II

*(Acts whose publication is not obligatory)*

# COUNCIL

## COUNCIL DIRECTIVE

of 9 October 1979

**concerning the methods of measurement and frequencies of sampling and analysis of surface water intended for the abstraction of drinking water in the Member States**

(79/869/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Articles 100 and 235 thereof,

Having regard to the proposal from the Commission (1),

Having regard to the opinion of the European Parliament (2),

Having regard to the opinion of the Economic and Social Committee (3),

Whereas the programme of action of the European Communities on the environment (4) provides for the standardization or harmonization of the measuring methods used, so as to render the results of pollution measurements in the Community comparable;

Whereas Council Directive 75/440/EEC of 16 June 1975 concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (5), and in particular Article 5 (2) thereof, provides for adoption of a Community policy regarding the frequency of sampling and analysis of parameters, together with methods of measurement;

Whereas any disparity between the provisions already applicable or in preparation in the various Member States concerning methods of measurement and the frequency of sampling and analysis for each parameter to determine the quality of surface water may create unequal conditions of competition and consequently directly affect the functioning of the common market; whereas it is therefore necessary to approximate the laws in this field, under Article 100 of the Treaty;

Whereas it seems necessary for this approximation of laws to be accompanied by Community action designed to achieve through more comprehensive legislation one of the objectives of the Community in the sphere of protection of the environment and improvement of the quality of life; whereas certain specific provisions to this effect should therefore be laid down; whereas Article 235 of the Treaty should be invoked, as the powers required for this purpose have not been provided by the Treaty;

Whereas, for the analyses carried out in the Member States, it is necessary to fix common reference methods of measurement to determine the values of the parameters defining the physical, chemical and microbiological characteristics of surface water intended for the abstraction of drinking water;

Whereas, for the purpose of monitoring the required quality, it is necessary to take a regular minimum number of samples of surface water in order that the

(1) OJ No C 208, 1. 9. 1978, p. 2.
(2) OJ No C 67, 12. 3. 1979, p. 48.
(3) OJ No C 128, 21. 5. 1979, p. 4.
(4) OJ No C 112, 20. 12. 1973, p. 1.
(5) OJ No L 194, 25. 7. 1975, p. 34.

parameters specified in Annex II to Directive 75/440/EEC may be measured;

Whereas the minimum frequency of sampling and analysis for each parameter should increase in proportion to the volume of water abstracted and the population served; whereas the frequency should increase with the degree of risk engendered by the deterioration of the quality of the water;

Whereas technical and scientific progress may necessitate the rapid adjustment of some of the requirements defined in Annex I to this Directive, in order to take account, in particular, of alterations in the levels of the parameters specified in Annex II to Directive 75/440/EEC; whereas, in order to facilitate implementation of the necessary measures, a procedure should be laid down for establishing close collaboration between the Member States and the Commission in a Committee on Adaptation to Technical and Scientific Progress,

HAS ADOPTED THIS DIRECTIVE:

*Article 1*

This Directive concerns the reference methods of measurement and frequencies of sampling and analysis for the parameters listed in Annex II to Directive 75/440/EEC.

*Article 2*

For the purposes of this Directive:

— 'reference method of measurement' means the designation of a measurement principle or a succinct description of a procedure for determining the value of the parameters listed in Annex I to this Directive,

— 'limit of detection' means the minimum value of the parameter examined which it is possible to detect,

— 'precision' means the range within which 95% of the results of measurements made on a single sample, using the same method, are located,

— 'accuracy' means the difference between the true value of the parameter examined and the average experimental value obtained.

*Article 3*

1. Analysis of samples of water taken shall concern those parameters set out in Annex II to Directive 75/440/EEC to which I and/or G values have been assigned.

2. Member States shall as far as possible use the reference methods of measurement referred to in Annex I to this Directive.

3. The values for the limit of detection and for the precision and accuracy of the methods of measurement used to check the parameters set out in Annex I to this Directive must be respected.

*Article 4*

1. The minimum annual frequencies of sampling and analysis for each parameter are set out in Annex II to this Directive. Sampling must as far as possible be spread over the year so as to give a representative picture of the quality of the water.

2. Surface water samples must be representative of the quality of the water at the sampling point as defined in Article 5 (4) of Directive 75/440/EEC.

*Article 5*

The containers used for samples, the agents or methods used to preserve part of a sample for the analysis of one or more parameters, the conveyance and storage of samples and the preparation of samples for analysis must not be such as to bring about any significant change in the results of the analysis.

