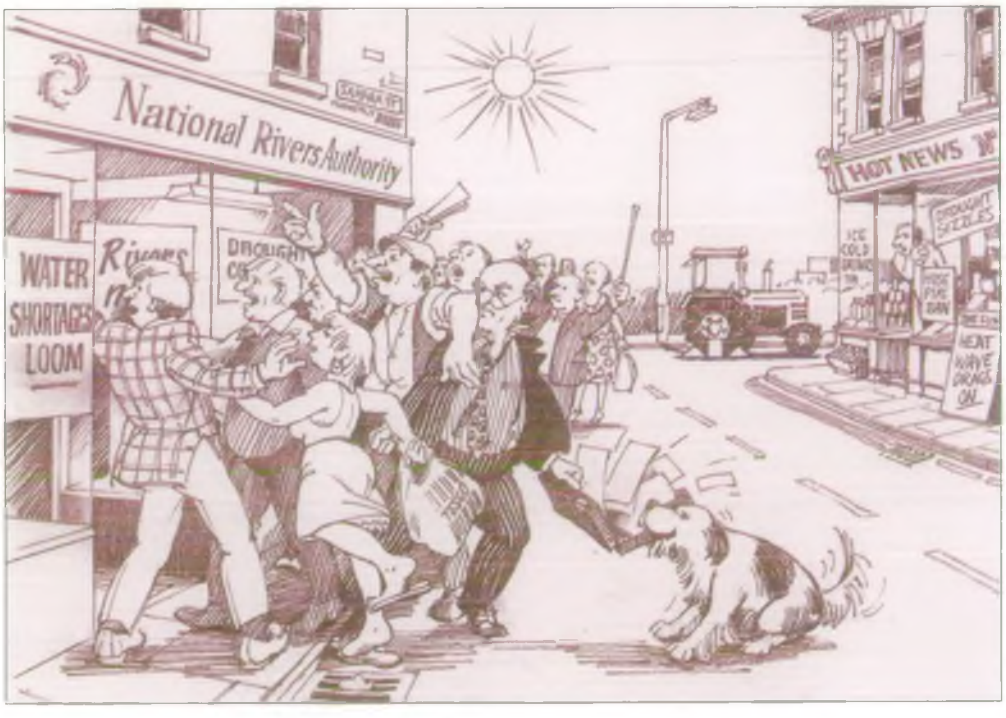
WATER IN ANGLIA

WATER RESOURCES IN BRITAIN'S DRIEST REGION



NRA

National Rivers Authority
Anglian Region

Introduction

Water is vital to our lives. We take it for granted, both in our taps and in our rivers. But in Anglia, Britain's driest and fastest growing region, it is a major task to keep pace with both human and environmental water needs.

