

# BLACKWATER CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT



**NRA**

*National Rivers Authority  
Anglian Region*

**NOVEMBER 1994**

# **THE BLACKWATER CATCHMENT MANAGEMENT PLAN**

## **FOREWORD**

National Rivers Authority  
Information Centre  
Head Office A9VZ  
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Established in 1989 the National Rivers Authority has as its role the "Guardians of the Water Environment". As such it is committed to protecting and improving the water environment in its broadest sense. Establishing a sound planning base for the development of river catchments is essential to good future management.

Integrated Catchment Management Planning will play an increasingly important role in the NRA's management of the water environment. Demands upon catchments are many and varied, and conflicts require careful consideration. The enhancement of the water environment is one of the main aims of consultation with individuals and organisations having an interest in the catchment.

This report examines the Rivers Blackwater, Pant, Colne, Chelmer, Wid, Can, Holland Brook, Asheldham Brook, their tributaries, their catchments and their offshore tidal waters.

The Blackwater Catchment contains the NRA's newest tidal flood defence barrier which is on the Colne Estuary below Colchester. Also within the area of this Plan are some of the country's most important saltmarsh and mudflat environments which support internationally important wildfowl populations.

The dry nature of this catchment, together with its high water demand, make water resource requirements a high priority. Tight water quality control is therefore essential to maintain the quality of the limited water available for the varied catchment uses.

This is the ninth such Plan produced in the Anglian Region. This Report is for public consultation and I look forward to receiving comments from those interested in order to produce a Final Plan balancing the conflicting demands placed upon an integral feature of the Nation's Heritage. Please make any contributions in writing to The Blackwater Catchment Management Plan, Area Manager, National Rivers Authority, Eastern Area, Cobham Road, Ipswich, Suffolk, IP3 9JE. The final date for responses is 8th February 1995.

**Grainger Davies**  
**Regional General Manager**

NATIONAL RIVERS AUTHORITY

ANGLIAN REGION

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## 1.0 CONCEPT

### 1.1 The National Rivers Authority

The National Rivers Authority (NRA) is the major environmental protection agency responsible for safeguarding and improving the natural water environment in England and Wales. The nature of its responsibilities are wide reaching and include:-

- Control of pollution and improving the quality of rivers, groundwaters and coastal waters.
- Flood defence, including the protection of people and property.
- Flood warning.
- Effective management of water resources.
- Maintenance, development and improvement of fisheries.
- Conservation of the natural water environment.
- Promotion of water based recreation including navigation.

To achieve success in all these areas the NRA works with industry, commerce, farming, local authorities, other statutory and non statutory agencies and the general public, to promote environmental awareness and to enforce appropriate environmental standards.

Catchment management assists the NRA to use its authority and work with others to ensure that the rivers, lakes, coastal and underground waters are protected and, where possible, improved for the benefit of present and future generations.

River catchments are subject to increasing use by a variety of activities. Many of these interact and conflicts may arise. The competing requirements and interests of users and beneficiaries must be balanced.

The NRA will use its resources to:-

- Respond promptly to all reported pollution incidents.
- Control pollution by working with dischargers to achieve improvement and monitor effluent compliance with appropriate standards.
- Monitor, survey and investigate the existing quality of controlled waters to determine short and long term changes.
- Maintain existing and invest in new assets to provide flood protection, develop water resources and provide other NRA services.



- Determine, police, enforce and review the conditions in water abstraction licences, discharge consents and land drainage consents to achieve operational objectives.
- Maintain, develop and improve fisheries, promote recreation, navigation and conservation.
- Influence planning authorities to control development so as to avoid conflict with NRA objectives and initiatives through Town and Country planning liaison.
- To assess, manage, plan and conserve water resources.

## 1.2 Scope and Process of Catchment Management Planning

This draft catchment plan consolidates the policies, objectives and options for the Blackwater catchment for the overall improvement of the water environment. It must be emphasised that the Catchment Management Plan is not an end in itself. Its aim is to provide a comprehensive guide to the present status and future vision for the Catchment. It is the essential first step in providing the basis for drawing up a plan of action. The timetable for the planning process is given in the table overleaf. The plan is drawn up as follows:-

### 1. Uses of the Catchment

For the identified uses of the water environment, text is produced, supported by a map indicating where in the catchment each use occurs. Objectives for the use are identified and targets set, (where applicable), for Water Quality, Water Quantity, Flood Defence and Physical Features, and Fisheries.

### 2. Catchment Targets

By taking the targets for individual uses, overall targets for Water Quality, Water Quantity and Physical Features are set for the catchment.

### 3. Current Shortfalls of the Catchment

Having set targets it is now possible to view the current state of the catchment and identify issues that need addressing to meet the future catchment targets.

### 4. Issues and Options

The next step to identify individual issues and suggest options to resolve these problems. These options identify responsible bodies and also suggest advantages and disadvantages.

The Plan is then released for public consultation in draft form. Comments on the objectives/targets and issues/options are invited before the plan is finalised to produce a Final Report for the Catchment.

The issues and options as presented are the **initial thoughts** of the NRA Anglian Region following preliminary external consultations, and do not constitute policy statements. Following the consultation period all comments will be drawn together and considered in drawing up the Final Report.

The co-operation of water users and all water related bodies cannot be overstated. The NRA seeks a partnership with all parties to obtain a balanced programme of improvements to the water environment.

### The Catchment Management Planning (CMP) Process

<u>Timescale</u>	<u>Steps</u>
0 months	<ol style="list-style-type: none"> <li>1. Set up an NRA CMP Group.</li> <li>2. Preliminary external consultations and meetings.</li> <li>3. Identify and describe catchment uses.</li> <li>4. Identify catchment targets for the catchment.</li> <li>5. Compare current status with catchment targets for the catchment.</li> <li>6. Identify catchment issues and options.</li> </ol>
6 months	<ol style="list-style-type: none"> <li>7. NRA internal consultation with Catchment Panels.</li> <li>8. External consultation.</li> </ol>
9 months	<ol style="list-style-type: none"> <li>9. Draw up Final Report version of the CMP.</li> </ol>
12 months Periodic Review	<ol style="list-style-type: none"> <li>10. Monitor progress towards target objectives and review the CMP in consultation with the NRA Catchment Panels.</li> </ol>

### 1.3 Limitations

The finished CMP will inevitably be subject to some limitations, the major examples of which are as follows:-

Where improvement works are required to overcome catchment problems, these will, in many cases, be in part or wholly the responsibility of other organisations or individuals. The NRA may have no powers to control the necessary actions directly. The responsible party may be a Company who may see little or no financial benefit in carrying out the actions, or a Local Authority with restricted capital budgets.

It will inevitably be the case that the achievement of some objectives will depend upon the Town and Country Planning Policy of the County, Borough or District Council. The NRA is a consultee to such policy, but it is recognised that the Councils are subject to many other constraints in meeting their obligations to the planning process and will not always be able to put the needs of the river catchment first.

The land use within a catchment is obviously a major contributor to the state of that catchment, as is apparent from this report. In area terms, the largest land use is agriculture, over which, apart from restricted areas (such as an SSSI and an ESA), there are few relevant controls. In cases where farming practice will need to change to permit the catchment improvements to proceed, it will be necessary to obtain the support of the landowners concerned and for them to make such changes voluntarily.

Whilst these limitations will inevitably hamper the achievement of some of the plan objectives, it is essential that these objectives should still be set and striven after. Alternative means of achieving them might be identified, or the very fact of their identification and publication might bring the necessary pressure to encourage those involved either individually or collectively to work towards their achievement. Public participation in this Plan will increase awareness of water related issues and lead to involvement in, and a feeling of ownership of, their water environment.

## 2.0 OVERVIEW

### 2.1 Introduction (Refer to Map 1)

The area covered by this plan includes the whole freshwater catchments of the Rivers Blackwater, Chelmer and Colne together with the Blackwater/Colne Estuaries and the adjacent coastal zones. All river tributaries are included, as are the smaller adjacent watercourses draining directly to the sea. The plan area is entirely within the county of Essex.

Land use is primarily agricultural, but some industry is associated with the main towns. The largest of these are Colchester, Chelmsford and Clacton, but the towns of Braintree, Witham, Maldon and Halstead are also important urbanised catchment features. Port facilities exist in Colchester, Rowhedge, Brightlingsea and Maldon. All of these towns, as well as many lesser ones and large areas of agricultural land, are potentially vulnerable to either fluvial or tidal flooding. The rivers and estuaries support a wide range of uses, which give rise to a host of potential conflicts. There are major abstractions for public water supply on the principal rivers. In the Pant/Blackwater, the natural flow is not always adequate to support this need, and a major water transfer scheme is operated regularly to augment the river. Large sewage effluent discharges to either river or sea are associated with all the principal towns, whilst the rural areas are served by a very large number of smaller works. There is some industrial use of water, together with a range of industrial discharges to both freshwater and tidal reaches. Agricultural interests make significant abstractions for spray irrigation in the summer months, as well as exerting a major influence on the management of water quality. Some commercial fishing takes place in the estuaries and coastal waters, with well established oysterages at Mersea and in the Blackwater estuary.

Large parts of the catchment enjoy the protection afforded by special conservation or landscape designations. There are a number of Sites of Special Scientific Interest, National Nature Reserves and County Wildlife Sites throughout the area. New agricultural policies leading to grants for "set aside" land and to the existence of Environmentally Sensitive Areas (ESA), are exerting an ever increasing influence on future land use planning.

Major recreational and amenity uses are further characteristics of the area. Most of the principal freshwater river lengths have good fish populations, which support widespread angling interests. The estuaries provide sheltered waters allowing a variety of boating activities. Both the Blackwater and Colne estuaries are navigable, and the Chelmer and Blackwater Navigation links the former to Chelmsford.

This plan shows how the NRA proposes to discharge its responsibilities throughout this complex and interesting catchment. In doing so, it seeks to both recognise all legitimate interests, and to reconcile potentially conflicting uses.

## 2.2 Land Use

### 2.2.1 Agriculture

Agriculture is the most widespread and important land use in the catchment area.

The quality of land is predominantly good, rated as within Grades 2 and 3 under the MAFF classification system with areas split approximately evenly. In addition the catchment contains small parcels of Grades 1 and 2 quality land; with a large area of Grade 1 (high quality) situated in and around the sub-catchment of Holland Brook within the Tendring Peninsular.

The catchment is mainly in arable production, with increasing reversion to grazing in the river valleys.

### 2.2.2 Urbanisation

The total population in the catchment is approximately 901,700 with 307,600 being located in the main towns and the remainder in the villages, hamlets and isolated farm settlements.

Much of the industry is related to agriculture. The area contains numerous industrial and commercial business parks and other significant industries such as soft fruit processing, electronics, warehousing and distribution.

Growth is identified within the Structure Plans and Local Plans covering the catchment but is generally limited to the towns and main villages.

## 2.3 Water Quality

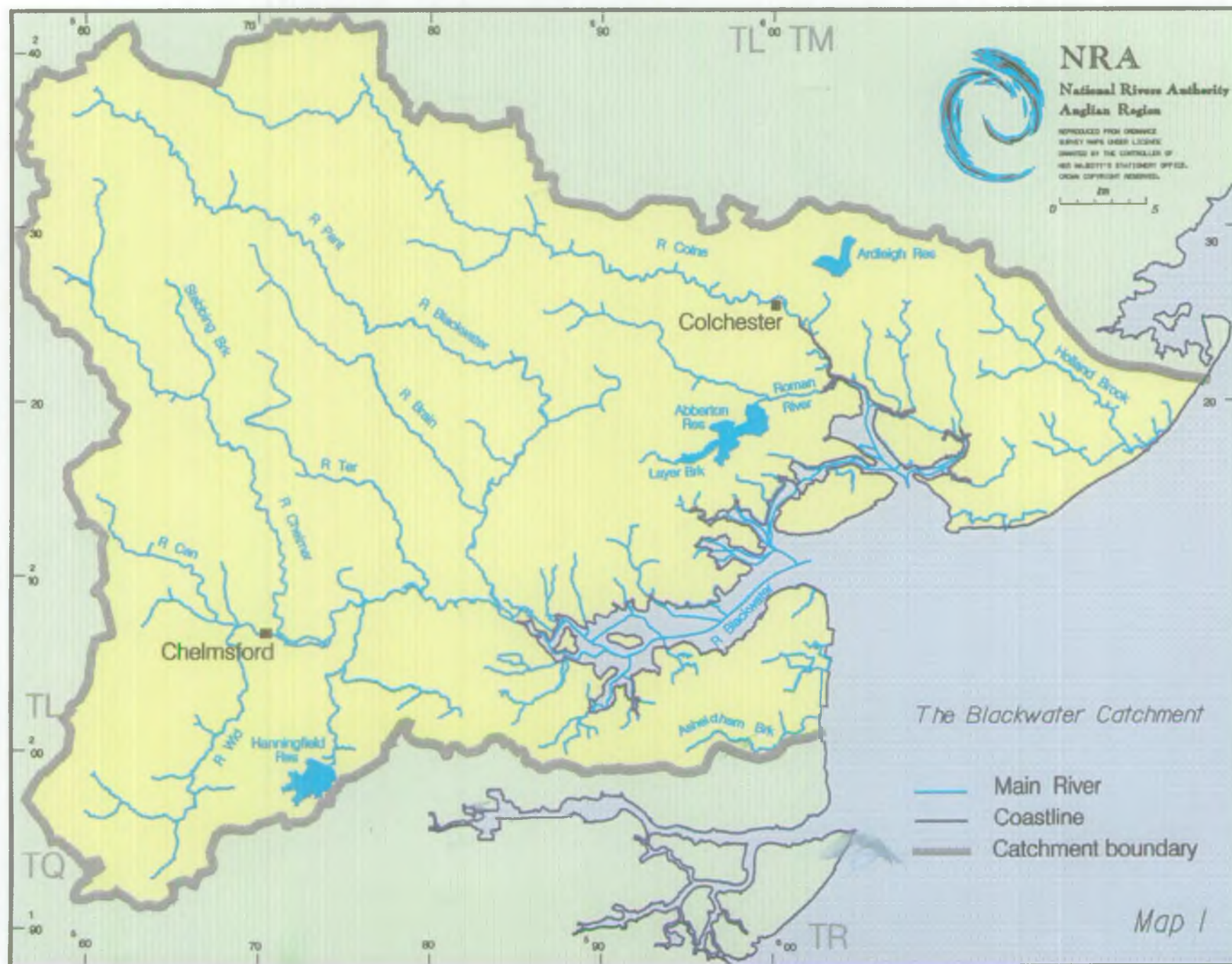
In this catchment, which contains significant areas of industry and has major agricultural use, it is essential that the pollution risks are minimised in order to allow the harmonious use of the rivers, estuaries and coastal water by the many activities which require water of a high quality.