*Article 6*

1. The competent authorities of the Member States shall fix frequencies of sampling and analysis for each parameter for each sampling point.

2. The frequencies of sampling and analysis shall be not less than the minimum annual frequencies given in Annex II to this Directive.

*Article 7*

1. Where a survey by the competent authorities of surface water intended for the abstraction of drinking water shows that the values obtained for certain parameters are considerably superior to those set by the Member States in accordance with Annex II to Directive 75/440/EEC, the Member State concerned may reduce the frequency of sampling and analysis for these parameters.

2. If there is no pollution in the cases referred to in paragraph 1 and if there is no risk of the quality of water deteriorating and if the water in question is superior in quality to the indications given in column

A1 of Annex II to Directive 75/440/EEC, the authorities concerned may decide that no regular analysis is necessary.

*Article 8*

1. For the purposes of applying this Directive, the Member States shall provide the Commission at its request with all relevant information on:

— the methods of analysis used,

— the frequency of analysis.

2. The Commission shall at regular intervals draw up a consolidated report based on the information so gathered.

*Article 9*

To take account in particular of alterations in the levels of the parameters specified in Annex II to Directive 75/440/EEC, the amendments required to adapt:

— the reference methods of measurement set out in Annex I to this Directive,

— the limit of detection, the precision and the accuracy of these methods,

— the materials recommended for the container

to technical progress, shall be adopted in accordance with the procedure set out in Article 11 of this Directive.

*Article 10*

1. A Committee on Adaptation to Technical and Scientific Progress (hereinafter referred to as the 'Committee'), consisting of representatives of the Member States and chaired by a Commission representative, is hereby set up for the purpose laid down in Article 9.

2. The Committee shall draw up its rules of procedure.

*Article 11*

1. Where the procedure laid down in this Article is to be followed, matters shall be referred to the Committee by its chairman, either on his own initiative or at the request of the representative of a Member State.

2. The Commission representative shall submit to the Committee a draft of the measures to be adopted. The Committee shall deliver its opinion on the draft within a time limit set by the chairman in the light of the urgency of the matter. It shall act by a majority of 41 votes, the votes of the Member States being weighted as provided for in Article 148 (2) of the Treaty. The chairman shall not vote.

3. (a) The Commission shall adopt the measures envisaged where they are in accordance with the opinion of the Committee.

(b) Where the measures envisaged are not in accordance with the opinion of the Committee, or if no opinion is adopted, the Commission shall without delay submit a proposal to the Council concerning the measures to be adopted. The Council shall act by a qualified majority.

(c) If, within three months of the proposals being submitted to it, the Council has not acted, the proposed measures shall be adopted by the Commission.

*Article 12*

1. Directive 75/440/EEC is hereby amended as follows:

(a) Article 5 (2) shall be deleted;

(b) in Article 5 (3) the words 'those referred to in paragraph 2' shall be replaced by the words 'the parametric values for the water quality in question'.

2. Paragraph 1 shall take effect within two years of the notification of this Directive.

*Article 13*

The Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive within two years of its notification. They shall forthwith inform the Commission thereof.

*Article 14*

This Directive is addressed to the Member States.

Done at Luxembourg, 9 October 1979.

*For the Council*

*The President*

D. O'MALLEY

*ANNEX I*

**Reference method of measuring the I and/or G values of the parameters in Council Directive 75/440/EEC**

| (A) | (B) | | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|---|
| | Parameter | | Limit of detection | Precision ± | Accuracy ± | Reference method of measurement | Materials recommended for the container |
| 1 | pH | pH unit | — | 0·1 | 0·2 | — Electrometry<br>Measured *in situ* at the time of sampling without prior treatment of the sample | |
| 2 | Coloration (after simple filtration) | mg Pt/l | 5 | 10 % | 20 % | — Filtering through a glass fibre membrane<br>Photometric method using the platinum-cobalt scale | |
| 3 | Total suspended solids | mg/l | — | 5 % | 10 % | — Filtering through a 0·45 $\mu$m filter membrane, drying at 105 °C and weighing<br>— Centrifuging (for at least 5 mins with mean acceleration of 2 800 to 3 200 g), drying at 105 °C and weighing | |
| 4 | Temperature | °C | — | 0·5 | 1 | — Thermometry<br>Measured *in situ* at the time of sampling without prior treatment of the sample | |
| 5 | Conductivity at 20 °C | $\mu$s/cm | — | 5 % | 10 % | — Electrometry | |
| 6 | Odour | Dilution factor at 25 °C | — | — | — | — By successive dilutions | Glass |
| 7 | Nitrates | mg/l $NO_3$ | 2 | 10 % | 20 % | — Molecular absorption spectrophotometry | |
| 8 | Fluorides | mg/l F | 0·05 | 10 % | 20 % | — Molecular absorption spectrophotometry after distillation if necessary<br>— Ion selective electrodes | |
| 9 | Total extractable organic chlorine | mg/l Cl | | | | | |

