## WASTE STREAM 9E22 Miscellaneous Contaminated Items

| | |
|---|---|
| **SITE** | Oldbury |
| **SITE OWNER** | Nuclear Decommissioning Authority |
| **WASTE CUSTODIAN** | Magnox Limited |
| **WASTE TYPE** | ILW |
| Is the waste subject to Scottish Policy: | No |

**WASTE VOLUMES**

| | | Reported |
|---|---|---|
| Stocks: | At 1.4.2022..... | 17.2 m³ |
| Future arisings - | 1.4.2022 - 31.3.2023..... | 0.5 m³ |
| | 1.4.2023 - 31.3.2024..... | 0.3 m³ |
| Total future arisings: | | 0.8 m³ |
| Total waste volume: | | 18.0 m³ |

Comment on volumes: MCI in both Waste Cells was sorted and segregated in 2019/20. 12.47m3 from this waste stream has been loaded into 3 DCICs: (GNS ID 5560, volume 4.25m3, GNS ID 5466, volume 3.75m3 and GNS 5471, volume 4.47m3) which have now been transported to Berkeley ISF awaiting conditioning (total volume of 12.47m3) there is 1.75 m3 stored in Waste Cell 1, 5.25 m3 stored in Waste Cell 2 + 2.78 m3 stored in B75/PFP. There is a forecast future arising of 0.5m3. Update in March 2022 - 21 drums of sand (5.25m3) were retrieved from the waste cells and have been processed, dried and repacked. 5m3 of this sand was re-characterised from ILW to LLW - 0.25 remains ILW, stream composition not updated to reflect this at this point in time.

| Uncertainty factors on volumes: | | | | |
|---|---|---|---|---|
| | Stock (upper): | x 1.2 | Arisings (upper) | x 1.2 |
| | Stock (lower): | x 0.8 | Arisings (lower) | x 0.8 |

**WASTE SOURCE** Redundant contaminated plant items and material not suitable for disposal as LLW to the LLWR.

### PHYSICAL CHARACTERISTICS

| | |
|---|---|
| General description: | Drums of: fine filters, Vacuum cleaner debris, sand, poly, size reduced fuel reception tray and miscellaneous waste |
| Physical components (%vol): | Drums of: fine filters(35% vol), Vacuum cleaner debris(23.5% vol), sand(18% vol), poly(3% vol), size reduced fuel reception tray (8.5% vol) and miscellaneous waste (12% vol). |
| Sealed sources: | The waste does not contain sealed sources. |
| Bulk density (t/m³): | ~1 |
| Comment on density: | The assumption of 1 t/m3 as the average bulk density may be subject to revision. |

### CHEMICAL COMPOSITION

| | |
|---|---|
| General description and components (%wt): | The waste comprises of sand, steel and other components which have not been assessed. Fission products, actinides and other activation products will be present as contaminants. |
| Chemical state: | Neutral |
| Chemical form of radionuclides: | H-3: Tritium may be present as water.<br>C-14: Carbon 14 will be present as graphite dust particles.<br>Cl-36: Chlorine 36 may be present in graphite dust particles.<br>Se-79: The selenium content is insignificant.<br>Tc-99: The technetium content is insignificant.<br>Ra: The radium isotope content is insignificant.<br>Th: Traces of thorium may be present in metallic form, as oxide or as insoluble salts.<br>U: Uranium isotopes are expected to be present as trace contamination in the form of natural uranium metal.<br>Np: The neptunium content is insignificant.<br>Pu: Plutonium isotopes are expected to be present as trace amounts from minor fuel leakage, probably metallic. |
| Metals and alloys (%wt): | - |

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| | (%wt) | Type(s) / Grade(s) with proportions | % of total C14 activity |
|---|---|---|---|
| Stainless steel | 16.7 | | |
| Other ferrous metals | 18.0 | | |
| Iron | | | |
| Aluminium | NE | | |
| Beryllium | 0 | | |
| Cobalt | | | |
| Copper | NE | | |
| Lead | 0 | | |
| Magnox/Magnesium | NE | | |
| Nickel | | | |
| Titanium | | | |
| Uranium | | | |
| Zinc | NE | | |
| Zircaloy/Zirconium | NE | | |
| Other metals | NE | Not fully assessed. | |

