14 Nitrate and the Law

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14.1 INTRODUCTION

The law on nitrate in water must be understood in the context of the general law on water pollution. This is because the development of legislation specifically directed at the problems posed by nitrate is as yet only in its infancy. It must also be understood in the context of controls on the quality of the public water supply, since much of the impetus for the control of nitrate in surface and groundwater has come from the need to control levels of nitrate in drinking water.

This chapter will therefore outline the general law on water pollution and water supply, including the standards set for nitrate in drinking water, before explaining in greater detail the provisions on nitrate sensitive areas and the EC Directive on Nitrates in Water 91/676. It should however, as always with matters of environmental law, be borne in mind that the law is liable to change and that the exact rules set out may well alter in the next few years.

14.2 DOMESTIC AND EC LAW

14.2.1 DOMESTIC LAW

In the environmental field domestic law mainly results from legislation (i.e. Acts passed by Parliament). However, because of the impossibility of providing for the detail of the law in the restricted time available in Parliament, it is common for Acts to include within them powers for specified individuals or bodies to make delegated legislation. This is normally a member of the elected government, such as the Secretary of State for the Environment or the Minister of Agriculture, Fisheries and Food.

14.2.2 EC LAW

EC law is of enormous importance in relation to environmental protection (see Haigh, 1989). In signing the various treaties establishing the EC, the UK has agreed to transfer some of its law-making powers to the EC institutions, albeit within limited spheres. EC law comes in a number of types, but the main one of relevance to environmental law is the Directive. A Directive is addressed to Member States, and imposes on them a duty to implement its terms, usually within a specified time limit. They will be in breach of EC law if they fail to implement the Directive fully. This may result in infringement proceedings being brought before the European Court of Justice, which, in turn, may declare whether the Directive is being properly implemented. However, one weakness of EC law is that there is no effective

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remedy for non-implementation of a Directive, except pressure from the EC institutions, the other Member States and the public.

Directives are not normally directly effective within Member States in the sense that they do not give rise to rights and obligations which can be enforced by individuals and companies before national courts. As a result, the law which is enforced before UK courts is domestic law: if EC law is different it acts as a reminder that the domestic law is likely to be changed to comply at some stage.

14.3 THE LEGISLATION ON WATER POLLUTION

The major part of the law on the quality of drinking water and on water pollution is in the Water Resources Act 1991, the Water Industry Act 1991 and delegated legislation made under those Acts (see Howarth, 1990a; Bell and Ball, 1991). They replace earlier Water Acts and the Control of Pollution Act 1974. However, in terms of content these Acts are the same as the Water Act 1989, which they replaced from 1 December 1991.

The shape of much of this law is now dictated by a string of EC Directives on water quality. In line with the aims of the EC, these normally have the twin objectives of seeking to ensure uniformity of laws and practices between all Member States and improvement of environmental standards throughout the EC. The Directives tend to follow two basic models: (1) those which impose standards on emissions, which are mainly used for the prevention or restriction of discharges of dangerous and toxic substances to surface and groundwaters; and (2) those which specify quality objectives for certain types of waters, mainly by reference to the use which is to be made of those waters (Somsen, 1990b). It is this second category which is of greatest relevance in relation to nitrate (see the Directives on Drinking Water and on Surface Water for Drinking referred to below).

Owing to the limited space available, the law in Great Britain only will be considered in this chapter. However, it can be reflected that the relevant EC standards are equally applicable in the other EC Member States.

14.4 THE STRUCTURE OF THE WATER INDUSTRY

14.4.1 WATER ACT 1989

The water industry of England and Wales was extensively reorganised by the Water Act 1989 from 1 September 1989. Prior to then, the ten Regional Water Authorities carried out water management on an integrated basis in hydrologically defined areas. The main reason for the reorganisation was the political one of privatising the operational side of the industry, but the objective of splitting the operational and regulatory sides of the industry was also achieved, thus retreating from a position where the Regional Water Authorities, as a result of their wide range of functions, were both 'poachers' and 'gamekeepers' at the same time.