| (A) | (B) | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|
| 10 | Dissolved iron mg/l Fe | 0·02 | 10 % | 20 % | — Atomic absorption spectrophotometry after filtering through a filter membrane (0·45 $\mu$m)<br>— Molecular absorption spectrophotometry after filtering through a 0·45 $\mu$m filter membrane | |
| 11 | Manganese mg/l Mn | 0·01 (2) | 10 % | 20 % | — Atomic absorption spectrophotometry | |
| | | 0·02 (3) | 10 % | 20 % | — Atomic absorption spectrophotometry<br>— Molecular absorption spectrophotometry | |
| 12 | Copper (10) mg/l Cu | 0·005 | 10 % | 20 % | — Atomic absorption spectrophotometry<br>— Polarography | |
| | | 0·02 (4) | 10 % | 20 % | — Atomic absorption spectrophotometry<br>— Molecular absorption spectrophotometry<br>— Polarography | |
| 13 | Zinc (10) mg/l Zn | 0·01 (2) | 10 % | 20 % | — Atomic absorption spectrophotometry | |
| | | 0·02 | 10 % | 20 % | — Atomic absorption spectrophotometry<br>— Molecular absorption spectrophotometry | |
| 14 | Boron (10) mg/l B | 0·1 | 10 % | 20 % | — Molecular absorption spectrophotometry<br>— Atomic absorption spectrophotometry | Materials not containing boron in any significant quantities |
| 15 | Beryllium mg/l Be | | | | | |
| 16 | Cobalt mg/l Co | | | | | |
| 17 | Nickel mg/l Ni | | | | | |
| 18 | Vanadium mg/l V | | | | | |
| 19 | Arsenic (10) mg/l As | 0·002 (2) | 20 % | 20 % | — Atomic absorption spectrophotometry | |
| | | 0·01 (5) | | | — Atomic absorption spectrophotometry<br>— Molecular absorption spectrophotometry | |

| (A) | (B) | | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|---|
| 20 | Cadmium (10) | mg/l cd | 0·0002<br>0·001 (5) | 30 % | 30 % | — Atomic absorption spectrophotometry<br>— Polarography | |
| 21 | Total chromium (10) | mg/l Cr | 0·01 | 20 % | 30 % | — Atomic absorption spectrophotometry<br>— Molecular absorption spectrophotometry | |
| 22 | Lead (10) | mg/l Pb | 0·01 | 20 % | 30 % | — Atomic absorption spectrophotometry<br>— Polarography | |
| 23 | Selenium (10) | mg/l Se | 0·005 | | | — Atomic absorption spectrophotometry | |
| 24 | Mercury (10) | mg/l Hg | 0·0001<br>0·0002 (5) | 30 % | 30 % | — Flameless atomic absorption spectrophotometry (cold vaporization) | |
| 25 | Barium (10) | mg/l Ba | 0·02 | 15 % | 30 % | — Atomic absorption spectrophotometry | |
| 26 | Cyanide | mg/l CN | 0·01 | 20 % | 30 % | — Molecular absorption spectrophotometry | |
| 27 | Sulphates | mg/l $SO_4$ | 10 | 10 % | 10 % | — Gravimetric analysis<br>— EDTA complexiметry<br>— Molecular absorption spectrophotometry | |
| 28 | Chlorides | mg/l Cl | 10 | 10 % | 10 % | — Titration (Mohr's method)<br>— Molecular absorption spectrophotometry | |
| 29 | Surfactants (reacting with methylene blue) | mg/l (Lauryl Sulphate) | 0·05 | 20 % | | — Molecular absorption spectrophotometry | |
| 30 | Phosphates | mg/l $P_2O_5$ | 0·02 | 10 % | 20 % | — Molecular absorption spectrophotometry | |
| 31 | Phenols (phenol index) | mg/l $C_6H_5OH$ | 0·0005<br>0·001 (6) | 0·0005<br>30 % | 0·0005<br>50 % | — Molecular absorption spectrophotometry 4 aminoantipyrine method<br>— Paranitraniline method | Glass |
| 32 | Dissolved or emulsified hydrocarbons | mg/l | 0·01<br>0·04 (3) | 20 % | 30 % | — Infra-red spectrometry after extraction by carbon tetrachloride<br>— Gravimetry after extraction by petroleum ether | Glass |