Within the catchment the protection of public drinking water supply abstractions is of prime importance. Abstraction for this purpose takes place on the River Colne to Ardleigh Reservoir, on the Blackwater/Chelmer to Hanningfield Reservoir, and Roman River to Abberton Reservoir. There are also a number of groundwater abstractions for public drinking supply within the catchment. It is essential that the quality of these public supply sources is protected.

Agriculture and food related industry plays a major role in the catchment and consequently adequate pollution prevention measures must be enforced to ensure that pollution from such activities is kept to a minimum.

Tourism and high amenity usage is a feature of the waters within the catchment. Similarly the coastal beaches are highly popular and it is necessary that the EC identified bathing waters of Clacton, Brightlingsea, Jaywick, Holland and West







Mersea maintain compliance with the quality limits imposed by the EC Directive or are quickly brought up to the necessary standard.

In order to protect these uses and interests, a comprehensive telemetered, automatic monitoring and sampling programme is undertaken throughout the catchment.

## 2.4 Hydrology

Average annual rainfall varies between around 600mm on the higher ground and 540mm near the coast. The yearly evapotranspiration loss is around 440mm. However, this is largely concentrated in the summer months, therefore effective rainfall is much higher in the winter than the summer.

The catchment is divided into 16 sub-catchments with the major rivers and tributaries being the Colne, Pant, Blackwater, Ter, Chelmer, Can and Wid. The surface geology is varied and provides a complex hydrology. Ground levels vary from around +120m OD in the west, lowering to sea level in the east.

Chalk provides the principal aquifer to the catchment and much of this is overlain by a thick layer of confining London Clay which itself is overlain by Glacial Sands and Gravels and Boulder Clay. River flows are derived from base flow contributions from the Gravels and surface run-off from the Boulder Clay.

In the north west part of the catchment the Chalk and river are hydraulically balanced due to there being no London Clay deposits. Here base flow to the river is from upward leakage of Chalk water, and throughflow from the Gravels.

To the east of the catchment, following a line from Chelmsford to Colchester, there are no Boulder Clay deposits. This allows more rainfall to infiltrate into the superficial Gravel aquifer. However, the effect of this on the hydrology is limited, as Sand and Gravel aquifers here are not extensive and their capacity for storage is low. Exposed London Clay in many places cause river flows to respond rapidly to rainfall events making the catchment "flashy" in nature.

At times of low flows the River Pant/Blackwater can be supported by operation of the NRA's Ely Ouse to Essex Transfer Scheme which provides water to the Essex surface reservoirs at Abberton and Hanningfield to meet public water supply demands as well as demands for spray irrigation and other in-river needs.

## 2.5 Hydrogeology (Refer to Map 2)

The main aquifer in the Blackwater catchment is the Chalk. However, the confined nature of the Chalk to the south east restricts recharge, which reduces its suitability for major abstractions. Within this area, the Glacial Sands and Gravel aquifer becomes increasingly important for small scale domestic and agricultural abstractions.

Aquifer transmissivities in the Chalk are highest within the valleys in the north of



the catchment, but lower between the valleys towards the south east. Recharge to the Chalk mainly occurs in the north west where the Chalk outcrops.

Chalk water levels range from +70m OD in the north west to -10m OD around Braintree. Groundwater movement is therefore predominantly in a south easterly direction.

Increased chloride levels have occurred in chalk groundwater at depth between the coast and Braintree. This was caused by concentrated groundwater abstraction which in the past lowered groundwater levels in this locality.

## 2.6 Hydrometric Network

There is an extensive network of hydrometric monitoring stations within the catchment, covering rainfall, river flows, groundwater levels, salinity, tide levels and wind speed parameters. Where these are needed for flood warning purposes the gauges are connected to the Authority's telemetry system.

## 2.7 Water Resources

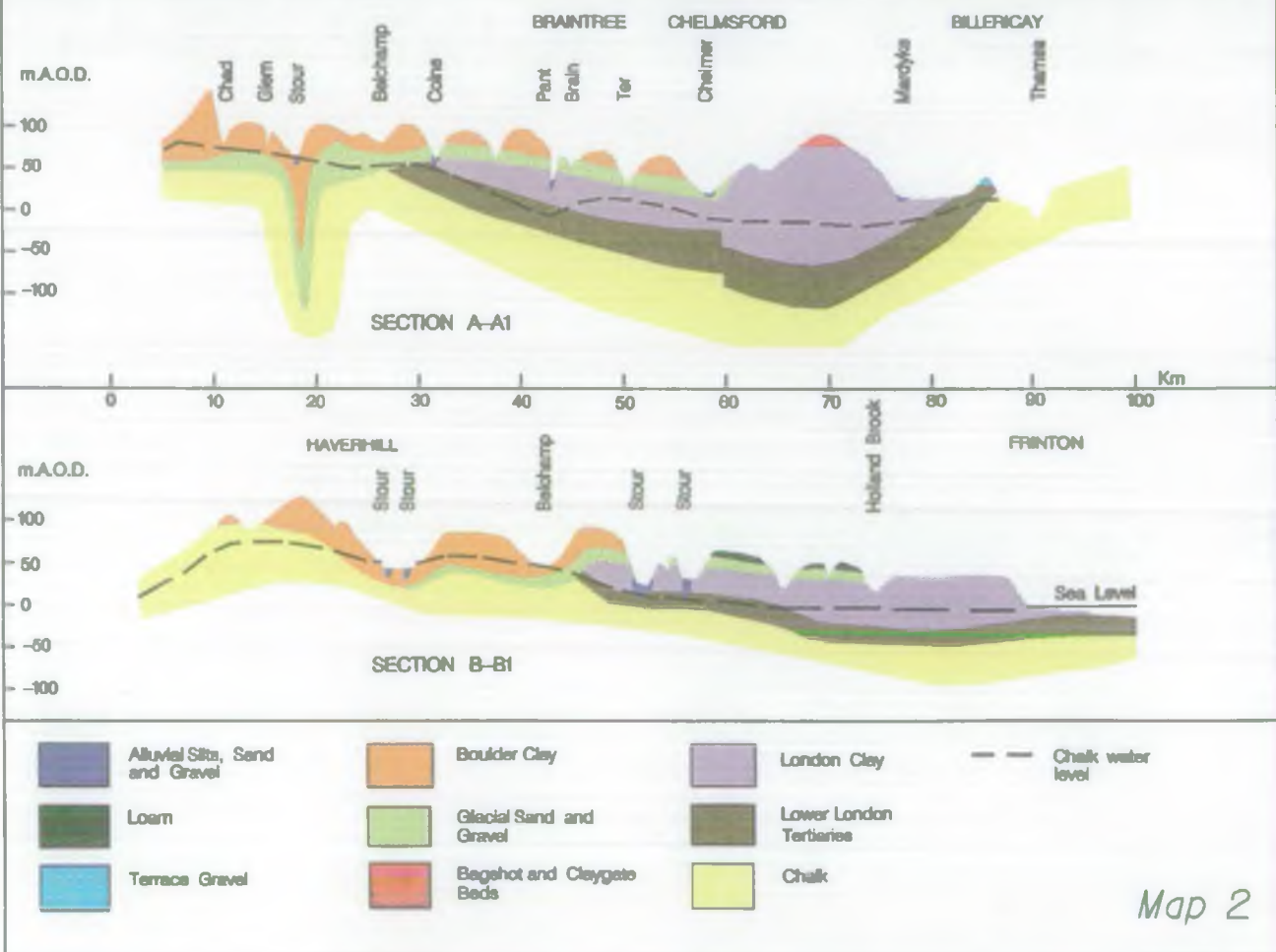
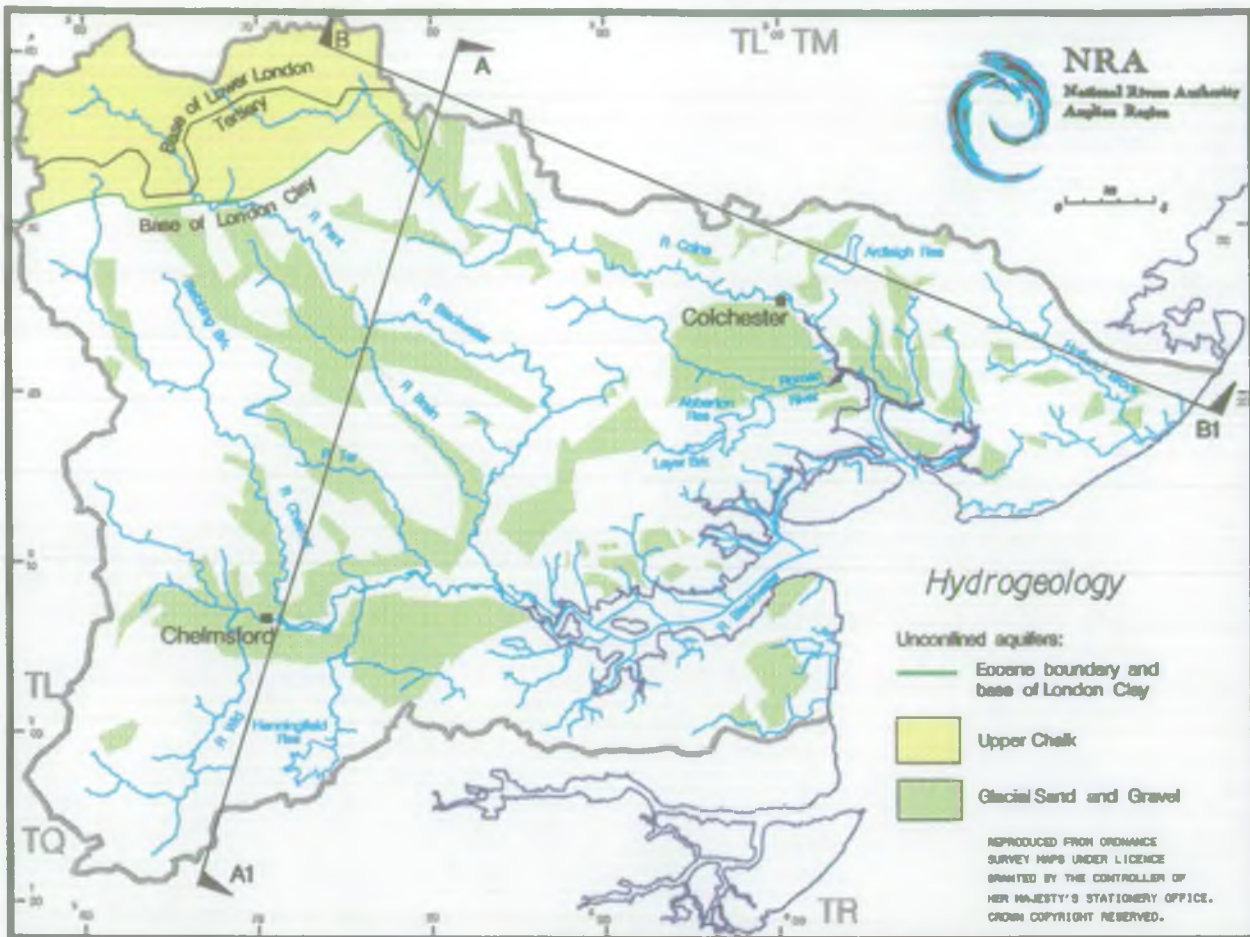
Within the NRA there is a requirement to balance the varied and competing needs for water resources. These include human needs, such as potable water supply industry and agriculture, as well as those of the water environment such as rivers, springs and wetlands.