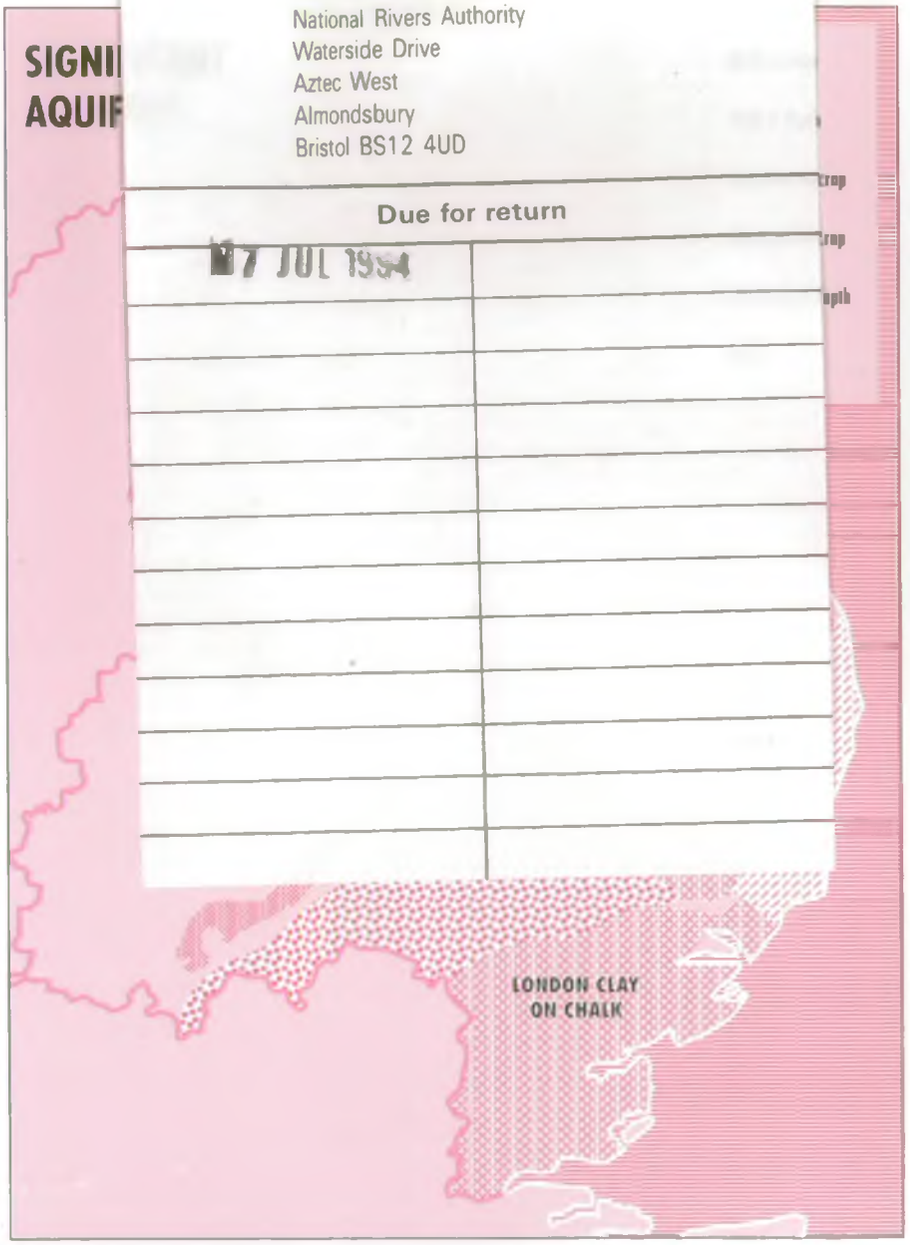
Recently the longest drought in living memory has focused attention on the conflicting needs for water - water for our homes, water for our crops and factories and water in our environment. As the population rises these conflicts will increase. It is the job of the National Rivers Authority to try to resolve them.

This leaflet looks at how we can keep the water flowing during future droughts.

Our Water Resources

Anglia lies in the 'rain shadow' of the western hills and its rainfall is about two thirds of the national average. Most of this rain evaporates and only the remaining part, called effective rainfall, is available for use. Anglia's effective rainfall is only about one third of the national average.

Even so, this works out at about three times the highest forecast of future water need. If it occurred at a steady rate, throughout the year and from year to year, there would be no problem.



Unfortunately it does not. Even in an average summer, evaporation (450 millimetres) greatly exceeds rainfall (300 millimetres). In Anglia every summer is a drought and all our water, in the tap and in the river, has to come from stored winter rainfall.

Nature has provided two sorts of water store, and man has added a third:-

Nature's stores

First the soil store. This 'belongs' to the plants and trees. Their roots dry it out through the summer, and it is

Left: Days of drought.

Right: Days of plenty.

refilled by winter rains. Second, the underground store. Suitable rocks, known as aquifers, can store huge amounts of water, usually much deeper than roots can reach. This store can only start to refill when the soil store is full. It helps to even out the year to year variations in rainfall, but its renewable water resource is limited to the average rate at which nature refills it. In nature the underground store 'belongs' to the rivers. Man borrows from it but he must be careful to avoid unacceptable effects on the environment. On page 2 we show the chalk, limestone and sandstone aquifers which provide the storage to meet about half of the water needs in this region.