Operational activities relating to the provision of the public water supply and sewerage services (including the treatment of sewage) are now carried out by the ten privatised Water and Sewerage Undertakers. There are also 29 Statutory Water Companies, which are responsible solely for water supply in their designated areas. Regulatory functions in relation to water supply and sewerage provision are the responsibility of the Office of Water Services (OFWAT).

14.4.2 THE NATIONAL RIVERS AUTHORITY

The 1989 Act created the National Rivers Authority as an independent non-departmental public agency. It has taken over most of the regulatory powers of the Regional Water Authorities and has the primary responsibility for dealing with pollution of inland, underground and coastal waters, although Her Majesty's Inspectorate of Pollution now has responsibility for discharges of certain dangerous substances under the Environmental Protection Act 1990. Its other functions relate to flood defence and land drainage, the maintenance of water resources and the operation of the system of licensing of abstractions of water, salmon and freshwater fisheries, navigation, and conservancy and harbour authority activities. In addition, it has a number of environmental duties relating to recreation and the promotion of conservation of nature (see Howarth, 1990b).

One of the strengths of the National Rivers Authority is its national status, and it is striving to build up a uniform system of pollution control throughout the country. This is to be achieved by the establishment and enforcement of uniform policies and practices on discharge consents and water quality.

14.4.3 SCOTLAND

The water industry is organised differently in Scotland. Regional and Island Councils are responsible for the provision of the water supply and for sewerage services. The control of water pollution is the responsibility of River Purification Boards, seven independent catchment area bodies with members appointed by the Regional and District Councils and the Secretary of State. As a further complication, the legislation is different too: the Control of Pollution Act 1974 remains in force in Scotland, although it has been amended by the Water Act 1989, Schedules 22 and 23. The result is that the substance of the law is similar in Scotland, though not always exactly the same. Any significant differences will be noted.

14.5 WATER SUPPLY

A major reason for protecting inland waters against nitrate is the public health reason of protecting the public water supply from pollution. British law is effectively dictated by EC standards in this respect.

14.5.1 DRINKING WATER DIRECTIVE

The EC Directive on Drinking Water 80/778 lays down 62 parameters relating to the quality of water provided for human consumption. The standards required are divided into two categories: Maximum Admissible Concentrations (or in some cases Minimum Required Concentrations) and Guide Levels. For Maximum Admissible Concentrations Member States must set values which are at least as strict as those in the Directive and must ensure that those values are met in practice. Guide Levels represent a concentration which the EC considers it desirable that waters should meet, but they are not legally binding. For nitrate, the Maximum Admissible Concentration is 50 mg l^{-1}, with a Guide Level of 25 mg l^{-1}. This compares with the recommended (i.e. non-binding) level of 100 mg l^{-1} established by the World Health Organisation.

Article 9 of the Directive allows States to grant derogations from its requirements where compliance is not possible due to the nature and structure of the ground in the supply area. The wording envisages derogations being granted for natural problems only and does not appear to cover the situation where the failure to reach the required standards is artificial (for example, due to nitrate leaching). The UK government originally granted a number of derogations on precisely this ground, but withdrew those that were not based on natural causes in April 1988 (Bates, 1989). Derogations may also be made on the grounds of adverse meteorological conditions, such as drought. Any derogation must not constitute a public health hazard.

Compliance with the Directive should have been achieved by 1985, but there is also a power in Article 20 for the Commission to authorise a delay in reaching the required standards if special difficulties are being experienced. No such authorisation appears to have been given and infringement proceedings against the UK are currently before the European Court of Justice for non-compliance with the standards for nitrate in respect of 28 zones in England (Case 337/89, see Somsen, 1990a). It is understood that the UK government is arguing that compliance will be achieved by 1995, but any argument that the deadline was too short is likely to be rejected on the grounds that the Member States agreed it in the first place.

One other Directive requires a mention. As part of the strategy for achieving drinking water standards, the Directive on Surface Waters for Drinking 75/440 defines classes of water (A1, A2 and A3), together with 46 relevant parameters with which surface sources of drinking water must comply in order to fall within each class. Waters below Class A3 should not normally be used for drinking. The standard for nitrate is set at a maximum of 50 mg l^{-1} in each class.