| (A) | (B) | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|
| 33 | Polycyclic aromatic hydrocarbons (10) mg/l | 0·00004 | 50 % | 50 % | — Measurement of fluorescence in the UV after thin layer chromatography<br>Comparative measurement in relation to a mixture of six control substances with the same concentration (8) | Glass or aluminium |
| 34 | Total pesticides (parathion, hexachloro-cyclohexane, dieldrin) (10) mg/l | 0·0001 | 50 % | 50 % | — Gas or liquid chromatography after extraction by suitable solvents and purification<br>Identification of the constituents of the mixture<br>Quantitative analysis (9) | Glass |
| 35 | Chemical oxygen demand (COD) mg/l $O_2$ | 15 | 20 % | 20 % | — Potassium dichromate method | |
| 36 | Dissolved oxygen saturation rate % | 5 | 10 % | 10 % | — Winkler's method | Glass |
| | | | | | — Electrochemical method | |
| 37 | Biochemical oxygen demand ($BOD_5$) at 20 °C without nitrification mg/l $O_2$ | 2 | 1·5 | 2 | — Determination of dissolved oxygen before and after five-day incubation at 20 °C ± 1 °C, in complete darkness<br>Addition of a nitrification inhibitor | |
| 38 | Nitrogen by Kjeldahl method (except in $NO_2$ and $NO_3$) mg/l N | 0·3 | 0·5 | 0·5 | — Mineralization, distillation by Kjeldahl method and ammonium determination by means of molecular absorption spectrophotometry or titration | |
| 39 | Ammonium mg/l $NH_4$ | 0·01 (2)<br>0·1 (3) | 0·03 (2)<br>10 % (3) | 0·03 (2)<br>20 % (3) | — Molecular absorption spectrophotometry | |
| 40 | Substances extractable with chloroform mg/l | (11) | — | — | — Extraction at neutral pH value by purified chloroform, evaporation in vacuo at room temperature, weighing of residue | |
| 41 | Total organic carbon mg/l C | | | | | |
| 42 | Residual organic carbon after flocculation and membrane filtration (5 $\mu$m) mg/l C | | | | | |

| (A) | (B) | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|
| 43 | Total coliforms /100 ml | 5 (2)<br>500 (7) | | | — Culture at 37 °C on an appropriate specific solid medium (such as Tergitol lactose agar, Endo agar, 0·4 % Teepol broth) with filtration (2) or without filtration (7) and colony count. Samples must be diluted or, where appropriate, concentrated in such a way as to contain between 10 and 100 colonies. If necessary, identification by gasification.<br>— Method of dilution with fermentation in liquid substrates in at least three tubes in three dilutions. Sub-culturing of the positive tubes on a confirmation medium. Count according to MPN (most probable number). Incubation temperature: 37 °C ± 1 °C. | Sterilized glass |
| | | 5 (2)<br>500 (7) | | | | |
| 44 | Faecal coliforms /100 ml | 2 (2)<br>200 (7) | | | — Culture at 44 °C on an appropriate specific solid medium (such as Tergitol lactose agar, Endo agar, 0·4 % Teepol broth) with filtration (2) or without filtration (7) and colony count. Samples must be diluted or, where appropriate, concentrated in such a way as to contain between 10 and 100 colonies. If necessary, identification by gasification.<br>— Method of dilution with fermentation in liquid substrates in at least three tubes in three dilutions. Subculturing of the positive tubes on a confirmation medium. Count according to MPN (most probable number). Incubation temperature 44 °C ± 0·5 °C | Sterilized glass |
| | | 2 (2)<br>200 (7) | | | | |
| 45 | Faecal streptococci /100 ml | 2 (2)<br>200 (7) | | | — Culture at 37 °C on an appropriate solid medium (such as sodium azide) with filtration (2) or without filtration (7) and colony count. Samples must be diluted or, where appropriate, concentrated in such a way as to contain between 10 and 100 colonies.<br>— Method of dilution in sodium azide broth in at least three tubes with three dilutions. Count according to MPN (most probable number) | Sterilized glass |
| | | 2 (2)<br>200 (7) | | | | |

| (A) | (B) | (C) | (D) | (E) | (F) | (G) |
|---|---|---|---|---|---|---|
| 46 | Salmonella [12] | 1/5 000 ml<br>1/1 000 ml | | | — Concentraion by filtration (on membrane or appropriate filter).<br>— Innoculation into pre-enrichment medium. Enrichment and transfer into isolating gelese — Identification. | Sterilized glass |

(1) Surface water samples taken at the abstraction point are analysed and measured after sieving (wire mesh sieve) to remove any floating debris such as wood or plastic.