Water resources within the catchment are derived from both surface (rivers and lakes) and groundwater. Overall availability is assessed by reference to river flow and the long term average recharge to the aquifer from rainfall. Current demands for water are heavily dependent on water imported into the catchment using NRA's Ely Ouse to Essex transfer scheme.

The allocation of water resources is controlled by abstraction licences issued by the NRA under the *Water Resources Act 1991* (previously the *Water Resources Act 1963*). These licences are only issued if there is sufficient water available; the need for the water is justified; all rights of existing users are protected and rivers, springs or wetland sites, are not adversely affected. As water resources continue to be developed it is becoming common practice to include conditions in licences to safeguard these interests.

The current policy with respect to the availability of water for licensed abstraction is as follows:

- Overall, groundwater resources within the catchment are fully committed and the area is classified as having "No Water Available". The only exception where further abstraction may be considered, is where a local surplus can be demonstrated, which could be used locally without causing unacceptable effect on dependent resources, the water environment or other existing users.





Administrative Details

County Council	: Essex
Borough/District Councils	: Basildon      Braintree Brentwood      Chelmsford Colchester      Epping Forest Maldon      Tendring Uttlesford      South Cambridgeshire
NRA	: Anglian Region - Eastern Area
Water Companies	: Anglian Water Services (AWS) Essex & Suffolk Water (ESW) Tendring Hundred Water Services (THWS) Three Valleys Water Services (TVWS)
Sewage Treatment Works	: Anglian Water Services.
Significant Works	: Chelmsford, Colchester, Clacton
Internal Drainage Boards	: None
Flood Defence Committees	: Essex Local Flood Defence Committee

Water Quality

Length of River in General Quality Assessment class 1991 to 1993 in kilometres (km)

River Ecosystem	RIVER CATCHMENT				
	Quality	R. Colne	R. Blackwater	R. Chelmer	All
Class 1	Good	1.5	1	0	2.5
Class 2		6.5	13.3	32.7	52.5
Class 3	Fair	56.6	59.3	90	205.9
Class 4		10	5	28.3	43.3
Class 5	Poor	22	15.8	42.3	80.1
TOTAL		96.6	94.4	193.3	384.3

Topography

Ground Levels	:	Min level +1m OD
		Max level +126m OD
Sea Levels	:	Mean high water springs + 2.6 OD
(Bradwell)	:	Mean low water springs - 2.2 OD

Surface Geology

Upper Colne and River Pant	:	Boulder Clay with exposed Glacial Sands and Gravels in the valleys.
Chelmer, Blackwater, middle and lower Colne	:	Boulder Clay with Glacial Sands and Gravels, River Terrace Gravels, and some London Clay exposed in the valleys.

Solid Geology

Upper Colne and River Pant	:	Chalk.
Blackwater and Chelmer, middle and lower Colne	:	Chalk confined by London Clay.

Water Resource Availability

Groundwater - Chalk	:	No additional water available.
Gravel	:	Limited water available for local development needs.

Surface Water -	No summer water (except from rivers augmented by the Ely Ouse to Essex Transfer Scheme. Subject to cessation conditions / availability of transfer. This currently applies to the River Pant/Blackwater). Limited winter water available.
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## Public Water Supply abstractions:

	AWS		ESW		THWS		TVWS	
	No.	Volume (Ml/a)	No.	Volume (Ml/a)	No.	Volume (Ml/a)	No.	Volume (Ml/a)
Groundwater boreholes	18	12,000	1	1,100	2	1,000	3	2,300
Surface water sources	1	4,800	2	202,000	1	4,800	-	-
TOTALS	19	16,800	3	203,100	3	5,800	3	2,300

(Ml/a = millions of litres per annum)

Flood Defence

Length of Designated Main River	:	Fluvial	473.2 km
	:	Tidal	53.3 km
Length of Main River Embankment	:	Fluvial	6.8 km
Length of NRA Tidal Defences	:	145.8 km	
Area at risk from tidal flooding	:	113 km <sup>2</sup>	
Area at risk from fluvial flooding	:	55.9 km <sup>2</sup>	

Navigation

Length of Navigable River	:	22.2 km
(The Chelmer and Blackwater Navigation)		

Conservation

Number of SSSIs	:	30
Number of water dependent SSSIs	:	11
Number of National Nature Reserves	:	3
Number of Ramsar sites	:	2
Number of ESAs	:	1
Number of SPAs	:	2
Number of proposed SPA/Ramsar sites	:	2
Number of Local Nature Reserves	:	1

Fisheries

River lengths (km) for each biomass class are listed below:-

Biomass Class gm <sup>-2</sup>	A >=20	B >=10	C >=5	D >=0	TOTAL
<b>Holland-on-Sea:</b>					
Holland Brook (Coarse)	0	0	8.0	0	8.0
Kirby Brook (Coarse)	0	0	1.2	0	1.2
Pickers Ditch (Coarse)	0	0	0.5	0	0.5
<b>Colne:</b>					
River Colne (Coarse)	24.2	13.3	0	0	37.5
Roman River (Coarse)	0	0	6.6	0	6.6
Layer Brook (Coarse)	0	0.9	0	0	0.9
<b>Blackwater:</b>					
River Pant (Trout)	12.8	0	0	0	12.8
River Pant (Coarse)	7.4	0	0	0	7.4
River Blackwater (Coarse)	38.3	0	0	0	38.3
River Brain (Coarse)	0	2.2	0	8.8	11.0
<b>Chelmer:</b>					
River Chelmer (Trout)	16.7	0	0	0	16.7
River Chelmer (Coarse)	11.4	0	0	0	11.4
Chelmer & B'water (Coarse)	22.0	0	0	0	22.0
River Can (Coarse)	4.2	0	0	0	4.2
River Wid (Coarse)	14.3	5.8	0	4.4	24.5
River Ter (Trout)	4.6	0	0	4.6	9.2
Sandon Brook (Coarse)	3.5	0.8	0	0	4.3
<b>Asheldham</b>					
Asheldham Brook (Coarse)	0	0	0	9.0	9.0
<b>Total (Coarse)</b>	125.3	23.0	16.3	26.8	191.4
<b>Total (Trout)</b>	34.1	1	0	0	34.1
<b>Total (Overall)</b>	159.4	23.0	16.3	26.8	225.5



### 3.0 CATCHMENT USES

#### 3.1 Development - Housing And Commerce

##### 3.1.1 General

Development must be considered when assessing the use of a river catchment. This use relates to existing and predicted future residential, commercial and industrial development which is identified in adopted and draft county structure and district local plans. These plans identify policies against which the planning authorities consider development proposals.

The NRA is a statutory consultee under planning legislation and advises county and local authorities on development proposals which may have an impact on matters relevant to the NRA.

The NRA seeks to pursue its aims and policies in relation to development through the planning consultation process, and although the final decision on planning matters rests with the planning authority, government guidelines advise on the need to consider the NRA's concern in determining proposals.

Irrespective of obtaining planning consent the NRA may use its relevant powers to control the nature of development proposals.

##### 3.1.2 Local Perspective (Refer to Map 3)

The Catchment is situated within the county of Essex. The catchment covers parts of the Borough/District Councils of Basildon, Braintree, Brentwood, Chelmsford, Colchester, Epping Forest, Maldon, Tendring and Uttlesford, with a tiny element of South Cambridgeshire.

Population, Housing and Settlement indicated within the *Essex County Structure Plan* recognises a need for growth and provides for a potential increase in housing within the catchment area of approximately 20,200 new houses by the year 2001.

Employment growth provided by commercial development including industrial, retail, warehousing etc. is also recognised as a need within the *County Structure Plan*. Provision is made for development sites within the catchment area, the overall area of which could be in excess of one square kilometre during the forthcoming decade.

Much of the growth is likely to be accommodated in the existing towns and main villages although it is expected that some will be provided by limited infilling within existing rural settlements.

Protection against flooding from rivers and the sea, protection of water resources and the protection of ground and surface waters from pollution is of particular concern in the catchment.



### 3.1.3 Development - Objectives

#### Flood Defence:

- To ensure new development is not at risk from flooding and does not put other areas at risk of flooding which could endanger life and damage property.
- To ensure any work which is needed to reduce the risk of flooding created by a new development is paid for by the developer and not the public.

#### Conservation and Enhancement of the Water Environment:

- To protect the water environment from any detriment due to development.
- To enhance the water environment in conjunction with development.

#### Water Quality:

- To protect inland, coastal and groundwaters from pollution.
- To ensure that adequate pollution prevention methods are incorporated into new developments and are consistent with the NRA's *National Groundwater Protection Policy*.

#### Water Resources:

- To ensure that development does not cause unacceptable effects on surface water and ground water sources and to protect the rights of those who are currently licensed to abstract water.
- To ensure water resources are made available to meet the reasonable needs of future development.

### 3.1.4 Development - Policy Summary

#### Flood Defence:

- The NRA will normally resist allocation of land for development, including the raising of land, where such development would be likely to impede the flow of flood water, or increase the risk of flooding elsewhere or increase the number of people or properties at risk. Should development be approved which would adversely affect flood defence standards, or which would be at flood risk itself, the developer should fund all compensation works which the NRA deems necessary prior to commencement of the project.

#### Conservation and Enhancement of the Water Environment:

- The NRA will normally resist allocation of land for development which is likely to have an adverse effect on fisheries, nature conservation, landscape and recreation in river corridors, coastal margins and other waterside areas.







**Water Quality:**

- The NRA will normally resist development including changes in land use which is likely to pose an unacceptable risk to the quality of ground and surface water.

**Water Resources:**

- The NRA will normally resist development including changes in land use which is likely to have a detrimental impact on water resources.

**3.2 Effluent Disposal****3.2.1 General**

Discharges of effluent are controlled by ensuring compliance with NRA consents which stipulate the quality and quantity of the material released. Consents are calculated by taking into account upstream water quality, the dilution available in the receiving watercourse and the desired quality of the receiving watercourse. Consents are designed to ensure that downstream water quality remains acceptable for its many uses and compliant with prescribed water quality standards, including relevant EC Directives and Water Quality Objectives.

Results of the monitoring of the treated effluent from all discharges is available from the *Water Resources Act 1991* Register at NRA Regional Headquarters, Peterborough.

**3.2.2 Local Perspective****3.2.2.1 Sewage Treatment Works  
(Refer to Map 4)**

There are 74 sewage treatment works and two sea outfalls operated by Anglian Water Services within the catchment.

In addition, there are a considerable number of sewage treatment works operated by commercial undertakings, local authorities and private householders. The 76 AWS and 14 larger private discharges are shown on the map and are graded according to the size of the population served by the individual works or sea outfall.

There are two sewage treatment works in the catchment serving populations equivalent to greater than 100,000 persons. Serving a population equivalent of 138,000, Chelmsford sewage treatment works discharges via a pipeline to the head of the Blackwater Estuary, and Colchester sewage treatment works with a population equivalent of 114,000 discharges to the tidal River Colne downstream of the town. Neither of these works complies with the consent standards that would be required to protect the non statutory quality objectives of the respective estuaries. Colchester sewage treatment works is having a significant adverse effect on the

Colne Estuary and a capital scheme is required to make the necessary improvement.

As both the estuaries receive effluents from towns with in excess of 10,000 population, they are candidate Sensitive Areas under the *EC Urban Waste Water Directive 91/271/EEC*. They are also candidate Polluted Waters under the *EC Nitrate Directive 91/676/EEC*. Data is currently being collected to ascertain whether it can be justified to press for designation in the future.

The seven other sewage treatment works serving populations in excess of 10,000 people are at Braintree, Bocking, Halstead, Maldon, Shenfield, St Osyth and Witham. The effluent from all these works comply with their present consent limits on quality and all except Braintree and St Osyth comply with the limits which are required to meet river quality objectives. The effluent from Witham sewage treatment works, which also now includes the sewage from the town of Hatfield Peverel, discharges to the head of the Blackwater Estuary via a pipeline.

#### 3.2.2.2 Coastal Outfalls

The sewage effluent from the towns of Jaywick and Clacton is discharged to the North Sea through their respective long sea outfalls. Both these effluents currently receive minimal treatment but will require primary treatment at least, following the implementation of the *EC Urban Waste Water Directive 91/271/EEC*. Comprehensive studies have to be undertaken which will satisfy the DoE that primary treatment will not adversely affect coastal waters. If these studies are unable to do so, then secondary treatment will be required at Jaywick and Clacton.

#### 3.2.2.3 Industrial Discharges (Refer to Map 5)

Within the catchment there are 21 significant industrial discharges; seven associated with potable water treatment works, and eight with gravel extraction. Included in the rest are farms, factories and Bradwell Nuclear Power Station. The locations of the 21 discharges are shown on the map.