Organics (%wt): Not fully assessed. The possible presence of cellulose is to be determined. There may be traces of oil and grease. Halogenated plastics and rubbers unlikely to be present.

| | (%wt) | Type(s) and comment | % of total C14 activity |
|---|---|---|---|
| Total cellulosics | NE | | |
| Paper, cotton | NE | | |
| Wood | NE | | |
| Halogenated plastics | NE | | |
| Total non-halogenated plastics | ~1.5 | | |
| Condensation polymers | ~0.75 | | |
| Others | ~0.75 | | |
| Organic ion exchange materials | NE | | |
| Total rubber | NE | | |
| Halogenated rubber | NE | | |
| Non-halogenated rubber | NE | | |
| Hydrocarbons | | | |
| Oil or grease | | | |
| Fuel | | | |
| Asphalt/Tarmac (cont.coal tar) | | | |
| Asphalt/Tarmac (no coal tar) | | | |
| Bitumen | | | |
| Others | | | |
| Other organics | TR | | |

Other materials (%wt): Traces of graphite may be present.

**WASTE STREAM 9E22 Miscellaneous Contaminated Items**

| | (%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..... | 42.0 | | |
| Glass/Ceramics..... | 0 | | |
| Graphite..... | TR | | |
| Desiccants/Catalysts..... | | | |
| Asbestos..... | 0 | | |
| Non/low friable..... | | | |
| Moderately friable..... | | | |
| Highly friable..... | | | |
| Free aqueous liquids..... | 0 | | |
| Free non-aqueous liquids..... | 0 | | |
| Powder/Ash..... | 20.0 | | |

Inorganic anions (%wt): None greater than 1%.

| | (%wt) | Type(s) and comment |
|---|---|---|
| Fluoride..... | 0.20 | |
| Chloride..... | 0.20 | |
| Iodide..... | 0.20 | |
| Cyanide..... | 0 | |
| Carbonate..... | 0.20 | |
| Nitrate..... | 0.20 | |
| Nitrite..... | 0.20 | |
| Phosphate..... | 0.20 | |
| Sulphate..... | 0.20 | |
| Sulphide..... | 0.20 | |

Materials of interest for waste acceptance criteria: No fire or other hazardous material expected but not fully assessed at present.

| | (%wt) | Type(s) and comment |
|---|---|---|
| Combustible metals..... | NE | |
| Low flash point liquids..... | 0 | |
| Explosive materials..... | 0 | |
| Phosphorus..... | 0 | |
| Hydrides..... | 0 | |
| Biological etc. materials..... | NE | |
| Biodegradable materials..... | 0 | |
| Putrescible wastes..... | 0 | |
| Non-putrescible wastes..... | | |

## WASTE STREAM 9E22 Miscellaneous Contaminated Items

| | |
|---|---|
| Corrosive materials..... | 0 |
| Pyrophoric materials..... | 0 |
| Generating toxic gases..... | NE |
| Reacting with water..... | NE |
| Higher activity particles..... | |
| Soluble solids as bulk chemical compounds..... | |

Hazardous substances / non hazardous pollutants: none expected

| | (%wt) | Type(s) and comment |
|---|---|---|
| Acrylamide..... | | |
| Benzene..... | | |
| Chlorinated solvents..... | | |
| Formaldehyde..... | | |
| Organometallics..... | | |
| Phenol..... | | |
| Styrene..... | | |
| Tri-butyl phosphate..... | | |
| Other organophosphates..... | | |
| Vinyl chloride..... | | |
| Arsenic..... | | |
| Barium..... | | |
| Boron..... | 0 | |
| Boron (in Boral)..... | | |
| Boron (non-Boral)..... | | |
| Cadmium..... | | |
| Caesium..... | | |
| Selenium..... | | |
| Chromium..... | | |
| Molybdenum..... | | |
| Thallium..... | | |
| Tin..... | | |
| Vanadium..... | | |
| Mercury compounds..... | | |
| Others..... | | |
| Electronic Electrical Equipment (EEE) | | |
| EEE Type 1..... | | |
| EEE Type 2..... | | |
| EEE Type 3..... | | |
| EEE Type 4..... | | |
| EEE Type 5..... | | |