14.5.2 IMPLEMENTATION IN THE UK

These Directives have been implemented as follows. Under the Water Industry Act, Section 67 (in Scotland the Water (Scotland) Act 1980, Section 76A), domestic water must be 'wholesome'. This is officially defined for the first time in the Water Supply (Water Quality) Regulations SI 1989/1147 (SI 1990/119 in Scotland). These lay down a large number of specific criteria with which water must comply. In each case the limits have been set so as to conform to the Drinking Water Directive. The Regulations also provide for a system of public registers of water quality, and a Drinking Water Inspectorate has been established within the Department of the Environment with responsibility for monitoring water quality. The requirements of the Surface Waters for Drinking Directive have been implemented by the Surface Waters (Classification) Regulations SI 1989/1148, which call the three classes DW1, DW2 and DW3.

14.6 GENERAL CONTROLS ON WATER POLLUTION

14.6.1 GENERAL OFFENCE OF WATER POLLUTION

It is a criminal offence to 'cause or knowingly permit any poisonous, noxious or polluting matter or any solid waste to enter controlled waters' (Water Resources Act 1991, Section 85). 'Controlled waters', defined in Section 104, include virtually all inland and coastal waters. It is of special relevance that they include groundwaters (i.e. any waters contained in underground strata, or in wells or boreholes). This offence is very widely drafted and will cover such things as agricultural runoff that pollutes surface or groundwaters and accidental

escapes of polluting materials. It is not necessary to show that there was any negligence involved, merely that a particular activity caused the entry. Almost the only effective defence is to have a consent from the National Rivers Authority.

There used to be a defence to this general offence if it was committed by a farmer who was acting in accordance with 'good agricultural practice', which was defined in a Code of Guidance issued by the Minister of Agriculture, Fisheries and Food. This defence was repealed by the Water Act 1989, although the Code of Guidance remains as a non-binding document (MAFF and WOAD, 1991). Breach of it gives rise to no criminal offence, but adherence will be taken into account in the decision whether to prosecute and in fixing any penalty.

On conviction in a Magistrates' Court there is a maximum fine of £20 000 and/or 3 months in prison. On conviction in the Crown Court there can be an unlimited fine and/or a 2-year jail sentence. The National Rivers Authority has a discretion over whether to prosecute for any breach. Although prosecution has in the past only been used as a last resort, or for serious incidents, current policy is clearly to prosecute more readily, and it is significant that the largest category each year relates to agricultural pollution incidents (National Rivers Authority, 1992).

14.6.2 CONSENTS FOR DISCHARGES

A consent is required from the National Rivers Authority before any trade or sewage effluent may be discharged into controlled waters. This covers active discharges through pipes or channels. 'Trade effluent' is defined very widely to include effluent from agricultural, fish farming or research establishments, so a consent is required for nearly all industrial or agricultural discharges.

The National Rivers Authority may attach a wide range of conditions to a consent, setting out what may be discharged and under what circumstances. It is normal to attach absolute numerical limits, with the result that *any* discharge in excess of the terms of a consent is in breach of it. It is a criminal offence, with the same potential penalties as for the general offence, to discharge trade or sewage effluent without a consent, or in breach of any conditions attached to one.

A fee is paid for the application, and from 1 July 1991, an annual charge has been payable by dischargers to reflect the cost to the National Rivers Authority of monitoring the discharge. There is a little-used right of appeal to the Secretary of State against refusal of a consent or against any conditions imposed. Applications for consent are publicised and there is a public register of all applications, consents, water quality objectives and samples taken by the National Rivers Authority.

Once granted, a consent may be varied or revoked by the National Rivers Authority without compensation, illustrating the position that no-one has a right to pollute. It is currently reviewing existing consents. However, a variation or revocation may not normally be made within 2 years of the previous variation.