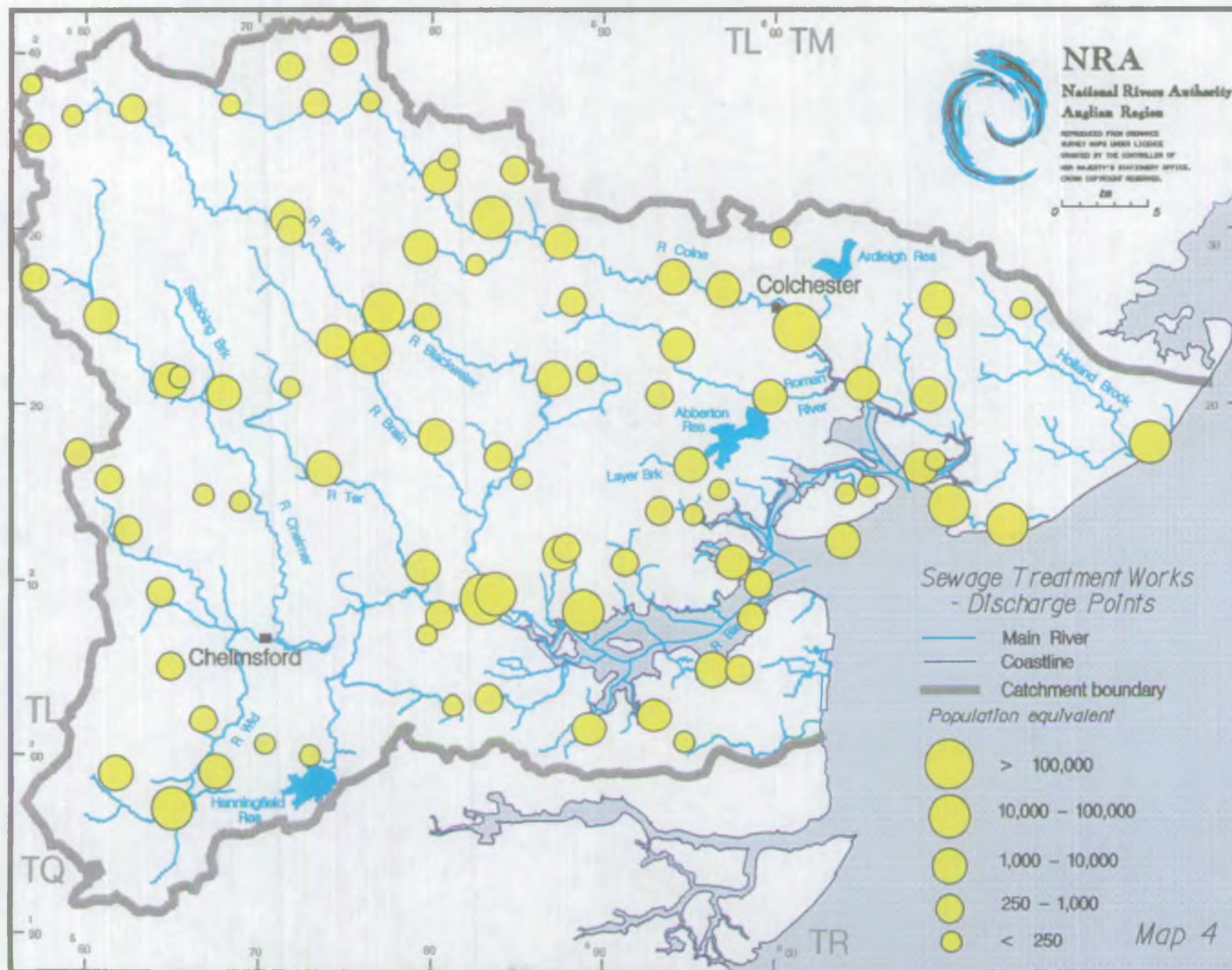
#### 3.2.3 Objectives

##### Water Quantity

- To ensure that low flow river characteristics do not fall below that used for determining the quality limits on consents to discharge.
- To ensure that undue reliance is not placed on effluent to maintain minimum river flows.

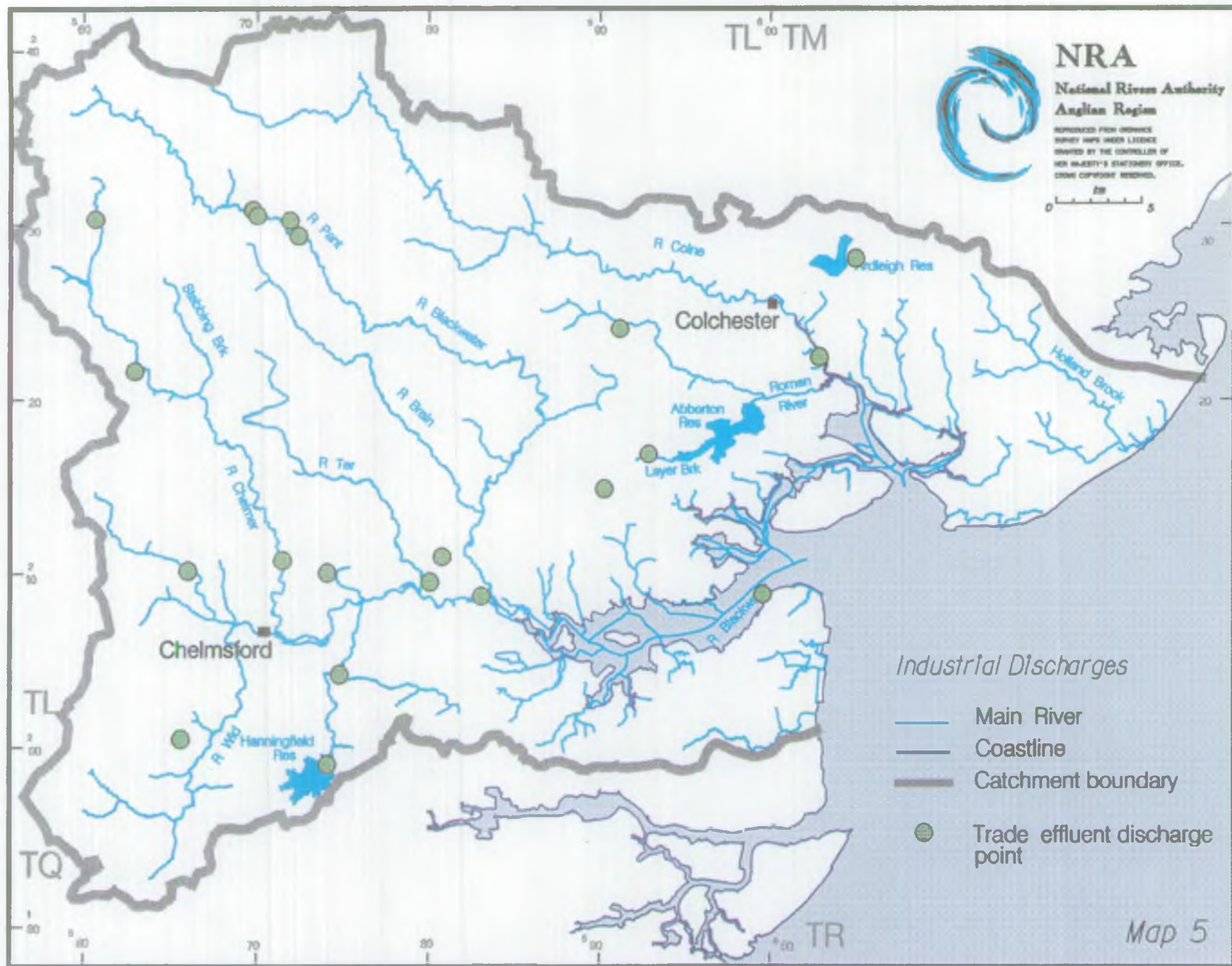
##### Water Quality

- To ensure consent conditions prevent exceedences of EC Directives and adequately safeguard river quality objectives.













- To establish compliance with EC Directives and quality standards by monitoring of effluent and controlled waters, and taking action in the event of non-compliance.

### 3.3 Landfill Sites

#### 3.3.1 General

The NRA is a statutory consultee of Waste Regulation Authorities (WRAs) throughout the life of any landfill site. It is also a statutory consultee of Planning Authorities under the Town and Country Planning Acts. A valid planning permission is required before a Waste Management Licence may be issued. Until recently, the planning permission was the means by which aftercare provision on closed landfill sites could be regulated. However, since 1st May 1994, conditions relating to aftercare as well as operational matters, may be included in the waste management licence.

It is recognised that a wide range of waste management operations require a Waste Management Licence. These include scrap yards, transfer stations, incinerators, waste storage facilities etc. Often the greatest threat to surface and groundwater quality is posed by landfill activities.

#### 3.3.2 Local Perspective (Refer to Map 6)

In the past, the majority of landfill sites were operated on the "dilute and disperse" principle, ie polluting liquid, known as leachate, emerging from the base of a site and into the underlying strata, was considered to be improved by natural attenuation processes and to be diluted by the general movement of groundwater passing under the site. Unfortunately it is now known that in some instances the dilution and attenuation processes were insufficient for rendering the leachate innocuous. Currently these sites do not affect any abstractions within the catchment. In future it is likely that the majority of landfill sites will be constructed as "containment" sites whereby the waste disposal licence will specify the engineering measures which must be taken to minimise the escape of any leachate generated. In addition, monitoring boreholes will be required around each site in order to assess the integrity of these leachate containment measures.

Landfill sites are licensed to accept various categories of non hazardous waste. Category A consists of dry inert material such as top soil, concrete and bricks. Category B wastes may contain substances which decompose slowly such as wood, paper and wool. Category C wastes include materials which decompose rapidly such as domestic wastes, animal carcasses and food processing waste. Within the area there are no sites licensed to accept hazardous waste, but there are a number of active and completed category C sites. Active category B and C, together with significant completed category C sites are marked on the map.

In addition to landfill sites, there are a number of areas of land in the catchment which have been contaminated by past industrial activities. Sites of demolished gas

works are an example. Identification of these sites in order to assess the implications of future development is required and the future Contaminated Land Register may well be of use in this respect.

### 3.3.3 Environmental Objectives

- To ensure that all landfill activity does not compromise water quality or water resources and proceeds in accordance with advice laid down in the NRA's *Regional and National Groundwater Protection Policies*.
- To ensure compliance with *EC Protection of the Quality of Groundwater Directive 80/68/EEC*.
- To ensure, by liaison with Planning Authorities, that advice is given on development proposals which may impact on ground and surface waters.

## 3.4 Mineral Extraction

### 3.4.1 General

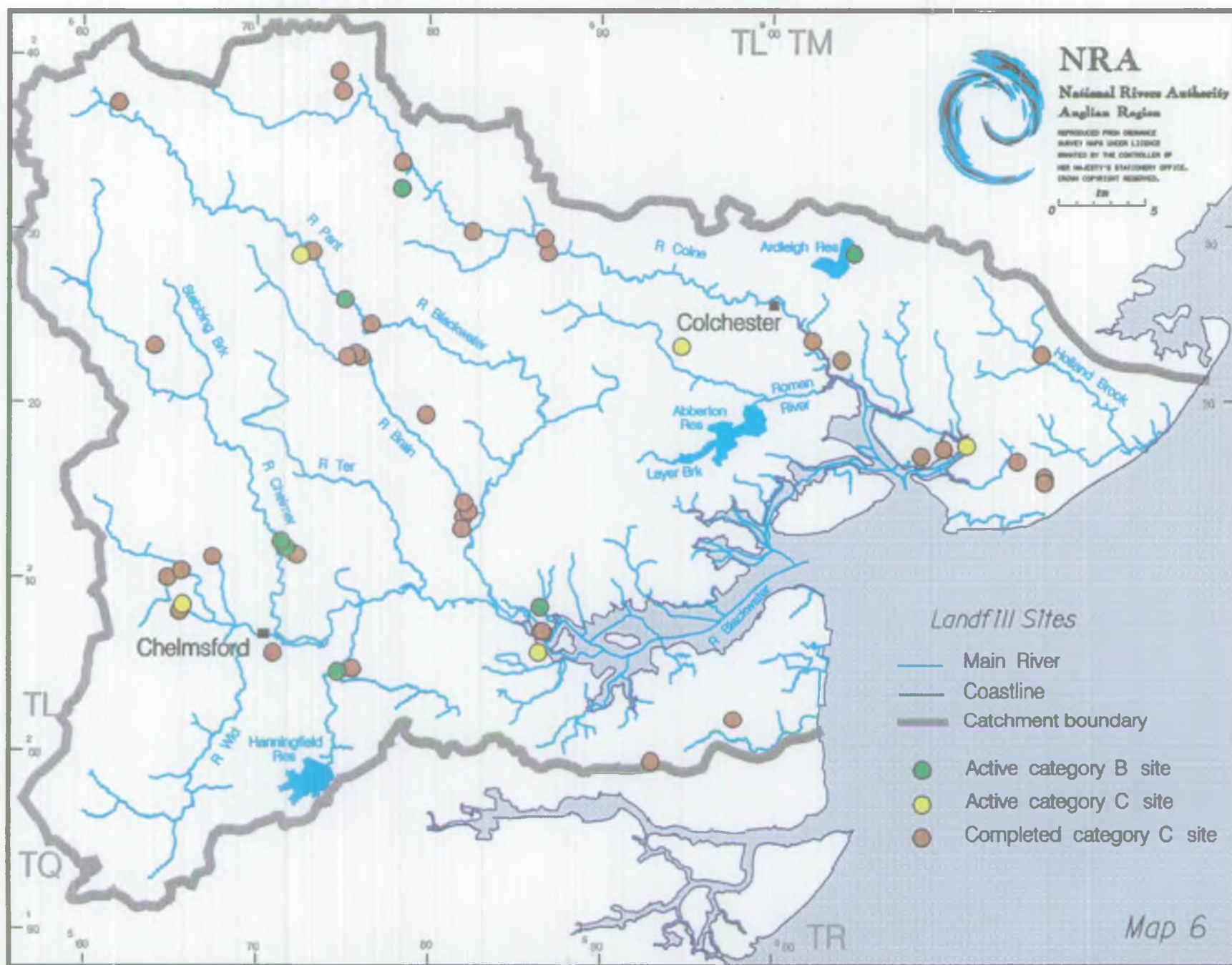
Mineral extraction can affect both groundwater quantity and quality. Generally minerals are located in the river valleys and their removal affects the balance of the river. Water storage for the aquifer is lost and, as a result of evaporation, river replenishment is decreased, particularly during periods of low flow. Materials returned to the excavated area, which are generally non-granular, never satisfactorily replace that which has been removed.

