
| Fuel | | | |
| Asphalt/Tarmac (cont.coal tar) | | | |
| Asphalt/Tarmac (no coal tar) | | | |
| Bitumen | | | |
| Others | | | |
| Other organics | TR | | |

Other materials (%wt): -

| | (%wt) | Type(s) and comment | % of total C14 activity |
|---|---|---|---|
| Inorganic ion exchange materials | 0 | | |
| Inorganic sludges and flocs | 100.0 | | |
| Soil | 0 | | |
| Brick/Stone/Rubble | 0 | | |
| Cementitious material | 0 | | |
| Sand | 0 | | |
| Glass/Ceramics | | | |
| Graphite | 0 | | |
| Desiccants/Catalysts | 0 | | |
| Asbestos | 0 | | |
| Non/low friable | | | |
| Moderately friable | | | |

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| | | |
|---|---|---|
| Highly friable..... | | |
| Free aqueous liquids..... | P | |
| Free non-aqueous liquids..... | 0 | |
| Powder/Ash..... | 0 | |

Inorganic anions (%wt): In normal operation the listed anions are not expected to be present in significant quantities. Borate ion will be present.

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

Materials of interest for waste acceptance criteria: There are no materials identified which are likely to pose a fire or other non-radiological hazard.

| | (%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..... | 0 | |
| Putrescible wastes..... | 0 | |
| Non-putrescible wastes..... | 0 | |
| Corrosive materials..... | 0 | |
| Pyrophoric materials..... | 0 | |
| Generating toxic gases..... | 0 | |
| Reacting with water..... | 0 | |
| Higher activity particles..... | 0 | Not expected. |
| Soluble solids as bulk chemical compounds..... | 0 | |

Hazardous substances / non hazardous pollutants: Contains boric acid in concentrate - listed substance code 060199.

| | (%wt) | Type(s) and comment |
|---|---|---|
| Acrylamide..... | NE | |
| Benzene..... | NE | |
| Chlorinated solvents..... | NE | |

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

Complexing agents (%wt): Yes

| | (%wt) | Type(s) and comment |
|---|---|---|
| EDTA | NE | |
| DPTA | NE | |
| NTA | NE | |
| Polycarboxylic acids | NE | |
| Other organic complexants | NE | Complexing agents are not expected to be present in any measurable quantity. |
| Total complexing agents | NE | |

Potential for the waste to contain discrete items: . No

## WASTE STREAM 3S04 Sludges and Concentrates

**TREATMENT, PACKAGING AND DISPOSAL**

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

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

Comment on planned treatments: Waste treatments for future arisisngs not yet determined but assumed to be incineration.

**Disposal Routes:**

| Disposal Route | Stream volume % | Disposal density t/m3 |
|---|---|---|
| Expected to be consigned to the LLW Repository<br>Expected to be consigned to a Landfill Facility<br>Expected to be consigned to an On-Site Disposal Facility<br>Expected to be consigned to an Incineration Facility<br>Expected to be consigned to a Metal Treatment Facility<br>Expected to be consigned as Out of Scope<br>Expected to be recycled / reused<br>Disposal route not known | 100.0 | |

Classification codes for waste expected to be consigned to a landfill facility: -

**Upcoming (2022/23-2024/25) Waste Routing (if expected to change from above):**

| Disposal Route | Stream volume % | | |
|---|---|---|---|
| | 2022/23 | 2023/24 | 2024/25 |
| Expected to be consigned to the LLW Repository<br>Expected to be consigned to a Landfill Facility<br>Expected to be consigned to an On-Site Disposal Facility<br>Expected to be consigned to an Incineration Facility<br>Expected to be consigned to a Metal Treatment Facility<br>Expected to be consigned as Out of Scope<br>Expected to be recycled / reused<br>Disposal route not known | | | |

**Opportunities for alternative disposal routing:** -

| Baseline Management Route | Opportunity Management Route | Stream volume (%) | Estimated Date that Opportunity will be realised | Opportunity Confidence | Comment |
|---|---|---|---|---|---|
| - | - | - | - | - | - |

**Waste Packaging for Disposal:** (Not applicable to this waste stream)

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| 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 | | | |
| 2m box (no shielding) | | | |
| 4m box (no shielding) | | | |
| Other | | | |

Other information: -

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

Container voidage: -

Waste Characterisation Form (WCH): It is not yet determined if the waste meets LLWR's Waste Acceptance Criteria (WAC).

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

**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: Contaminated sludge and concentrates. Contamination by fission products and activation products, with trace quantities of actinides.

