

## SCHEDULE 5

Regulation 8

## MONITORING FOR INDIVIDUAL RADIONUCLIDES

1. A water undertaker may use a screening strategy for gross alpha and gross beta to monitor for the parametric indicator value for indicative dose(1). The recommended screening value for gross alpha is 0.1Bq/l and for gross beta is 1.0Bq/l.

If the gross alpha activity exceeds 0.1Bq/l or the gross beta activity exceeds 1.0Bq/l, analysis for specific radionuclides is required.

The radionuclides to be measured must be based on all relevant information about likely sources of radioactivity.

## 2. Calculation of the ID

The ID must be calculated from the measured radionuclide concentrations and the dose coefficients laid down in Annex III, Table A of Directive 96/29/Euratom or more recent information recognised by the Department, on the basis of the annual intake of water (730l for adults). Where the following formula is satisfied, it can be assumed that the ID is less than the parametric value if 0.1mSv and no further investigation is required.

$$\sum_{i=1}^n \frac{C_i(\text{obs})}{C_i(\text{der})} \leq 1$$

where

$C_i(\text{obs})$  = observed concentration of radionuclide  $i$

$C_i(\text{der})$  = derived concentration of radionuclide  $i$  (see Table 1)

$n$  – number of radionuclides detected.

TABLE 1

**Derived concentration for radioactivity in water intended for human consumption<sup>(1)</sup>**

<i>Origin</i>	<i>Radionuclide</i>	<i>Derived concentration<sup>(2)</sup></i>
Natural	U-238 <sup>(3)</sup>	3.0 Bq/l
	U-234 <sup>(3)</sup>	2.8 Bq/l
	Ra-226	0.5 Bq/l
	Ra-228	0.2 Bq/l
	Pb-210	0.2 Bq/l
	Po-210	0.1 Bq/l

(1) This table includes value for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0.1mSV, an annual intake of 730 litres and using the dose coefficients laid down in Annex III of Directive 96/29/Euratom; derived concentration for other radionuclides can be calculated on the same basis, and values can be updated on the basis of more recent information recognised by the competent authorities.

(2) Where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 concentration.

(3) This table allows only for the radiological properties of uranium, not for its chemical toxicity.

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**Status:** This is the original version (as it was originally made).

<i>Origin</i>	<i>Radionuclide</i>	<i>Derived concentration<sup>(2)</sup></i>
Artificial	C-14	240 Bq/l
	Sr-90	4.9 Bq/l
	Pu-239/Pu-240	0.6 Bq/l
	Am-241	0.7 Bq/l
	Co-60	40 Bq/l
	Cs-134	7.2 Bq/l
	Cs-137	11 Bq/l
	I-131	6.2 Bq/l

- (1) This table includes value for the most common natural and artificial radionuclides; these are precise values, calculated for a dose of 0.1mSV, an annual intake of 730 litres and using the dose coefficients laid down in Annex III of Directive 96/29/Euratom; derived concentration for other radionuclides can be calculated on the same basis, and values can be updated on the basis of more recent information recognised by the competent authorities.
- (2) Where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 concentration.
- (3) This table allows only for the radiological properties of uranium, not for its chemical toxicity.

### 3. Performance characteristics and method of analysis.

For the following parameters and radionuclides, the method of analysis used must, as a minimum be capable of measuring activity concentrations with a limit of detection specified in Table 2 below:

**TABLE 2**

<i>Parameters and radionuclides</i>	<i>Limit of detection<sup>(1)(2)</sup></i>
Tritium <sup>(3)</sup>	10 Bq/l
Radon <sup>(3)</sup>	10 Bq/l
gross alpha activity <sup>(4)</sup>	0.04 Bq/l
gross beta activity <sup>(4)</sup>	0.4 Bq/l
U-238	0.02 Bq/l
U-234	0.02 Bq/l
Ra-226	0.04 Bq/l
Ra-228 <sup>(5)</sup>	0.02 Bq/l
Pb-210	0.02 Bq/l
Po-210	0.01 Bq/l
C-14	20 Bq/l
Sr-90	0.4 Bq/l
Pu-239/Pu-240	0.04 Bq/l
Am-241	0.06 Bq/l
Co-60	0.5 Bq/l

<i>Parameters and radionuclides</i>	<i>Limit of detection<sup>(1)(2)</sup></i>
Cs-134	0.5 Bq/l
Cs-137	0.5 Bq/l
I-131	0.5 Bq/l

- (1) The limit of detection must be calculated according to the ISO standard 11929: Determination of the characteristic limits (decision threshold, detection limit, and limits of confidence interval) for measurements of ionising radiation– Fundamentals and application, with probabilities of error of 1st and 2nd kind of 0.05 each.
- (2) Measurement uncertainties must be calculated and reported as complete standard uncertainties or as expanded uncertainties with an expansion factor of 1.96 according the ISO Guide for the Expression of Uncertainty in Measurement.
- (3) The limit of detection for tritium and for radon is 10% of its parametric value of 100 Bq/l.
- (4) The limit of detection for gross alpha activity and gross beta activities are 40% of the screening values of 0.1 and 1.0 Bq/l respectively.
- (5) This limit of detection applies only to initial screening for ID for a new water source, if initial checking indicates that is not plausible that Ra-228 exceeds 20% of the derived concentration, the limit of detection may be increased to 0.8 Bq/l for routine Ra-228 nuclide specific measurements until a subsequent re-check is required.