During extraction dewatering can cause suspended solids to be discharged to rivers and the industrial nature of the activity poses other pollution risks such as oil contamination. Any lake created by extraction can, if directly connected to the river, seed the river with algal material causing unacceptable changes in the downstream water quality. However, many disused gravel pits do create valuable conservation habitats and recreational areas.

### 3.4.2 Local Perspective (Refer to map 7)

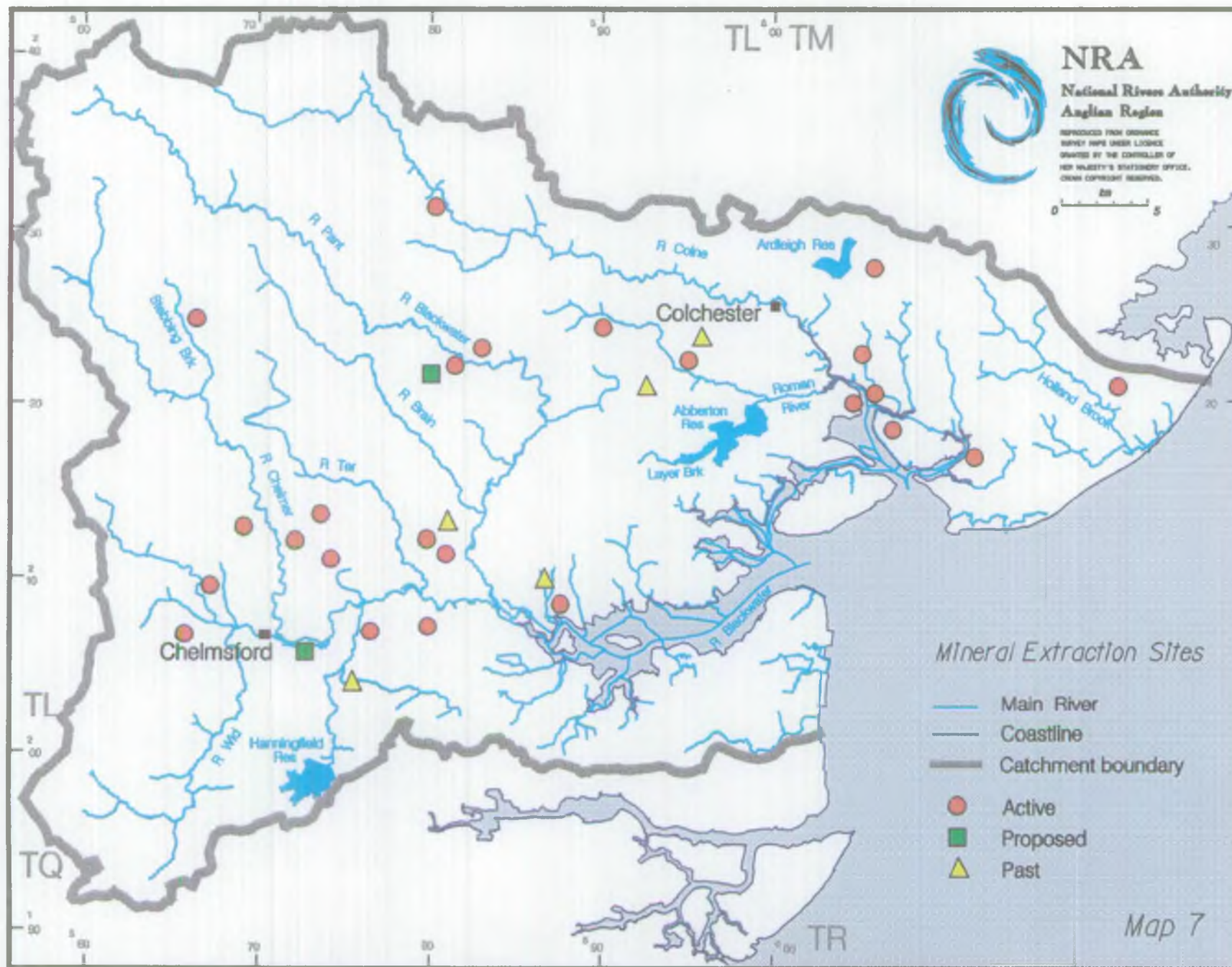
The county of Essex holds significant sources of sand and gravel with production in 1987 of approximately seven million tonnes. The map indicates existing mineral extraction sites, but does not necessarily indicate if these sites are still active; however, the distribution of the sites and the predominance of the sites in the river valleys is clearly shown. In accordance with the *Town and Country Planning Acts*, Essex County Council produced the *1991 Minerals Subject Plan*; this explains the provisions for future extraction and proposed policies to guide that process. The NRA has been consulted on the Plan and should be consulted as a statutory consultee regarding individual planning permissions which should include restoration proposals.

An important source of sands and gravels within the catchment is from marine











deposits. The marine aggregate winning area is located some eight to ten miles offshore parallel to the coast. Although the responsibility for licensing marine aggregate abstraction lies with the Crown Estates Commissioners, the NRA has an interest to ensure that water quality is not adversely affected, sea defences are not put at risk, and marine life is not significantly disturbed. In 1990 the volume of marine sand and gravels was approximately 19% of the land-won aggregates (latest figures from the *1991 Minerals Subject Plan*).

### 3.4.3 Objectives

Wherever possible, groundwater resources will be conserved and protected. The NRA will seek to persuade the County Councils to impose conditions in line with the NRA's *Groundwater Protection Policy* on associated planning permissions.

#### Water Quantity

- To ensure that dewatering and mineral extraction does not cause unacceptable effects on surface and groundwater resources.
- To ensure that existing rights of those who abstract water are protected.

#### Water Quality

- To ensure no deterioration of groundwater or surface water quality.
- To ensure that any discharge of mineral processing water is in line with consent limits and that dewatering and other activities do not cause pollution.

#### Physical Features

- To ensure that worked out sites are reinstated with an enhanced value to the environment and/or recreational facilities.
- To minimise the loss of flood plain habitats of conservation value.
- To control activities both during the extraction and restoration stages to avoid increased flood risks.

## 3.5 Potable Water Supply

### 3.5.1 General

This use relates to the abstraction of water for public consumption (ie. drinking, washing etc). Water is abstracted from wells and boreholes constructed into the underground rocks called aquifers (groundwater abstraction) or from rivers and springs (surface water abstraction). The major source of groundwater in this catchment is the Chalk aquifer although limited amounts are also derived from the overlying Sands & Gravels. Surface water is taken from the rivers Stour (in the adjacent catchment), Blackwater, Chelmer, Colne and Roman River.



Abstractions are made by Anglian Water Services, Essex & Suffolk Water, Tendring Hundred Water Services, Three Valleys Water Services and Ardleigh Reservoir Committee. In addition, individual householders abstract water from wells or boreholes for their own domestic use. Abstractions are controlled by abstraction licences issued by the NRA or its predecessors. Abstractions by private individuals for their own domestic use only require a licence if the abstraction is greater than 20 cubic metres per day.

### 3.5.2 Local Perspective

#### 3.5.2.1 Groundwater (Refer to Map 8)

There are 18 Chalk borehole sites licensed in the catchment for public water supply. Anglian Water Services operate 15 sites with a total licensed quantity of 12,000 Ml/a (millions of litres per annum) and Three Valleys Water Services are licensed to abstract 2,300 Ml/a from three sites.

In addition there are three Sand & Gravel borehole sites licensed; Essex & Suffolk Water are licensed to abstract 1,100 Ml/a from one source and Tendring Hundred Water Services are licensed to abstract 1,000 Ml/a from two sites.

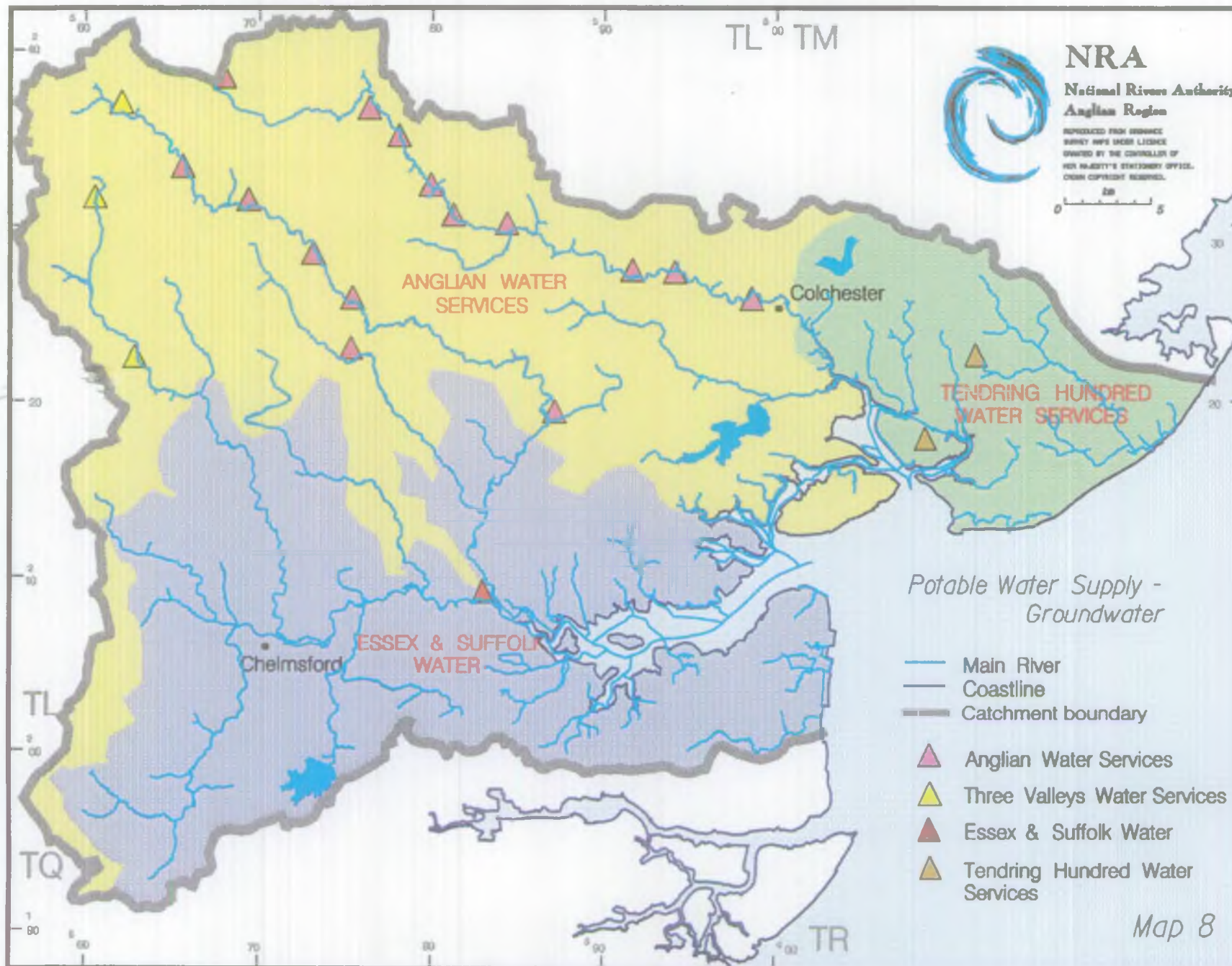
All the water companies operate a comprehensive water supply mains network and hence the water can be distributed from the source to the point of demand. Demand is spread throughout much of Essex taking in the Tendring Peninsular and including the towns of Colchester and Chelmsford, though much of this demand is satisfied through the combined use of surface water and groundwater sources.

Actual abstraction for potable water supply from groundwater in the catchment is currently 70% of that licensed.

Groundwater resources in the catchment are fully committed. Developments to meet future predicted rises in demand are likely to be met from outside the catchment, or by increased conjunctive use of existing groundwater and enhanced surface water imports. Consideration is also being given to further re-use of existing resources within the catchment, such as the effluent from Chelmsford sewage treatment works.