14.6.3 SEWAGE WORKS

Discharges from sewage works are subject to the same requirements. However, compliance is normally only required on a 95 percentile rate. This is a hangover from the days when sewage works were operated by the same bodies which regulated water pollution, and the National Rivers Authority has proposed that the position is changed so that they are brought

into line with other dischargers (National Rivers Authority, 1990). (A discharge *to* the sewers requires a trade effluent consent from the sewerage undertaker.)

14.6.4 WATER QUALITY OBJECTIVES

Consents have traditionally been set on an individualised basis by reference to the effects of the discharge on the receiving waters. Particular emphasis has always been placed on Biochemical Oxygen Demand. This involves consideration of the use to which water is to be put. The Water Act 1989 introduced a statutory system of water quality classifications, with specific standards set for various uses. Water quality objectives for individual stretches of controlled waters will then be set by the Secretary of State (after a public procedure). These will replace the non-statutory objectives currently in operation and will be of enormous importance in setting discharge consents and in making other decisions about water quality. The National Rivers Authority will be under a duty to exercise its powers to achieve these statutory objectives at all times, so far as it is practicable to do so.

14.6.5 WATER POLLUTION AND COMMON LAW

At common law surface and groundwaters are not owned by anyone, but any owner of a river bank, or of land through which water percolates, or of a property right such as a fishery, has a right to receive water in its ordinary state. Any interference with the quality of this water may amount to a nuisance, giving the owner a right to claim damages or to seek an injunction to halt the pollution. These rights act as a significant complement to the regulatory and criminal laws on water pollution in relation to toxic substances, but an action for nitrate pollution is unlikely because of the difficulty of showing any damage to the relevant owner.

14.6.6 LIMITATIONS OF GENERAL CONTROLS

The emphasis in water pollution control has tended to be on discharge consents and dealing with accidents. One limitation is that, while the system is generally adequate for controlling emissions from definite sources, such as pipes, it is less successful at controlling pollution from diffuse sources. As a result, the consent system is increasingly being supplemented by a range of preventative powers, which aim to prevent pollution arising at source.

14.7 PREVENTATIVE CONTROLS

Under Section 161 of the Water Resources Act 1991 the National Rivers Authority has widely drafted powers to prevent pollution incidents where there is a threat to controlled waters, and to carry out remedial and clean-up operations. It can recover the cost from the person who caused the pollution. This section is mainly used for one-off acts of pollution, but there is no reason why it could not be used for continuing leaching that was causing pollution.

Section 92 empowers the Secretary of State to make Regulations concerning precautions to be taken to prevent any poisonous, noxious or polluting matter from entering controlled waters. The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations SI 1991/324 have been made setting minimum standards for silage operations and for slurry and agricultural fuel oil stores from 1 September 1991. It is a criminal offence to breach

the fairly specific standards laid down in the Regulations and the National Rivers Authority is given clean-up powers (Ball, 1991).

Section 93 empowers the Secretary of State to designate water protection zones. These would effectively establish a system of local law with regard to water pollution within the zone. Similar powers were available in the Control of Pollution Act 1974, but no such zones have ever been designated. It was originally intended that water protection zones should be used to control nitrate, but the publicity engendered by the nitrate problem during the passage of the Water Act 1989 was such that a special section was inserted on nitrate sensitive areas. Accordingly, a Water Protection Zone cannot now include restrictions on nitrate.

Finally, it should be noted that a waste-disposal licence is required from the local authority for the disposal of waste to land. Although there are exceptions for agricultural wastes disposed on the farm of origin, such activities as the spreading of sewage sludge may require such a licence, and the potential for water pollution is a ground for refusal or the application of conditions. This system is soon to change, so that a waste management licence is required under the Environmental Protection Act 1990.

14.8 NITRATE SENSITIVE AREAS

14.8.1 DEFINITION

Specific powers in relation to nitrate are set out in Sections 94 and 95 of the Water Resources Act 1991 (Section 31B of the Control of Pollution Act 1974 in Scotland). This allows for the designation of nitrate sensitive areas, in which the entry of nitrate into controlled waters may be prevented or controlled. The section only applies where the entry takes place as a result of agriculture: the entry of nitrate from other sources can only be controlled by the other mechanisms already mentioned. However, since controlled waters are defined in Section 104 so as to include groundwaters, this section potentially covers all leaching of nitrate from agricultural activities.