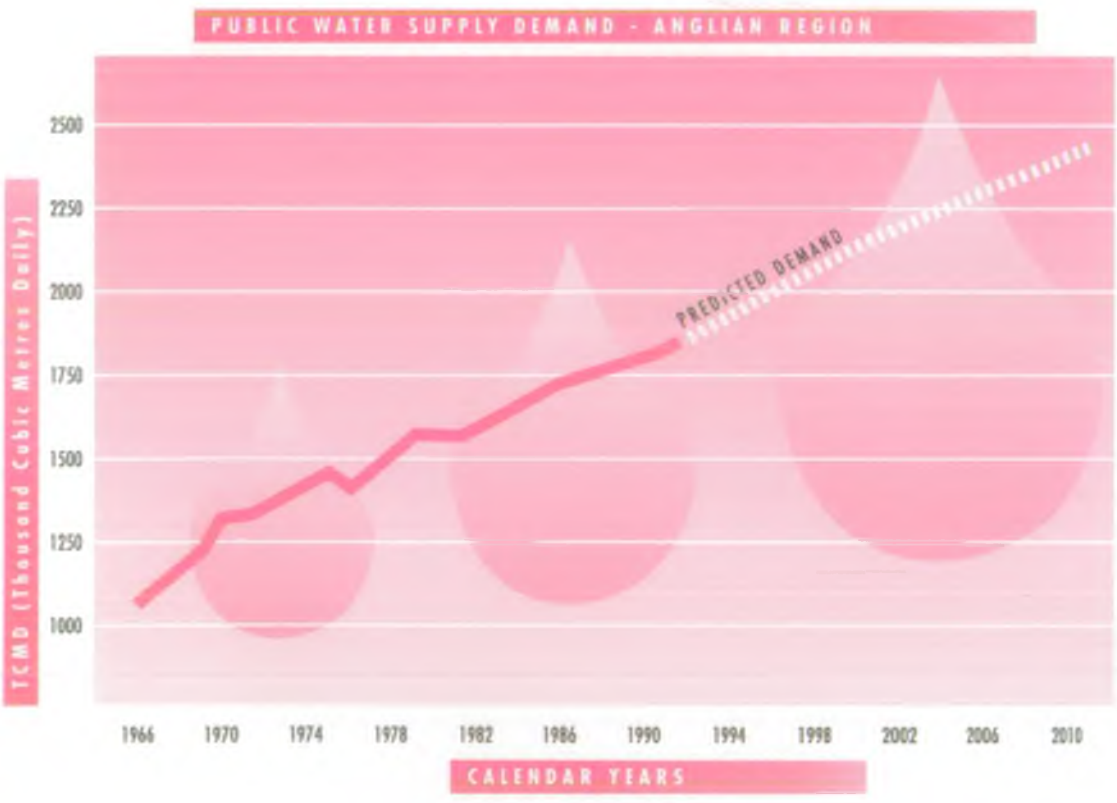
Man's Stores

These are reservoirs, built to store winter river flows in areas where natural storage is inadequate. They range in size from Rutland Water in Leicestershire, one of the largest reservoirs in Europe, to farm reservoirs of a few acres, of which there are several hundred. Anglia's terrain is not very suitable for reservoirs; most have to be built in side valleys, and filled by expensive pumping from the main rivers.

Increasing Use of Water

The region's population is 5.5 million and rising at about one per cent a year. As living standards improve, individual water use also increases. The graph shows how public water supplies have grown over the years and how they may increase in future.

In this region, agriculture is also a big user of water. Half of the country's spray irrigation takes place in Anglia, and this is rising even faster than public supplies. It has a big impact because all the water is consumed by the crops and it takes place over a short period just when water is scarcest.



In addition large amounts of water have to be diverted in summer out of the lower ends of our major rivers to maintain water levels in the fen drains and fields.

Industry uses roughly the same amount of water as agriculture. There can be problems in supplying particular factories or power stations, but overall industry has less impact than agriculture as much of its water is returned to the river and no major increase in demand is forecast.

Where Our Water Comes From

The map of the groundwater areas (opposite), indicates the extent to which renewable groundwater resources are already committed. Only in parts of Norfolk and Suffolk area is there appreciable potential for development. The other map shows the rivers and intakes, and the major reservoirs which are filled from them. All the significant rivers are tapped for public supply at or near their tidal limits, and there is very little scope for further use of river water unless additional storage is provided.

The region also has a 'water grid' - a combination of river-to-river and groundwater-to-river transfers operated by NRA; and of reservoirs and strategic mains operated by the water companies. This system is as complex as any in the country. It 'knits together' our ground and surface water resources over a very wide area. It is not quite the popular concept of a water grid, but it serves the same purpose, to spread water

Below: Wetlands.

from where it is available to where it is needed.