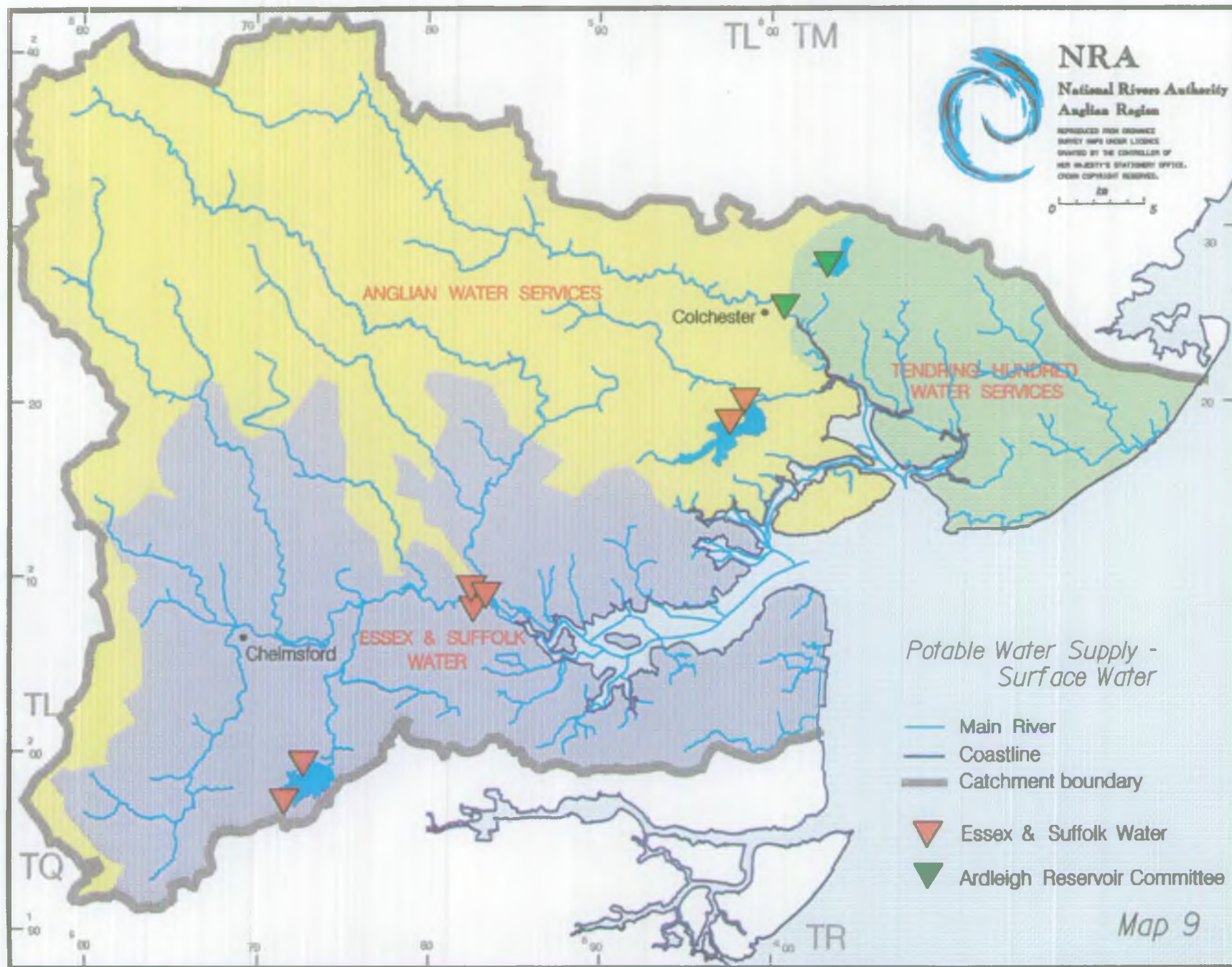
#### 3.5.2.2 Surface Water (Refer to Map 9)

Essex & Suffolk Water operate several surface water intakes to maintain reserves for public water supply in Abberton and Hanningfield reservoirs. Water is imported into the catchment from the River Stour, re-abstracted at Cattawade, Langham and Stratford St Mary and pumped into Abberton Reservoir. Provision also exists to transfer water from Roman River to Abberton. In addition, water is abstracted from the Blackwater and Chelmer rivers at Langford and pumped into Hanningfield Reservoir. Once in storage, the water also provides recreation and amenity facilities prior to subsequent treatment and distribution to the Essex area.













Abstractions are made from the River Colne in order to pump water into Ardleigh Reservoir. This is operated by the Ardleigh Reservoir Committee on behalf of Tendring Hundred Water Services and Anglian Water Services to meet supplies in the Tendring Peninsular and the Colchester area.

River flows in, and abstractions from the River Blackwater (and the Stour in the neighbouring catchment), are supplemented at times of low flows by operation of the NRA's Ely Ouse to Essex Transfer Scheme which augments supplies into the area for subsequent abstraction and distribution. The scheme transfers surface water, when available, which would otherwise be lost to tide through the estuary at Kings Lynn. Flows for transfer can also be augmented by operation of NRA's Great Ouse Groundwater Scheme and the Stour Augmentation Groundwater Scheme which pump groundwater into the system.

### 3.5.2.3 Re-Use of Effluents

The NRA *Water Resource Development Strategy (Anglian Region)* identifies that, by the diversion of Chelmsford sewage works effluent to the River Chelmer and re-use, an additional valuable resource in the order of 30 Ml/d (millions of litres per day) could be made available to help meet increasing demands for water within the area. Currently, the effluent is discharged by pipeline to the Blackwater estuary and consequently lost to the limited resource.

### 3.5.3 Objectives

#### Water Quantity

- To manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.
- In terms of level of service for public water supply, the NRA has worked to the levels of service set by Ofwat (the Water Industries Regulator) for public water supply. These are:-
- A hosepipe ban on average not more than once every 10 years,
- The need for voluntary savings of water on average not more than once in 20 years,
- The risk of rota cuts or use of standpipes on average not more than once in 100 years.

#### Water Quality

- Standards are set in accordance with EC Directives and proposed Water Quality Objectives. For surface water this is the *EC Surface Water Directive 75/440/EEC* and for groundwater the *EC Groundwater Directive 80/68/EEC*.
- To protect existing licensed potable water abstractions from pollution using protection zones.

- To protect all groundwater as a potential future resource in accordance with the NRA's *Groundwater Protection Policy*.

### 3.6 Agricultural and Industrial Abstraction

#### 3.6.1 **General**

This use relates to the abstraction of water from ground and surface sources for agricultural and industrial uses including spray irrigation, general agriculture (stock watering, crop spraying etc), industrial processes, cooling and mineral washing. All such uses, except for general agriculture from surface sources of less than 20 cubic metres per day, require a licence from the NRA.

#### 3.6.2 **Local Perspective** (Refer to Map 10 and Appendix II)

##### Spray Irrigation

Spray irrigation is widely practised across the catchment. There are a total of 535 irrigation licences. The surface geology of the catchment lends itself well to the construction of winter storage reservoirs and this is evident in the high proportion of such schemes in Essex compared to other parts of the country.

The total quantities licensed are 11,300 Ml/a from surface water and 2,500 Ml/a from groundwater.

This use is virtually wholly consumed, ie not returned to the system after use, and therefore lost to the resource.

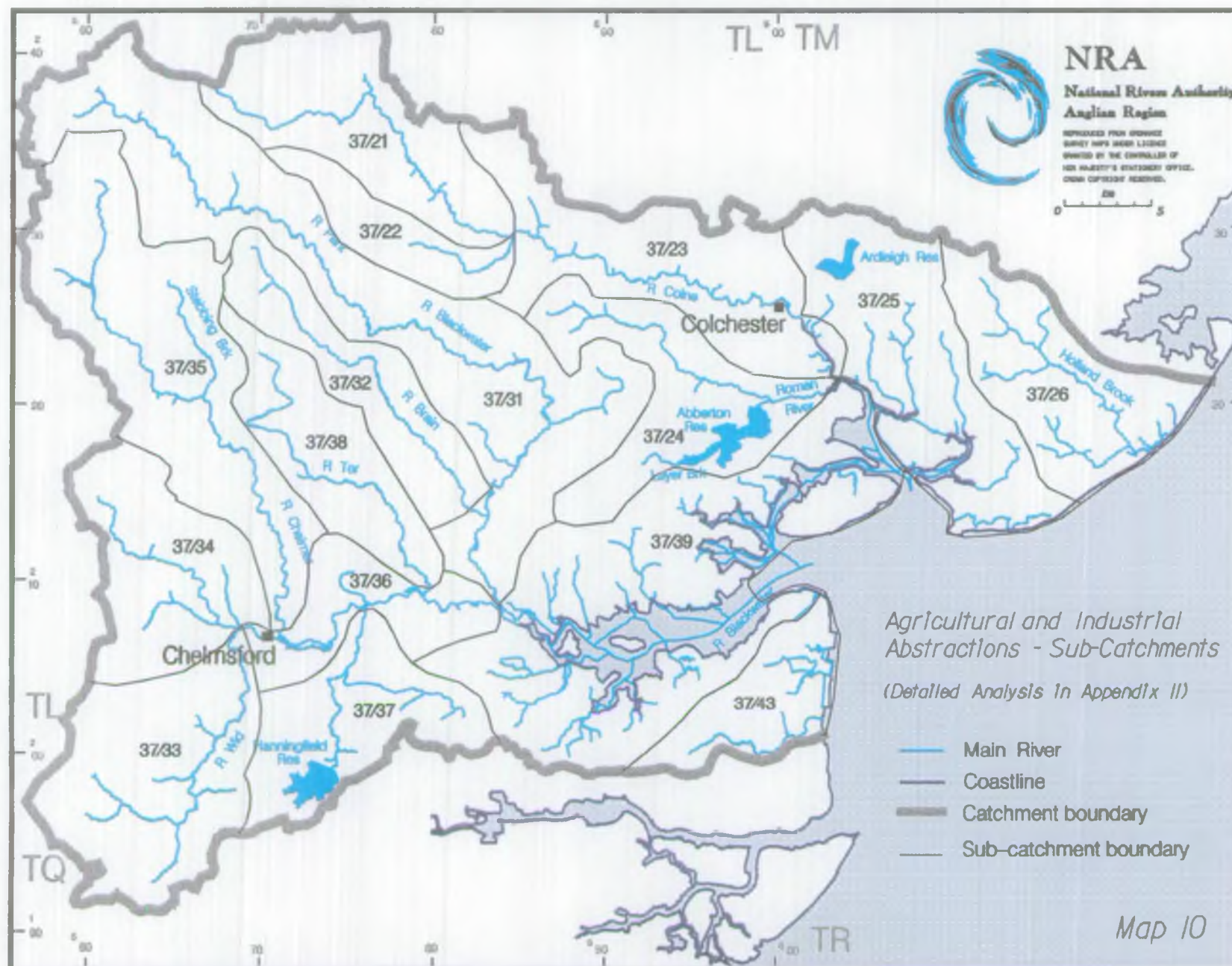
It is estimated that future demand up to the year 2000 for this use is likely to increase by 1.7% per year, reducing to 1% thereafter. Groundwater and summer surface resources in the catchment are considered to be fully committed to the environment and to existing licences and any further demand is likely to have to be met from further winter storage or inter catchment transfers.

##### General Agriculture

There are 379 licences to abstract a total of 1,000 Ml/a for this purpose. In the main they are small abstractions having little impact either locally or on overall resources.

##### Industrial

There are 64 licensed abstractions in the catchment, permitted to take up to 760,000 Ml/a. Fifteen abstractions draw water from surface sources, totalling 750,000 Ml/a, the majority of this being abstracted from tidal waters for use by Nuclear Electric. The remaining 10,000 Ml/a is abstracted from groundwater. Water used in industrial processes generally represent an overall loss but uses such as cooling or mineral washing can result in a high proportion being returned to the system.





### 3.6.3 Objectives

#### Water Quantity

- The Region's level of service objective for spray irrigation is that on average irrigation restrictions should occur not more than once in 12 years.
- To encourage the storage of surplus winter flows in reservoirs for subsequent use during dry periods.

#### Water Quality

- To maintain and improve water quality in accordance with Water Quality Objectives, as appropriate.

### 3.7 Raw Water Transfer and River Support Schemes

#### 3.7.1 **General** (Refer to Map 11)

The Catchment is significantly affected by the Ely Ouse to Essex Transfer Scheme, which includes the Great Ouse Groundwater and Stour Augmentation Groundwater river support schemes.

The Ely Ouse to Essex Transfer Scheme opened in 1971 and is designed to transfer surplus water from the Ely Ouse to the headwaters of the Rivers Stour, Colne and Blackwater, to increase their flows and make extra water available to licensed abstractors, particularly Essex & Suffolk Water who operate reservoirs at Abberton and Hanningfield, and direct abstraction at Langham and Langford.

As part of the scheme, water which originates from the River Ouse at Denver in Norfolk is discharged into the headwaters of the River Stour at Kirtling Green. A pumping station at Wixoe allows some or all of this water to subsequently be transferred to the Rivers Pant/Blackwater.