These powers are complementary to the more general legal controls and to other methods of reducing nitrate in drinking water, such as the blending of different supplies. But they are important because they reflect a policy of tackling the problem at source rather than once it has arisen. It is clear that such preventative powers will be used more commonly in the future.

14.8.2 DESIGNATION

Designation of a nitrate sensitive area is effected by the relevant Secretary of State making a statutory Order to that effect. (In England the Secretary of State must act jointly with the Minister of Agriculture, Fisheries and Food.) Because of the possible expenditure implications, the consent of the Treasury is also required. An Order can only be made if requested by the National Rivers Authority which, in making the request, must identify controlled waters at risk from nitrate pollution and the agricultural land from which the entry of nitrate into those waters is likely. The National Rivers Authority should only apply for an Order if it considers that its other more general powers are inadequate to control nitrate pollution. This is the limit of the Authority's formal involvement in nitrate sensitive areas, since the special regulatory powers available within them are exercised by the relevant Agricultural Department (i.e. the Ministry of Agriculture, Fisheries and Food, or the Agriculture Department of the Welsh or Scottish Office).

14.8.3 VOLUNTARY CONTROLS

There are effectively two types of Order available, respectively imposing voluntary and mandatory controls. Under the voluntary scheme the relevant Agriculture Minister is empowered to enter into agreements with owners or tenants of agricultural land in which obligations with respect to the management of the land are agreed in return for compensation. There is no compulsion involved: the farmer has a choice whether to enter an agreement or not. Under the mandatory scheme controls over activities may be imposed on farmers in return for compensation.

In keeping with its clear preference for such methods in dealing with agricultural problems, the Conservative government made public its intention to use only the voluntary controls initially, and for the mandatory powers to be held in reserve as back-up powers (MAFF and WOAD, 1989). In the Nitrate Sensitive Areas (Designation) Order SI 1990/1013, ten areas have been designated which are subject to the voluntary scheme (Forster, 1990). This is a pilot scheme to assess the effectiveness of the controls, hence areas with a range of agricultural practices and hydrogeological conditions have been selected. The ten areas, which are fairly limited in size, are Sleaford (Lincolnshire), Branston Booths (Lincolnshire), Ogbourne St George (Wiltshire), Old Chalford (Oxfordshire), Egford (Somerset), Broughton (Nottinghamshire), Wildmoor (Hereford and Worcester), Wellings (Staffordshire and Shropshire), Tom Hill (Staffordshire) and Kilham (North Humberside).

The Order lists two sets of standard terms which a farmer must agree to in order to qualify for the payments offered — respectively, a Basic Scheme Agreement and a Premium Scheme Agreement.

14.8.4 BASIC SCHEME AGREEMENT

To qualify for this, the farmer must agree to some very detailed restrictions on farming activities. These involve changes in farming practice often going well beyond good agricultural practice, but which reduce the prospect of nitrate leaching, such as the reduction of uses of fertiliser in autumn and winter, the avoidance of grassland ploughing and the maintenance of winter cover. Specific restrictions relate to:

- The amounts of inorganic (i.e. chemical) nitrogen fertiliser that may be applied.
- The amounts of organic nitrogen fertiliser that may be applied.
- The timing of any applications of fertilisers, especially with a view to limiting or preventing the application of fertiliser in the autumn and winter.
- The storage of slurry or liquid sewage sludge.
- The cultivation of grassland in autumn and winter.
- The removal of hedgerows or woodland.
- The use of irrigation.
- The conversion of grassland to arable land.

In addition, the agreement requires that winter cover is retained either by an autumn-sown crop or by sowing a cover crop. No inorganic nitrogen fertiliser may be applied to a cover crop and there are further restrictions on its removal.

Farmers producing pigs or poultry which are permanently housed must also submit a plan with their application indicating how they propose to store, handle and dispose of slurry or manure to avoid the entry of nitrate into controlled waters. Once an agreement is made they should adhere to this plan.