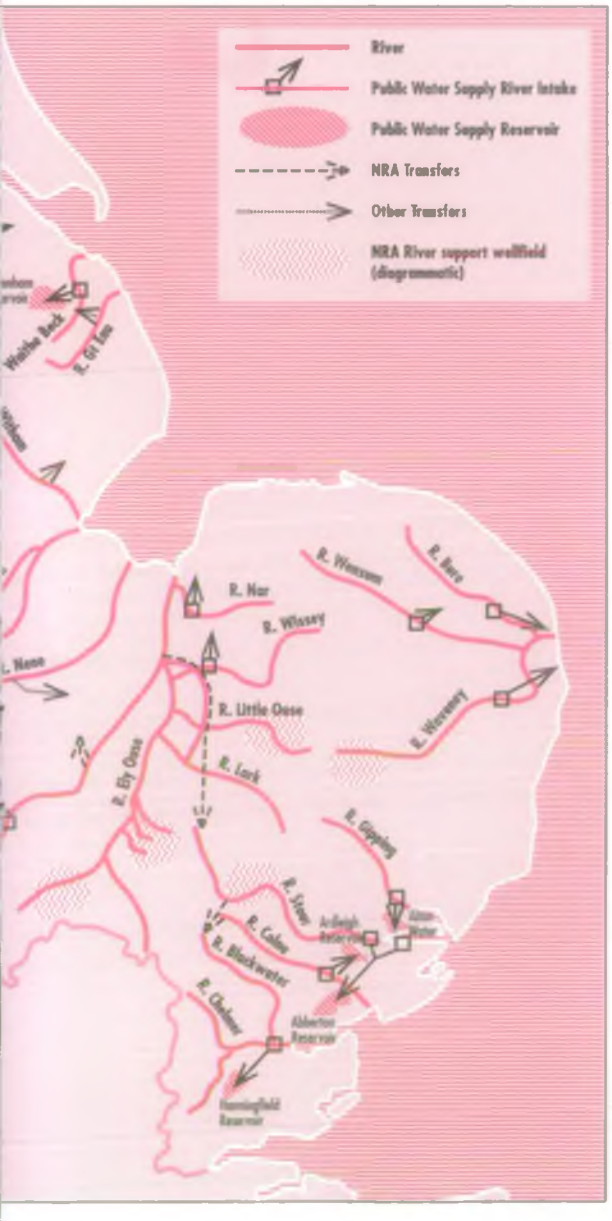
The Water Environment

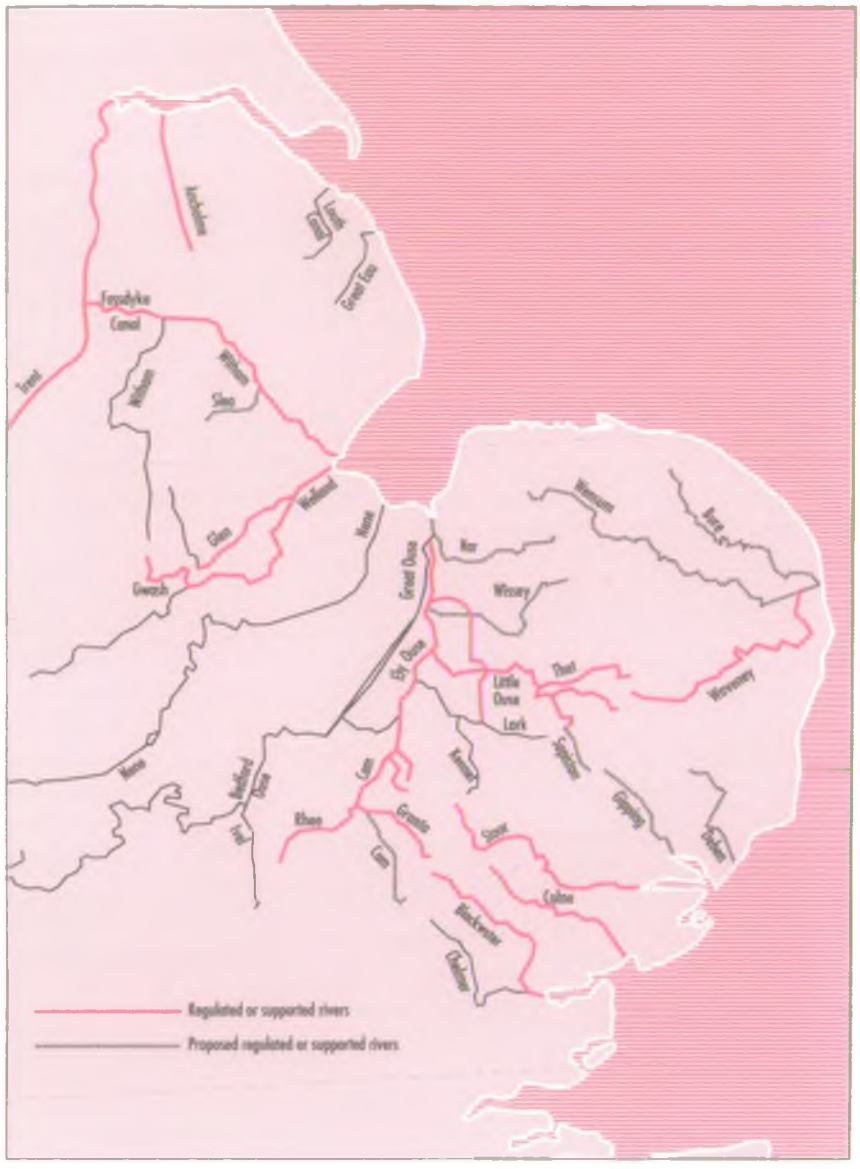
There are three elements to our water environment:-