There is also the facility to support flows in the River Colne although this is currently classed as an unsupported river for charging purposes, and there is doubt that the yield of the scheme is sufficient to allow such support in extreme dry years. Licence conditions allow up to 455 Ml/d (millions of litres per day) to be transferred into the Stour and up to 341 Ml/d to be abstracted from the Stour at Wixoe. Actual abstraction is currently limited by installed pump capacity at Wixoe of 227 Ml/d.

#### 3.7.2 **Operating Rules**

The prime requirement for the Ely Ouse to Essex Transfer Scheme is to provide water to Essex & Suffolk Water's reservoirs at Abberton and Hanningfield. To this end, the timing, pumped flow and duration of the transfer is determined, using reservoir control curves to achieve the optimum reservoir re-fill rate. Natural flows in the Rivers Stour and Blackwater, together with the availability of the water at



Denver Sluice, determine the limits within which these transfer assessments are made.

Due to the complex nature of the calculations and the many people affected by the operation of the scheme, a formal planned pumping procedure co-ordinates the whole process. This ranges from the annual to daily pumping programmes and ensures an efficient flow of information and co-ordination of resources.

In addition to increased environmental opportunities, other benefits to this catchment of the scheme operation are the support to flows in the Rivers Pant/Blackwater for spray irrigation and potable water supplies, and the provision of dilution water at times following pollution incidents. Facility also exists to transfer water into the River Colne; however, this is not widely practised as this river is currently classed as "unsupported" for licence charging purposes. This is because when River Colne abstractors would like to utilise additional supplies from the Ely Ouse to Essex Transfer Scheme in times of drought, the transfer resource is fully committed to abstractors from other rivers.

### 3.7.3 Objectives

#### Water Quantity

- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability.

#### Water Quality

- To maintain and improve water quality in accordance with Water Quality Objectives, as appropriate.

## 3.8 Flood Defence

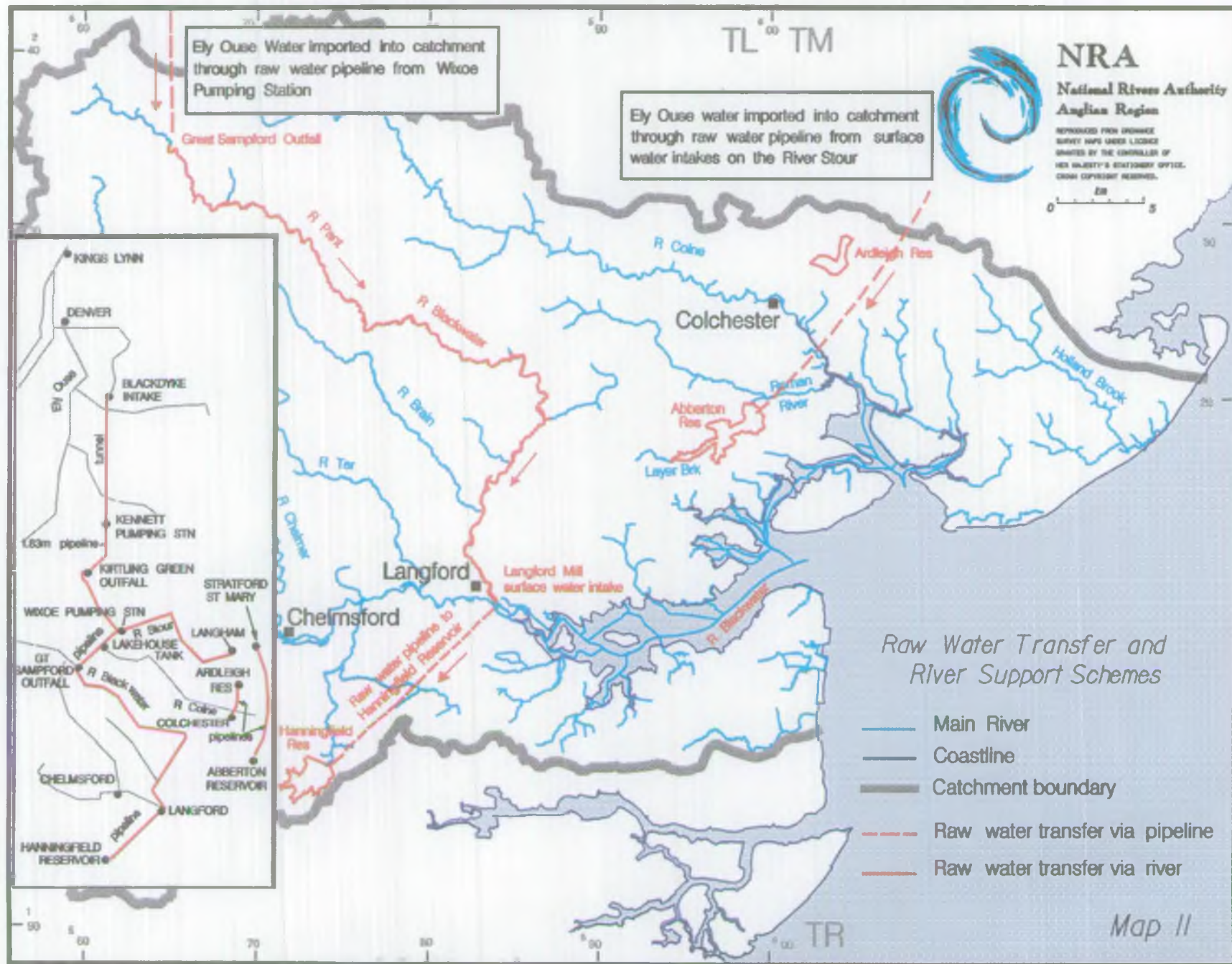
### 3.8.1 General

This catchment use reflects the NRA's corporate aim for flood defence which is the protection of people and property against the risk of flooding from rivers and the sea.

The use is divided into the following categories:-

- Sea Defences
- Fluvial Rivers
- Flood Warning

Section 105 of the *Water Resources Act 1991* requires the NRA to exercise a general supervision over all matters relating to flood defence. For the purposes of management, certain watercourses are formally designated as "Statutory Main River". On Main River, the NRA has special powers to carry out works and control the actions of others. Any proposal that could interfere with the bed or banks or obstruct the flow in the river requires formal consent from the NRA. For





watercourses which are not designated as Main River, local authorities have powers under the *Land Drainage Act 1991*, to maintain or improve existing works or construct new works, except in Internal Drainage Board areas where the powers rest with those boards. These powers are permissive and do not relieve riparian owners from any obligations to which they were subject by reason of "tenure, custom, prescription or otherwise", before the commencement of the 1991 legislation.

### 3.8.2 Local Perspective (Refer to Map 12)

#### 3.8.2.1 Sea Defences

The Rivers Colne, Blackwater and Chelmer all drain into the Blackwater Estuary which is the largest in Essex. Much of the land bordering the estuary is low lying and protected by sea defences. Tidal surges with their origins in the North Sea, can give extremely high water levels, particularly at times of spring tides. The sea defences need to be heavily revetted to prevent damage caused by high water levels and accompanying large waves. The problem of wave damage is increasing as saltmarshes and foreshore levels erode allowing the large waves to be sustained close inshore.

There are several major settlements within the estuary: Heybridge, Bradwell, Mayland and Tollesbury on the Blackwater, and Colchester and Brightlingsea on the Colne. All but Brightlingsea are presently protected by sea defences maintained by the NRA. A scheme to protect Brightlingsea is being promoted. A typical urban frontage defence would be a structural unit - steel sheet piles or reinforced concrete, whereas elsewhere space would allow clay and hoggin embankments to be built.

Beyond the estuary mouth to the north lies the Clacton and Jaywick frontage which is exposed to the open sea. Here sea conditions and tidal currents have in the past caused considerable loss of beach material. Recent major improvement schemes on this frontage have included beach recharge secured by large rock groynes. Even so there are still occasions when the beach is damaged and emergency repairs are required.

Likewise on the Dengie frontage, wave attack is a major problem, but because there are few properties at risk, less expensive solutions are being used. The construction of offshore wavebreaks, and salting regeneration schemes have been undertaken in an attempt to reduce the wave heights near the shore and reduce, or even reverse, the present general trend of salting erosion.

Maintenance activities on the sea defences are generally concentrated on the seaward face, repairing the blockwork revetment and lowering the seawall toe as the foreshore erodes. Repair techniques are continually evolving as new equipment and materials become available. All new working methods are economically and environmentally tested to ensure that there is no risk to the high conservation value of the estuary.

#### 3.8.2.2 Fluvial Rivers

The main fluvial rivers are the Colne, Pant/Blackwater, Chelmer and Brain. Other

significant systems are Holland Brook, Roman River, and the Rivers Ter, Can and Wid. Several large urban areas lie on these rivers; Colchester, Braintree and Chelmsford have had schemes completed to provide flood protection. The rural lengths of channel generally pass through agricultural land, predominantly arable. The natural river flood plain is a vital part of the flood protection regime. If it is lost then water levels will rise, usually damaging property and infrastructure.

Flood management is generally undertaken by the NRA. On the Colne and Blackwater, NRA workmen operate most sluices to optimise flood discharge. This is more a responsibility of the mill owners on the Chelmer system and is appropriate to the needs of that river. The other major reason for NRA gate operation on the Blackwater and the Colne concerns the Ely Ouse to Essex Transfer Scheme. This requires careful water level monitoring and fine adjustment of sluice gates.

The fluvial rivers are generally of a natural channel section, and require little more in the way of maintenance other than annual weed cutting and selective desilting, with any unstable trees being removed or pollarded. During floods, blockage patrols keep gates and bridges clear.

The upkeep of the many old timber mill gates and sluices is one of the biggest problems. These are important to the environmental value of the rivers and to the discharge of floodwater. Unfortunately the majority are in private ownership and are costly in both finance and time for their owners to maintain effectively.

#### 3.8.2.3 Flood Warning

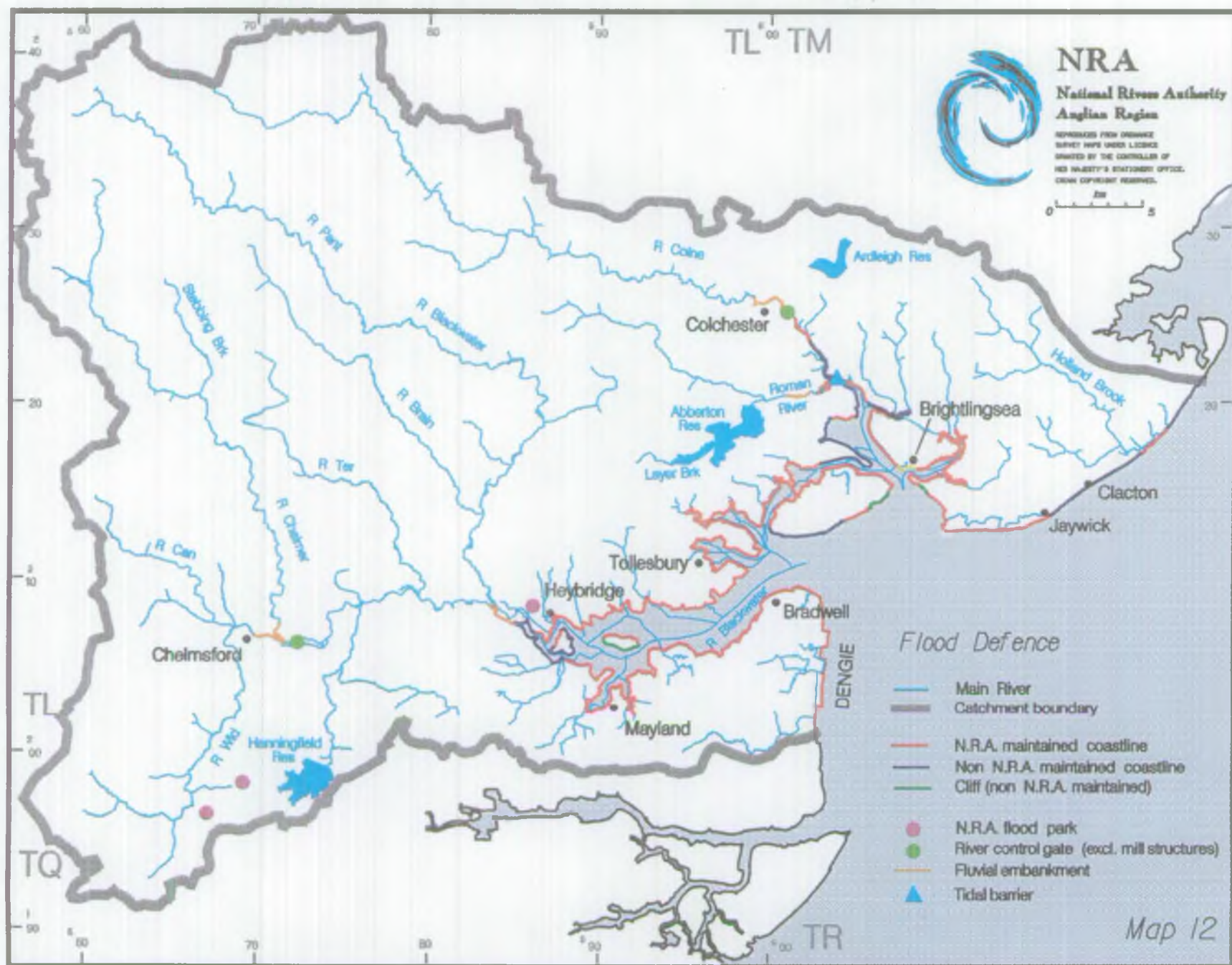
The NRA provides information and advice to Essex County Police Force. This gives them sufficiently advanced warnings of areas likely to be affected by tidal and/or fluvial flooding, in order that effective actions can be taken. When appropriate, public warnings are issued.