14.8.5 PREMIUM SCHEME AGREEMENT

A farmer may only agree a Premium Scheme Agreement if already in the Basic Scheme. The essential objective is to remove land from arable use. Thus a farmer must agree to stop arable use before 1 October in any relevant year and replace it with grassland which is maintained without cultivation (apart from reseeding, which requires the permission of the relevant Agriculture Department) for the period of the agreement.

There are four options available to the farmer, which attract varying rates of compensation. In each case, any grass cuttings must be removed. Irrigation is not permitted, except under option D. The options are:

(A) Conversion to unfertilised grassland with no grazing.
(B) Conversion to unfertilised grassland with grazing that is limited to the number of stock which may be fed from the grass alone.
(C) Conversion to grassland used for grazing, but with limited applications of fertiliser permitted.
(D) Conversion to unfertilised grassland with woodland, but with no grazing. At least 50% of the woodland must be broadleaved, and alder is not permitted.

14.8.6 COMPENSATION AND MONITORING

There are standard amounts of compensation set out in Schedule 4 to the Order. These vary between the designated areas, ranging from £55 to £95 per hectare per year for a Basic Scheme Agreement, and from £90 to £380 per hectare per year for a Premium Scheme Agreement, with different payments applying according to the option chosen. These rates will be reviewed in 1993. There are special payments for pig and poultry producers who build a slurry store or transport manure in order to comply with the agreement. A farmer must normally agree in respect of the whole of the farm which is within the designated area. For the areas already designated, applications should have been made by May 1991 and the government has reported that agreements have been made on 87% of the land area within the nitrate sensitive areas. Payments will not duplicate those made under other schemes in which similar restrictions may be agreed. For example, in designated environmentally sensitive areas farmers may receive annual payments for agreeing to certain specified farming practices in the interests of landscape and wildlife protection (see the Agriculture Act 1986, Section 18).

An agreement is a contract between the farmer and the relevant Agriculture Department. Unlike the general provisions on water pollution, it is not a criminal offence to fail to comply with the terms of an agreement. There are provisions through which compliance with the agreement may be monitored, and the farmer must keep records of fertiliser application. The agreement may be terminated, or payments withheld or recovered, if a farmer fails without reasonable excuse to comply with its terms. An agreement will bind those deriving title from the original farmer, such as new owners.

There is also an advisory campaign within designated areas to promote good agricultural practice relating to nitrate leaching; compliance with this advice does not give rise to compensation.

14.8.7 MANDATORY CONTROLS

No mandatory Orders have yet been made, but under Section 94 restrictions similar to those above may be imposed on farmers in designated areas. In addition, a mandatory Order may require positive obligations to be undertaken, such as the construction of containment walls around slurry stores. The section provides for the introduction of systems requiring consent for specified activities from the Minister responsible for the designation (not the National Rivers Authority), and also for the creation of criminal offences of ignoring the provisions of the Order, with the same maximum penalties as for the offences under Section 85. The Order may provide for compensation to be paid to anyone affected by the obligations, and the government is clearly committed to paying compensation wherever restrictions go beyond good agricultural practice.

The procedures for making a mandatory Order are set out in Schedule 12 and are more complex than those for making a voluntary Order. The National Rivers Authority must apply for an Order by submitting a draft to the relevant Minister. Precise publicity requirements are laid down, including a duty to notify any local authority and water undertaker within the designated area, and to notify any owner or occupier appearing to the relevant Minister to be likely to be affected. The relevant Minister has a power (not a duty) to hold a public inquiry before making the Order and may modify it in the light of representations received.

14.9 EC DIRECTIVE ON NITRATES 91/676

14.9.1 THE PASSAGE OF THE DIRECTIVE

The Directive on the protection of waters against pollution caused by nitrates from agricultural sources was formally issued by the EC Council in December 1991. It goes quite a bit further than current British measures (Forster, 1989; Somsen 1990a) by laying down some fairly specific requirements and restrictions, and may well necessitate the use of stronger powers to combat nitrate pollution in Britain, including the use of mandatory Orders. However, it should be noted that the final form of the Directive does not go anywhere near as far as earlier drafts in laying down detailed requirements. It also, unlike earlier drafts, only applies to nitrate pollution caused by agricultural sources and not where it has resulted from other sources.

