

## SCHEDULE 4

Regulation 6

### Monitoring for indicative dose and analytical performance characteristics

#### **Monitoring for compliance with the indicative dose**

1.—(1) A water undertaker may use reliable screening strategies to indicate the presence of radioactivity in water intended for human consumption.

(2) The strategies may include screening for—

- (a) certain radionuclides or individual radionuclide; or
- (b) gross alpha activity or gross beta activity (where appropriate gross beta activity may be replaced by residual beta activity after subtraction of the K-40 activity concentration).

#### **Screening for certain radionuclides, or screening for an individual radionuclide**

2.—(1) If one of the activity concentrations exceeds 20% of the corresponding derived value or the tritium concentration exceeds its parametric value listed in Schedule 2 an analysis of additional radionuclides is required.

(2) In deciding which radionuclides are required to be measured for each supply, a water undertaker must take into account all relevant information about likely sources of radioactivity.

#### **Screening strategies for gross alpha activity and gross beta activity**

3.—(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.

(2) Subject to sub-paragraph (3) the recommended screening values are—

- (a) 0,1Bq/l for gross alpha activity; and
- (b) 1,0Bq/l for gross beta activity(1).

(3) If the gross alpha activity exceeds 0,1Bq/l or the gross beta activity exceeds 1,0Bq/l, analysis for specific radionuclides is required.

(4) The Welsh Ministers may set alternative screening levels for gross alpha activity and gross beta activity where it can be demonstrated by the water undertaker that the alternative levels are in compliance with an indicative dose of 0,1 mSv.

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

#### **Calculation of the indicative dose**

4.—(1) The indicative dose must be calculated from—

- (a) the measured radionuclide concentrations and the dose coefficients referred to as “standard values and relationships” in Article 13, and recommended for the estimation of doses from internal exposure in the definition of “standard values and relationships” in Article 4(96), of Council Directive 2013/59/Euratom laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation(2);or

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

(2) OJ No L 13, 17.1.2014, p.1. For the estimation of doses from internal exposure, Article 4(96) refers to chapter 1 of ICRP (International Commission on Radiological Protection) Publication 119. See Table F.1 in Annex F. A copy of ICRP Publication 119 can be obtained from the ICRP website ([www.icrp.org](http://www.icrp.org)) or from the Welsh Government Water Branch, Welsh Government, Cathays Park, Cardiff, CF10 3NQ.

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

(b) more recent information recognised by the Welsh Ministers, on the basis of the annual intake of water (730 l for adults).

(2) Where the following formula is satisfied, it can be assumed that the indicative dose is less than the parametric value of 0,1 mSv and no further investigation is required—

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

where—

“ $C_i(ops)$ ” means observed concentration of radionuclide I;

“ $C_i(der)$ ” means derived concentration of radionuclide i;

“ $n$ ” means number of radionuclides detected.

**Table 1**

**Derived concentrations for radioactivity in water intended for human consumption**

This table includes values for the most common natural and artificial radionuclides: these are precise values, calculated for a dose of 0.1 mSv, an annual intake of 730 litres and using the dose coefficients referred to as “standard values and relationships” in Article 13, and recommended for the estimation of doses from internal exposure in the definition of “standard values and relationships” in Article 4(96), of Council Directive 2013/59/Euratom. Derived concentrations 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 Welsh Ministers.

<b>Origin</b>	<b>Nuclide</b>	<b>Derived concentration</b>
Natural	U-238 <sup>(a)</sup>	3,0 Bq/l
	U-234 <sup>(a)</sup>	2,8 Bq/l
	Ra-226	0,5 Bq/l
	Ra-228	Ra-228
	Pb-210	0,2 Bq/l
	Po-210	0,1 Bq/l
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
	1-131	6,2 Bq/l

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

### Performance characteristics and methods 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 below:

Parameters and radionuclides	Limit of detection (Notes <sup>(1),(2)</sup> )	Notes
Tritium	10 Bq/l	Note <sup>(3)</sup>
Radon	10 Bq/l	Note <sup>(3)</sup>
gross alpha	0,04 Bq/l	Note <sup>(4)</sup>
gross beta	0,4 Bq/l	Note <sup>(4)</sup>
U-238	0,02 Bq/l	
U-234	0,02 Bq/l	
Ra-226	0,04 Bq/l	
Ra-228	0,02 Bq/l	Note <sup>(5)</sup>
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	
Cs-134	0,5 Bq/l	
Cs-137	0,5 Bq/l	
I-131	0,5 Bq/l	

Notes:

- (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 errors 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 indicative dose for a new water source; if initial checking indicates that it is not plausible that Ra-228 exceeds 20% of the derived concentration, the limit of detection may be increased to 0,08 Bq/l for routine Ra-228 nuclide specific measurements, until a subsequent re-check is required.