## WASTE STREAM 9E22 Miscellaneous Contaminated Items

Complexing agents (%wt): Yes

| | (%wt) | Type(s) and comment |
|---|---|---|
| EDTA..... | | |
| DPTA..... | | |
| NTA..... | | |
| Polycarboxylic acids……. | | |
| Other organic complexants..... | | |
| Total complexing agents..... | TR | |

Potential for the waste to contain discrete items: Not yet determined. In & of itself not a DI; waste stream may include DIs (notably any stainless steel components)

### PACKAGING AND CONDITIONING

Conditioning method: The waste has been sorted and some was classified as LLW and moved to an alternative LLW stream for disposal as such. Waste will be packaged to fit into as few containers as possible.

Plant Name: -

Location: Oldbury Power Station

Plant startup date: -

Total capacity ($m^3$/y incoming waste): -

Target start date for packaging this stream: 2022

Throughput for this stream ($m^3$/y incoming waste): -

Other information: -

Likely container type:

| Container | Waste packaged (%vol) | Waste loading ($m^3$) | Payload ($m^3$) | Number of packages |
|---|---|---|---|---|
| 3$m^3$ RS box | 100.0 | 4.39 | 2.5 | 5 |

Likely container type comment: -

Range in container waste volume: -

Other information on containers: -

Likely conditioning matrix:

Other information: -

Conditioned density (t/$m^3$): -

Conditioned density comment: -

Other information on conditioning: -

Opportunities for alternative disposal routing: -

## WASTE STREAM 9E22 Miscellaneous Contaminated Items

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

### RADIOACTIVITY

| | |
|---|---|
| Source: | The waste usually arises from the irradiated fuel handling and pond operations. Some of the waste came from AETP refurbishment. Components that have been associated with fuel pond operations are likely to be of high activity. |
| Uncertainty: | The values quoted are indicative of the activities that might be expected. |
| 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 is a function of Station operating history. Figures were derived by estimation based upon available information. |
| Other information: | - |