14.9.2 VULNERABLE ZONES

The Directive has two main objectives: to avoid a concentration of nitrate in surface and groundwaters, and to avoid eutrophication of surface, estuarial, coastal and marine waters. To achieve these objectives, Member States are first required to identify waters which could be affected by nitrate pollution. These are defined in Annex I as:

(1) Surface freshwaters, especially those intended for abstraction for drinking water, which either contain, or could contain if protective action is not taken, more than the concentration of nitrate laid down in Directive 75/440 (i.e. 50 mg l^{-1}).
(2) Freshwaters, estuaries and coastal waters which are eutrophic, or may become eutrophic in the near future, if protective action is not taken.
(3) Groundwaters which contain more than 50 mg l^{-1} nitrate, or could contain more than that amount if protective action is not taken.

There is a degree of flexibility involved here. The application of the criteria is a matter for the Member States. Not all waters that fit the description are to be covered: Member States must also take account of other factors set out in Annex IB, such as the physical and environmental characteristics of the waters and the land. This rather vague formulation is a recipe for future argument as to the scope of the Directive, particularly in areas where waters are eutrophic but nitrate pollution is not the sole factor.

Having identified waters which may be affected by nitrate pollution, Member States must then designate 'vulnerable zones'. These are defined as areas which drain into the polluted (or potentially polluted) waters described above and which contribute to the nitrate pollution in them. Again the vagueness of this last phrase is likely to give rise to debate. Member States must identify these vulnerable zones by 19 December 1993. They must also review the designations at least every 4 years, and add extra zones if appropriate.

14.9.3 RESTRICTIONS WITHIN VULNERABLE ZONES

Within the vulnerable zones, Member States are required, within 2 years of the designation of the zone, to establish action programmes, which must then be implemented within a further 4 years. The action programmes must include the measures laid down in Annex III, though these are not as detailed as in earlier drafts of the Directive. They mainly concern general requirements, such as that rules shall be formulated about periods when the application of certain types of fertiliser to land is prohibited and the capacity of storage vessels for livestock manure. They must also include limitations on the application of fertilisers to land, taking into account the soil, climate and land-use characteristics of the vulnerable zone and the balance between nitrogen supply and foreseeable nitrogen requirements of the crops. One matter of detailed control is that the measures adopted should ensure that the amount of livestock manure applied to land each year should not exceed 210 kg of nitrogen per hectare in the first 4 years and 170 kg thereafter. However, Member States may permit higher levels if they inform the Commission and the derogation can be justified objectively on the basis of such things as a long growing season, high rainfall, or the growing of crops with a high nitrogen uptake.

There is a further duty to take additional measures if it is clear that the action programmes are not meeting the objectives of the Directive, though this is limited by a duty to take into account the cost-effectiveness of any proposed additional measures.

14.9.4 RESTRICTIONS OUTSIDE THE VULNERABLE ZONES

Outside the vulnerable zones, Member States are required to draw up codes of good agricultural practice with the aim of reducing nitrate pollution. Compliance by farmers with these codes is to be entirely voluntary, but general requirements as to their scope are laid down in Annex II of the Directive. The existing British codes will have to be amended to comply with these requirements.

14.9.5 MONITORING IMPLEMENTATION OF THE DIRECTIVE

Member States are required to set up monitoring programmes to assess the effectiveness of the action programmes, which must, in any event, be reviewed at least every 4 years. They are also required to establish programmes for monitoring nitrate levels. In both cases guidelines

may be drawn up by a committee of national experts. Finally, Member States are to send implementation reports to the Commission every 4 years from the notification of the Directive.