- Soil water which sustains plants and trees
- Wetlands
- River flows

Soil water is generally (though not always) independent of the deeper water table from which abstractions are made. It is affected by farm practices, especially drainage, but is not generally in conflict with other water uses.

Wetlands are areas where the water table is at or near the surface. Developments of all kinds, including farming practice, land drainage and abstraction, have greatly diminished our natural wetlands. Many of those remaining are designated as Sites of Special Scientific Interest, and it is important to sustain their water regimes as close to natural as possible.





Rivers carry all effective rainfall to the sea. In groundwater areas, river flows are naturally evened out by springs which sustain relatively good summer flows. Groundwater abstractions which are used locally and returned after treatment as sewage effluent have the same beneficial effect on river flows. In some non-groundwater fed rivers summer flows depend heavily on effluents.

In many rivers this incidental augmentation is supplemented by NRA's river to river transfers, or by river support pumping from groundwater. The NRA augments rivers in this way, either for the benefit of downstream users or for the benefit of the river itself. In either case the result is to sustain the flows in these rivers at, or above, what they would naturally have been.

The combined effects of abstractions, discharges and augmentations make almost all the region's river flows unnatural. This may or may not be a bad thing, but it is an inevitable consequence of a large population thriving in a dry region. As population increases so will the artificial management of low river flows; it is important to identify what low flow regimes are appropriate and to manage our water resources accordingly.

Droughts

Our 'water grid' is designed to maintain water supplies and flows in rivers even during droughts. It copes readily with normal conditions, but in very dry years our effective rainfall is severely reduced and water resource systems become stretched. The diagram (below) shows that drier than average spells of two, three or even four years are a regular event in this region, and it is important to ensure that the system is progressively enhanced to keep pace with rising demands.

It is unrealistic to provide for all water use to be met, without restriction, throughout the worst conceivable drought - the cost and the environmental consequences would not be tolerable. It is therefore common practice to design for target levels of service for water resources, which are currently:

• For public water supply
A hosepipe ban on average not more than once in every 10 years.

Need for voluntary savings of water on average not more than once in 20 years.

Risk of rota cuts or use of stand-pipes on average less than once in 100 years.

• Irrigation
Inherited practice in the Anglian region is for initial restrictions not more often than once in every 12 years.

• Water Environment
No specific target is set, but environmental difficulties are considered acceptable with comparable frequency and severity to supply difficulties. Some rivers and wetlands dry up naturally in drought conditions.
The drought of 1988/92 has been a much more severe event than 1 in 20 years, and it is a credit to both users and managers of our water resources that restrictions and environmental difficulties have been limited to relatively few areas during such a severe event.

NRA aims to manage water resources in such a way that supplies are sustained during future droughts at or above the target levels of service. It will do this at the same time as keeping river flows generally at or above their natural minimum and keeping water table - dependent wetlands as natural as possible.

Climate Change?

Even if climate change is occurring, rainfall is so variable that it will be many years before we can detect any trend. There is no detectable trend in 90 years of rainfall records, and the 1988 to 1992 drought is within the historical pattern; 1899 - 1903 was similar.

The best predictions of climate change suggest (very tentatively) drier summers and wetter winters. For water resources wetter winters would be good news, but increased demands in longer hotter summers could outweigh the benefit.

NRA therefore keeps a watching brief on climate change but believes it is unlikely to be a significant factor for many years.