## WASTE STREAM 9E22 Miscellaneous Contaminated Items

| Nuclide | Mean radioactivity, TBq/m³ | | | | Nuclide | Mean radioactivity, TBq/m³ | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code | | Waste at 1.4.2022 | Bands and Code | Future arisings | Bands and Code |
| H 3 | 1.02E-03 | DD 2 | 1.02E-03 | DD 2 | Gd 153 | | 8 | | 8 |
| Be 10 | | 8 | | 8 | Ho 163 | | 8 | | 8 |
| C 14 | 3.98E-04 | DD 2 | 3.98E-04 | DD 2 | Ho 166m | | 8 | | 8 |
| Na 22 | | 8 | | 8 | Tm 170 | | 8 | | 8 |
| Al 26 | | 8 | | 8 | Tm 171 | | 8 | | 8 |
| Cl 36 | 6.97E-04 | DD 2 | 6.97E-04 | DD 2 | 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 | Tl 204 | | 8 | | 8 |
| Mn 54 | | 8 | | 8 | Pb 205 | | 8 | | 8 |
| Fe 55 | 4.44E-05 | DD 2 | 4.44E-05 | DD 2 | Pb 210 | | 8 | | 8 |
| Co 60 | 2.1E-05 | DD 2 | 2.1E-05 | DD 2 | Bi 208 | | 8 | | 8 |
| Ni 59 | | 8 | | 8 | Bi 210m | | 8 | | 8 |
| Ni 63 | 8.24E-05 | DD 2 | 8.24E-05 | DD 2 | 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 | 2.99E-03 | DD 2 | 2.99E-03 | DD 2 | 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 | 8.25E-09 | DD 2 | 8.25E-09 | DD 2 |
| Nb 93m | | 8 | | 8 | Th 232 | | 8 | | 8 |
| Nb 94 | | 8 | | 8 | Th 234 | 2.99E-05 | DD 2 | 2.99E-05 | DD 2 |
| Mo 93 | | 8 | | 8 | Pa 231 | | 8 | | 8 |
| Tc 97 | | 8 | | 8 | Pa 233 | 3.22E-08 | DD 2 | 3.22E-08 | DD 2 |
| Tc 99 | | 8 | | 8 | U 232 | | 8 | | 8 |
| Ru 106 | 2.54E-07 | DD 2 | 2.54E-07 | DD 2 | U 233 | | 8 | | 8 |
| Pd 107 | | 8 | | 8 | U 234 | 2.99E-05 | DD 2 | 2.99E-05 | DD 2 |
| Ag 108m | | 8 | | 8 | U 235 | 6.97E-07 | DD 2 | 6.97E-07 | DD 2 |
| Ag 110m | | 8 | | 8 | U 236 | 3.98E-06 | DD 2 | 3.98E-06 | DD 2 |
| Cd 109 | | 8 | | 8 | U 238 | 2.99E-05 | DD 2 | 2.99E-05 | DD 2 |
| Cd 113m | | 8 | | 8 | Np 237 | 3.23E-08 | DD 2 | 3.23E-08 | DD 2 |
| Sn 119m | | 8 | | 8 | Pu 236 | | 8 | | 8 |
| Sn 121m | | 8 | | 8 | Pu 238 | 4.53E-04 | DD 2 | 4.53E-04 | DD 2 |
| Sn 123 | | 8 | | 8 | Pu 239 | 9.96E-04 | DD 2 | 9.96E-04 | DD 2 |
| Sn 126 | | 8 | | 8 | Pu 240 | 9.95E-04 | DD 2 | 9.95E-04 | DD 2 |
| Sb 125 | 5.13E-07 | DD 2 | 5.13E-07 | DD 2 | Pu 241 | 1.69E-02 | DD 2 | 1.69E-02 | DD 2 |
| Sb 126 | | 8 | | 8 | Pu 242 | | 8 | | 8 |
| Te 125m | 1.29E-07 | DD 2 | 1.29E-07 | DD 2 | Am 241 | 3.36E-03 | DD 2 | 3.36E-03 | DD 2 |
| Te 127m | | 8 | | 8 | Am 242m | | 8 | | 8 |
| I 129 | 5.97E-09 | DD 2 | 5.97E-09 | DD 2 | Am 243 | | 8 | | 8 |
| Cs 134 | 7.67E-05 | DD 2 | 7.67E-05 | DD 2 | Cm 242 | | 8 | | 8 |
| Cs 135 | | 8 | | 8 | Cm 243 | 3.02E-06 | DD 2 | 3.02E-06 | DD 2 |
| Cs 137 | 7.58E-03 | DD 2 | 7.58E-03 | DD 2 | Cm 244 | 2.53E-05 | DD 2 | 2.53E-05 | DD 2 |
| Ba 133 | 2.74E-06 | DD 2 | 2.74E-06 | DD 2 | Cm 245 | | 8 | | 8 |
| La 137 | | 8 | | 8 | Cm 246 | | 8 | | 8 |
| La 138 | | 8 | | 8 | Cm 248 | | 8 | | 8 |
| Ce 144 | 7.58E-08 | DD 2 | 7.58E-08 | DD 2 | Cf 249 | | 8 | | 8 |
| Pm 145 | | 8 | | 8 | Cf 250 | | 8 | | 8 |
| Pm 147 | 1.76E-04 | DD 2 | 1.76E-04 | DD 2 | Cf 251 | | 8 | | 8 |
| Sm 147 | | 8 | | 8 | Cf 252 | | 8 | | 8 |
| Sm 151 | | 8 | | 8 | Other a | | | | |
| Eu 152 | 5.39E-07 | DD 2 | 5.39E-07 | DD 2 | Other b/g | | | | |
| Eu 154 | 7.65E-06 | DD 2 | 7.65E-06 | DD 2 | **Total a** | **5.90E-03** | **DD 2** | **5.90E-03** | **DD 2** |
| Eu 155 | 1.1E-06 | DD 2 | 1.1E-06 | DD 2 | **Total b/g** | **3.00E-02** | **DD 2** | **3.00E-02** | **DD 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