14.9.6 CONSULTATION PAPER ON DESIGNATING RELEVANT WATERS

In March 1992 the government issued a consultation paper on the proposed criteria and procedures for identifying the relevant waters (Scottish Office Environment Department, 1992). For criterion (1), monitoring of water for compliance with Directive 75/440 has now commenced. For criterion (2), it is recommended that different factors be considered for estuaries and coastal waters on the one hand and freshwaters on the other. For estuaries and coastal waters, the consultation paper recommends that the following factors should be taken into account in deciding whether any stretch of water is likely to suffer from eutrophication: enhanced winter nitrate concentrations; unusual algal blooms; long duration of algal blooms; oxygen deficiency; reductions in fauna; changes in macrophyte growth; occurrence and magnitude of paralytic shellfish poisoning; and formation of algal scums.

For freshwaters, the consultation paper also recommends that simple numeric chemical criteria are not appropriate, but that a range of factors should be considered before deciding on the facts whether any stretch of water is likely to suffer from eutrophication. For still freshwaters, the following symptoms are recommended: phosphorus concentrations; chlorophyll-*a* concentrations; water clarity; dissolved oxygen; effects on fauna; effects on macroflora; effects on microflora. For running freshwaters, the following symptoms are recommended: phosphorus concentration; algal biomass; water-retention time; dissolved oxygen; effects on fauna; effects on macroflora; effects on microflora.

As far as groundwaters are concerned (criterion (3) of the Directive), it is suggested that all groundwater sources with nitrate levels in excess of 50 mg l^{-1} or a positive linear trend should first be identified. All sources which are not projected to have a concentration in excess of 50 mg l^{-1} by 2010 should then be rejected, as should those where sources other than agriculture are implicated. Those sources where the expected equilibrium nitrate concentration is 45 mg l^{-1} or less can also be rejected, leaving candidate areas where more refined tests can be undertaken.

Further consultation will follow in due course on the mechanisms to be used to designate vulnerable zones under the Directive and on where they should be located.

14.10 URBAN WASTE WATER TREATMENT DIRECTIVE 91/271

The Urban Waste Water Treatment Directive, which was agreed by the EC Council on 18 March 1991, is a far-reaching Directive which will have an important impact on discharges of effluent from sewage works. However, once again the original proposals put forward by the Commission and supported by the European Parliament were weakened significantly by the Council, which put deadlines back and increased thresholds for action (Collins, 1991).

The Directive lays down minimum standards for sewerage systems and sewage treatment. These vary according to the size of the urban area concerned and the nature of the receiving area. Thus, secondary (i.e. biological) treatment is required for discharges from municipalities with a population equivalent of 15 000 or more by 31 December 2000, with smaller municipalities required to comply, in most cases, by the end of 2005.

In relation to nitrate, the importance of the Directive is strengthened by the fact that additional

treatment and higher standards will be required for discharges to sensitive areas. The criteria for identifying sensitive areas are laid down in Annex IIA of the Directive and include the following:

(1) Surface freshwaters intended for abstraction for drinking water which could contain more than the concentration of nitrate laid down in Directive 75/440 if protective action is not taken (i.e. 50 mg l^{-1}); and
(2) Freshwaters, estuaries and coastal waters which are eutrophic, or may become eutrophic in the near future if protective action is not taken.

These requirements are almost identical to those under the Nitrates Directive and the consultation paper mentioned above (Scottish Office Environment Department, 1992) treats them in the same manner. It should also be noted that under the Directive exceptions may be made for less sensitive areas (although primary treatment is always required). Member States are required to identify sensitive and less sensitive areas by the end of 1993.

APPENDIX: DOMESTIC AND EC LEGISLATION

Control of Pollution Act 1974
Water (Scotland) Act 1980
Agriculture Act 1986
Water Act 1989
Environmental Protection Act 1990
Water Resources Act 1991
Water Industry Act 1991

Water Supply (Water Quality) Regulations SI 1989/1147
Water Supply (Water Quality) (Scotland) Regulations SI 1990/119
Surface Waters (Classification) Regulations SI 1989/1148
Nitrate Sensitive Areas (Designation) Order SI 1990/1013
Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations SI 1991/324

Directive on Surface Waters for Drinking 75/440
Directive on Drinking Water 80/778
Directive on Nitrates 91/676 (OJ 1991 L 375/3)
Directive on Urban Waste Water Treatment 91/271 (OJ 1991 L 135/40)

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