How Water Resources Are Shared Out

The NRA is responsible under the Water Resources Act 1991 for securing the proper use of water resources and for allocating raw water by means of abstraction licences.

There is a basic presumption that the "reasonable needs" of would-be abstractors should be met if possible. On the other hand NRA must give priority to existing abstraction rights and must have regard to the needs of river flows and wetlands.

When determining any licence application the NRA:-

- considers the overall availability of water: abstraction will not be authorised in excess of renewable resources,
- considers the potential effects on neighbouring abstractors: abstractions will not be authorised which derogate existing rights unless suitable arrangements are made.

– considers the potential effects on river flows: abstractions will not be authorised which would unacceptably affect low river flows.

– considers the potential effects on wetlands: abstractions will not be authorised which would unacceptably affect them.

How Future Demands May Be Met

It will not be sensible to meet all demands under all conditions. Applicants for licences will be encouraged to provide their own storage. However, in some areas NRA augmentation and transfer works may make more water available to private abstractors. Guidelines on the availability of raw water will be produced from time to time.

On the larger scale, NRA has published a Regional Strategy which identifies five approaches to rising demands:-

• Demand Management
NRA promotes the wise use of water; it encourages leakage reduction, more efficient water-using appliances, the selective metering of household supplies, and appropriate restrictions in time of shortage. Demand forecasts allow for a good degree of leakage control and other demand management. Further such measures might defer the need for works but will not eliminate it.

• Groundwater
Surplus groundwater resources in parts of Norfolk and Suffolk could meet most of the foreseeable needs of those areas in an environmentally acceptable way, provided they are sensitively developed - that is provided that boreholes are located well away from sensitive wetlands, and unacceptable effects on river flows are counteracted by river support pumping.

• Low River Flows
All pumping to fill major reservoirs is constrained by 'hands off' flow conditions to protect the river. Reduction of these flow constraints could increase public supplies at a stroke. However, this would affect the river and/or estuary downstream; Environmental Impact Assessments are necessary.

• The River Trent
NRA already transfers Trent water through the Rivers Witham and Ancholme for use in much of Lincolnshire and South Humberside. Trent flows are far higher than those in Anglian rivers. Subject to needs in the lower Trent there is no physical reason not to increase Trent transfers and extend them as far as it is economically worthwhile to do so.

The quality of the Trent has been improved greatly in the last decade or two and, with suitable treatment, it is already being used for public supply. However the acceptability of its widespread use needs to be considered; and so do the costs and the environmental effects of transferring large flows of Trent water through the Anglian river system.

• Great Bradley Reservoir
A large new reservoir could be built near the village of Great Bradley on the Suffolk/Cambridge borders. The site was studied in detail 20 years ago when it was found to be feasible for a reservoir bigger than Grafham, though smaller than Rutland. In terms of location it has many advantages; it could be filled directly with surplus winter flows in the River Ely Ouse by the NRA's existing transfer works and it commands all the high demand areas in the south of the region, and perhaps into London too. However large reservoirs also have their problems - environmental, social and, not least, financial. This is not an easy option either.

All of these options are possible, but none are easy. They would all be unpopular with somebody and most are environmentally difficult. The NRA, and others, are carrying out the necessary studies which will lead, by 1994, to a strategy to keep both the water supplies and the rivers of the Anglian region flowing into the next century.

Below: Towards the future.

The National Rivers Authority

Guardians of the Water Environment

The National Rivers Authority is responsible for a wide range of regulatory and statutory duties connected with the water environment.

Created in 1989 under the Water Act it comprises a national policy body coordinating the activities of 10 regional groups each one mirroring an area served by a former regional water authority.

The main functions of the NRA are:

Water resources	— The planning of resources to meet the water needs of the country; licensing companies, organisations and individuals to abstract water and monitoring the licences.
Environmental quality and Pollution Control	— maintaining and improving water quality in rivers, estuaries and coastal seas; granting consents for discharges to the water environment; monitoring water quality; pollution control.
Flood defence	— the general supervision of flood defences; the carrying out of works on main rivers and sea defences.
Fisheries	— the maintenance, improvement and development of fisheries in inland waters including licensing, re-stocking and enforcement functions.
Conservation	— furthering the conservation of the water environment and protecting its amenity.
Navigation and Recreation	— navigation responsibilities in three regions — Anglian, Southern and Thames and the provision and maintenance of recreational facilities on rivers and waters under its control.

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