(2) For waters of Category A1, G value.

(3) For waters of Categories A2 and A3.

(4) For waters of Category A3.

(5) For waters of Categories A1, A2 and A3, I value.

(6) For waters of Categories A2, I value and A3.

(7) For waters of Categories A2 and A3, G value.

(8) Mixture of six standard substances all of the same concentration to be taken into consideration: fluoranthene; 3, 4 benzofluoranthene; 11, 12-benzofluoranthene; 3, 4-benzopyrene; 1, 12-benzoperylene; indano /1, 2, 3 - cd/ pyrene.

(9) Mixture of three substances all of the same concentration to be taken into consideration: parathion, hexachlorocyclohexane, dieldrin.

(10) If the samples contain so much suspended matter as to require special preliminary treatment, the accuracy values shown in column E in this Annex may as an exception be exceeded and will be regarded as a target. These samples must be treated so as to ensure that the analysis covers the largest quantity of substances to be measured.

(11) As this method is not in current use in all the Member States, it is not certain that the limit of detection required for checking the values in Directive 75/440/EEC can be attained.

(12) Absence in 5 000 ml (A1, G) and absence in 1 000 ml (A2, G).

*ANNEX II*

**Minimum annual frequency of sampling and analysis for each parameter in Directive 75/440/EEC**

| Population served | A1 (*) | | | A2 (*) | | | A3 (*) | | |
|---|---|---|---|---|---|---|---|---|---|
| | I (**) | II (**) | III (**) | I (**) | II (**) | III (**) | I (**) | II (**) | III (**) |
| ≤ 10 000 | (***) | (***) | (***) | (***) | (***) | (***) | 2 | 1 | (***) ([1]) |
| > 10 000 to ≤ 30 000 | 1 | 1 | (***) | 2 | 1 | (***) | 3 | 1 | 1 |
| > 30 000 to ≤100 000 | 2 | 1 | (***) | 4 | 2 | 1 | 6 | 2 | 1 |
| >100 000 | 3 | 2 | (***) | 8 | 4 | 1 | 12 | 4 | 1 |

(*) Quality of surface waters, Annex II Directive 75/440/EEC.
(**) Classification of parameters according to frequency.
(***) Frequency to be determined by the competent national authorities.

([1]) Assuming that such surface water is intended for the abstraction of drinking water, the Member States are recommended to carry out at least annual sampling of this category of water (A3, III, ≤ 10 000).

CATEGORIES

| I | | II | | III | |
|---|---|---|---|---|---|
| Parameter | | Parameter | | Parameter | |
| 1 | pH | 10 | Dissolved iron | 8 | Fluorides |
| 2 | Coloration | 11 | Manganese | 14 | Boron |
| 3 | Total suspended solids | 12 | Copper | 19 | Arsenic |
| 4 | Temperature | 13 | Zinc | 20 | Cadmium |
| 5 | Conductivity | 27 | Sulphates | 21 | Total chromium |
| 6 | Odour | 29 | Surfactants | 22 | Lead |
| 7 | Nitrates | 31 | Phenols | 23 | Selenium |
| 28 | Chlorides | 38 | Nitrogen by Kjeldahl method | 24 | Mercury |
| 30 | Phosphates | 43 | Total coliforms | 25 | Barium |
| 35 | Chemical oxygen demand (COD) | 44 | Faecal coliforms | 26 | Cyanide |
| 36 | Dissolved oxygen saturation rate | | | 32 | Dissolved or emulsified hydrocarbons |
| 37 | Biochemical oxygen demand (BODs) | | | 33 | Polycyclic aromatic hydrocarbons |
| 39 | Ammonium | | | 34 | Total pesticides |
| | | | | 40 | Substances extractable with chloroform |
| | | | | 45 | Faecal streptococci |
| | | | | 46 | Salmonella |