Uncertainty: -

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: -

Other information: -

## WASTE STREAM 3S04 Sludges and Concentrates

| Nuclide | Mean radioactivity, TBq/m³ Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code | Nuclide | Mean radioactivity, TBq/m³ Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code |
|---|---|---|---|---|---|---|---|---|---|
| H 3 | | | 1E-02 | C C 2 | Gd 153 | | | | |
| Be 10 | | | | 8 | Ho 163 | | | | |
| C 14 | | | 3E-06 | C C 2 | Ho 166m | | | | |
| Na 22 | | | | 4 | Tm 170 | | | | |
| Al 26 | | | | 4 | Tm 171 | | | | |
| Cl 36 | | | | 8 | Lu 174 | | | | |
| Ar 39 | | | | | Lu 176 | | | | |
| Ar 42 | | | | | Hf 178n | | | | |
| K 40 | | | | | Hf 182 | | | | |
| Ca 41 | | | | 8 | Pt 193 | | | | |
| Mn 53 | | | | | Tl 204 | | | | |
| Mn 54 | | | 5E-04 | C C 2 | Pb 205 | | | | |
| Fe 55 | | | 7E-04 | C C 2 | Pb 210 | | | | 8 |
| Co 60 | | | 7E-04 | C C 2 | Bi 208 | | | | |
| Ni 59 | | | 9E-08 | C C 2 | Bi 210m | | | | |
| Ni 63 | | | 1E-05 | C C 2 | Po 210 | | | | 8 |
| Zn 65 | | | 4E-05 | C C 2 | Ra 223 | | | | |
| Se 79 | | | | 8 | Ra 225 | | | | |
| Kr 81 | | | | | Ra 226 | | | | 8 |
| Kr 85 | | | | | Ra 228 | | | | |
| Rb 87 | | | | | Ac 227 | | | | |
| Sr 90 | | | 6E-06 | C C 2 | Th 227 | | | | |
| Zr 93 | | | | 8 | Th 228 | | | | |
| Nb 91 | | | | | Th 229 | | | | 8 |
| Nb 92 | | | | | Th 230 | | | | 8 |
| Nb 93m | | | | 8 | Th 232 | | | | 8 |
| Nb 94 | | | 7E-09 | C C 2 | Th 234 | | | | |
| Mo 93 | | | 8E-09 | C C 2 | Pa 231 | | | | 8 |
| Tc 97 | | | | | Pa 233 | | | | |
| Tc 99 | | | | 8 | U 232 | | | | |
| Ru 106 | | | 8E-05 | C C 2 | U 233 | | | | 8 |
| Pd 107 | | | | 8 | U 234 | | | | 8 |
| Ag 108m | | | 2E-08 | C C 2 | U 235 | | | | 8 |
| Ag 110m | | | 2E-05 | C C 2 | U 236 | | | | 8 |
| Cd 109 | | | | | U 238 | | | | 8 |
| Cd 113m | | | | | Np 237 | | | | 8 |
| Sn 119m | | | | | Pu 236 | | | | |
| Sn 121m | | | | 8 | Pu 238 | | | 5E-08 | C C 2 |
| Sn 123 | | | | | Pu 239 | | | 2E-08 | C C 2 |
| Sn 126 | | | | 8 | Pu 240 | | | 2E-08 | C C 2 |
| Sb 125 | | | 9E-05 | C C 2 | Pu 241 | | | 6E-06 | C C 2 |
| Sb 126 | | | 5E-05 | C C 2 | Pu 242 | | | | 8 |
| Te 125m | | | 7E-07 | C C 2 | Am 241 | | | 9E-09 | C C 2 |
| Te 127m | | | 8E-06 | C C 2 | Am 242m | | | | 8 |
| I 129 | | | | 8 | Am 243 | | | 1E-09 | C C 2 |
| Cs 134 | | | 2E-04 | C C 2 | Cm 242 | | | 1E-07 | C C 2 |
| Cs 135 | | | | 8 | Cm 243 | | | | 8 |
| Cs 137 | | | 2E-04 | C C 2 | Cm 244 | | | 1E-08 | C C 2 |
| Ba 133 | | | | | Cm 245 | | | | 8 |
| La 137 | | | | | Cm 246 | | | | 8 |
| La 138 | | | | | Cm 248 | | | | |
| Ce 144 | | | 6E-05 | C C 2 | Cf 249 | | | | |
| Pm 145 | | | | | Cf 250 | | | | |
| Pm 147 | | | 7E-06 | C C 2 | Cf 251 | | | | |
| Sm 147 | | | | | Cf 252 | | | | |
| Sm 151 | | | 1E-08 | C C 2 | Other a | | | | 8 |
| Eu 152 | | | | 8 | Other b/g | | | 3E-03 | C C 2 |
| Eu 154 | | | 6E-07 | C C 2 | **Total a** | **0** | | **2.1E-07** | **C C 2** |
| Eu 155 | | | 4E-07 | C C 2 | **Total b/g** | **0** | | **1.57E-02** | **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