### 3.8.3 **Objectives**

#### Physical Features

- To provide an effective defence for people and property against flooding from rivers and the sea. The standard of protection to be economically viable, technically sound and environmentally acceptable.
- To provide adequate arrangements for flood forecasting and warning.
- To provide an emergency response to flood events.
- To maintain river channel structures and sea defences to protect people and property to the appropriate standard and take account of environmental needs and requirements.
- To ensure the effective operation of barriers, washlands, sluices and other control structures.
- To identify and action environmental enhancement opportunities.







- To monitor and assess coastal geomorphology.

### 3.9 Surface Water Drainage

#### 3.9.1 General

This concerns the provision for the passage and disposal of surface water from the catchment via watercourses and sewers to the tidal estuary or sea frontage.

#### 3.9.2 Local Perspective

##### Rural

The catchment falls generally into two main types of drainage - steeper "upland" and flat "lowland" systems.

The "upland" system is typically found on the upper and mid reaches of the river systems. Here falls are steeper and channels flow freely, being mostly self cleansing. Much of the arable land has sub-surface drainage which causes fairly rapid run-off to the ditches and watercourses. This also tends to increase chemical run-off and contributes to the diffuse pollution problem. Smaller watercourses such as the River Brain can be quite "flashy", responding rapidly to rainfall, and falling quickly afterwards.

The "lowland" systems are found along the coastal belts, Tendring and Dengie particularly, and to a lesser degree at the seaward ends of the Blackwater Estuary. Here the lack of steeper land gradients and tide-lock conditions hold water in the channels and cause siltation. Much of the old pasture land behind seawalls, and some of the arable land was formerly saltmarsh or has become freshwater marsh. In these areas the borrow ditch (used to gain material for seawall construction) forms a collection drain for surface water and land drainage, discharging through tidal sluices at low water. Recent years of drought have caused many minor, and some major sluice outfall channels to silt up and block: the difficulty then is one of keeping the channels flowing.

##### Urban

The surface water drainage in the major towns varies considerably. Areas that have been recently constructed or redeveloped generally incorporate systems which balance and control the rates of discharge to the rivers. The older parts of towns suffer from sewer overloading at times of heavy rainfall, due to sewers containing a combination of sewage and storm water, and flooding is also caused in receiving channels.

#### 3.9.3 Objectives

##### Water Quality

- To ensure that adequate precautions are taken to prevent contamination of surface water from roads, urban and industrial areas.

- To ensure that surface water discharges are of a suitable quality for the receiving watercourses.
- To explore with other agencies techniques for controlling diffuse nutrient sources (nitrogen and phosphorus).
- To ensure that watercourses are of a suitable quality for their various uses.

#### Physical Features

- To ensure that discharges to watercourses from new development is adequately controlled so as to avoid surface water flooding problems.
- To maintain the drainage effectiveness of watercourses to meet flood defence requirements and take account of nature conservation interests.

### 3.10 Water Mills

#### 3.10.1 General

Within the catchment there are a large number of water mills which are of varying but considerable age, and within the next 50 years it is thought that they will all fail as water retaining structures unless maintained and renovated or bypassed with new structures. There are over 50 such mills and the effects of their demise and loss of retained water level would be considerable in terms of amenity, landscape value and also from the point of view of environmental and recreational interests. The mills themselves usually involve a minimum of four separate structures - floodgates, control gates, weirs and mill head banks. Of the 54 mills within the catchment, the NRA holds the water rights to 10 and can be considered to have some responsibility for the maintenance of the structures. At the remaining sites the NRA has no legal duty to operate river control works, but may do so during flooding or emergency conditions.

#### 3.10.2 Consequence of Collapse

If nothing is done to the mill structures they will all eventually fail and the retained water level will run away. This will inevitably lead in a short while to reversion to the original water course with the river running swiftly at shallow depth. Apart from the sites where the water rights have been acquired by express agreement, there are, even in the general case, factors which should be taken into account. These are:-

1. Visual amenity. At present the river system has considerable charm and character because of the broad stretches of slow moving water, interrupted at intervals by picturesque cascades at each mill pool.
2. Fisheries. Fishing is by far the main recreational activity on the impounded rivers and the majority of reaches are leased by angling clubs for private fishing. Loss of water depth would have a considerable impact on the nature of the rivers

and lead to an overall reduction in fish population by up to 90%. Also related to the change in water habitat, the number of species supported would probably fall from the present eight or nine to about two.

3. Navigation. Some stretches of river are used for recreational boating and canoeing. In this catchment, the NRA does not have any statutory navigation responsibilities. The River Chelmer between Chelmsford and Heybridge is a statutory navigation and is the responsibility of the company of proprietors of the Chelmer and Blackwater Navigation Ltd. Loss of mill heads would very significantly reduce river lengths available to water borne craft because of shallow water.

4. Abstractions. Should the mill structures collapse, water would no longer be available in the quantity and at the level previously occurring. This would affect numerous abstractors on the major rivers who use the water for spray irrigation. Whilst there is no obligation on the NRA to ensure a supply, it would undoubtedly be detrimental to those licenced abstractors with fixed intakes. There are within this group, public water supply abstractors who take from certain impounded reaches, and these would be protected by specific works outside the scope of a general policy on mill structures.

5. Water quality. Obviously there are a number of sewage treatment works discharging into the rivers which rely on a combination of dilution and aeration to achieve an acceptable quality. The shallow, rapid flowing river gives greater aeration and the ability to self purify and would therefore be something of an advantage. Also, in some circumstances it may be desirable to minimise retention time of certain pollutants and clear them quickly from the river system. However, with an impounded river the surface area is greater and therefore increased aeration enhanced by the turbulent flow over the mill weirs. There is also a distinct advantage in controlling pollution incidents, particularly of oil, which require the use of floating booms.

6. Bank erosion. The effect of the structures is to reduce the slope of the water surface and, in normal times, slow down the movement of the water. This leads to less erosion of the banks, and concentrates all the violent flows in the vicinity of the mills where adequate protective measures can be taken against damage. It is the failure to ensure that such protection works have been maintained that has led to the present conditions at the mills.

7. River operations. Advantage is taken of the long lengths of deep water to employ weed boats for maintenance operations. It has been found to be cost effective on the wider rivers where bank access is difficult for large plant. There is also a complementary effect in that weeds do not grow in the deeper water and growth is confined to the shallower edges of the channel.

### 3.10.3 Local Perspective (Refer to Map 13)

Of the 54 mills referred to above, many can no longer retain a water head and in some cases, the mill gates have been removed. None are now in commercial



operation for the purpose of grinding corn, though Abbey Mill on the River Blackwater at Coggeshall has been restored to full working order and is open occasionally for exhibition.

### 3.10.3.1 Private Mill Rights

Most mills are in private ownership for residential purposes, with their owners holding the mill rights. These give entitlement to control water levels and some other privileges, together with a legal duty under the NRA's byelaws to maintain the river control works in a proper state of repair and efficiency to the reasonable satisfaction of the Authority. Nevertheless, this occasionally leads to conflict between private mill owners and the NRA. Sometimes the imminent collapse of a structure risks loss of retention levels with high impact on fishery and conservation or it risks blockage to channels and flow ways preventing the controlled discharge of flood water. In such situations a solution can sometimes be found with the co-operation of the mill owners and a contribution towards repairs.

### 3.10.3.2 NRA Mill Rights

River Colne	.....	Langley Mill, Earls Colne, Fordham Mill, East Mill.
River Pant/Blackwater	.....	Wethersfield Mill, Straits Mill, Pointwell Mill, Greys Mill.
River Chelmer	.....	Felsted Mill, Hartford End Mill.

### 3.10.4 **Objectives**

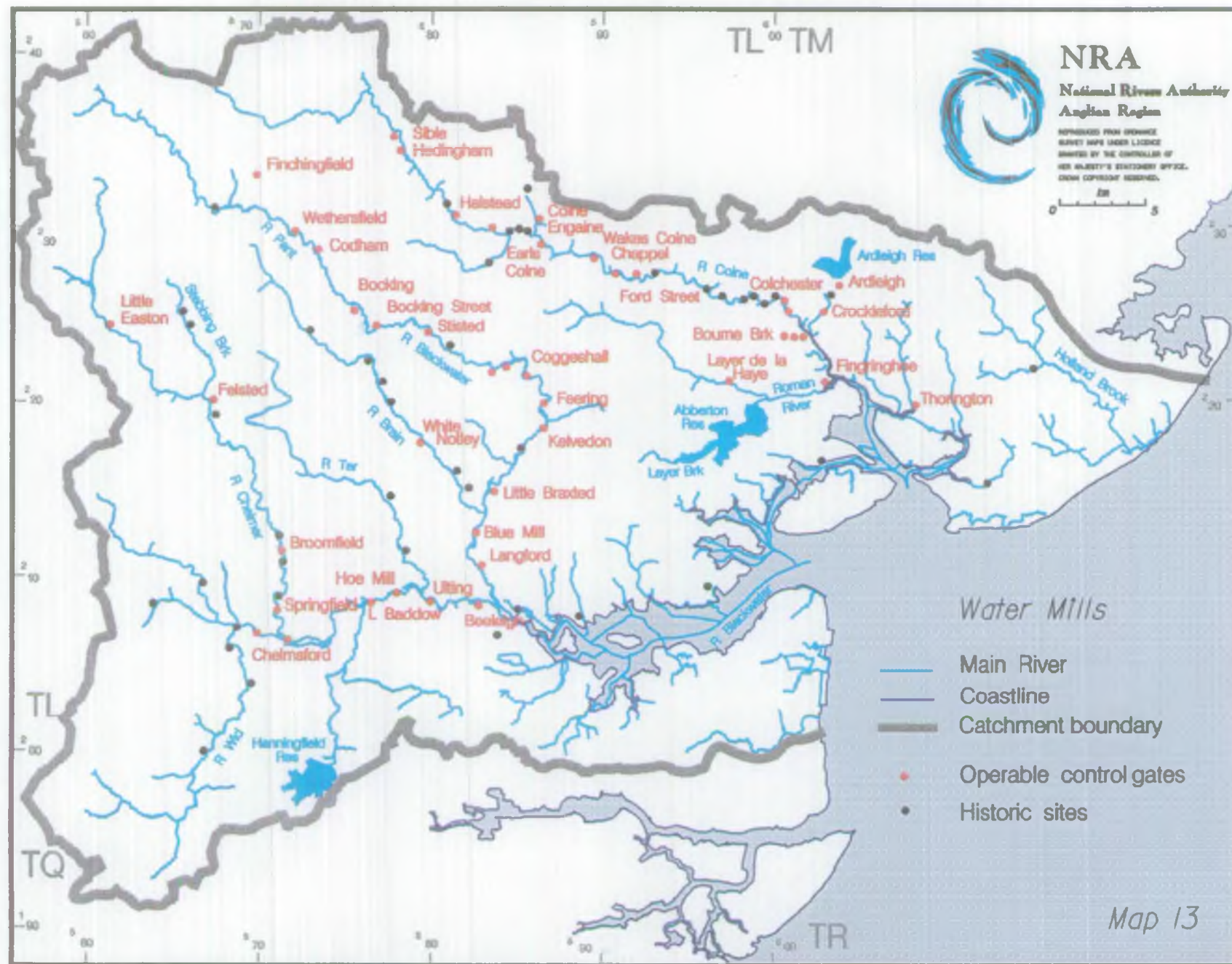
#### Physical Features

- To maintain mill pools and millstreams free of silt, obstructions and weed growth to allow continued use.
- To maintain mill structures and controls, to allow their operation under all flow conditions.
- To automate manually controlled mill structures/sluices where appropriate.

### 3.11 Fisheries -Freshwater

#### 3.11.1 **General**

Under Section 114 of the *Water Resources Act 1991* the NRA has a duty to maintain, develop and improve fisheries. Section 2 of the same Act confers a more general duty to further the conservation of flora and fauna, which is important for bank-side aquatic habitat. Fish populations are affected by both the quality and quantity of water, and by the physical suitability and structure of the aquatic ecosystem. The presence of a thriving fish stock is therefore one of the best possible indicators of a satisfactory water environment.





Freshwater fisheries use covers:-

- 1) Game fisheries - those supporting breeding populations of salmonid fish (represented only by riverine brown trout in this catchment).
- 2) Coarse fisheries - those supporting breeding populations of coarse fish (represented mainly by various cyprinid species, together with eels, pike and perch).
- 3) Maintained fisheries - those supporting non-breeding populations of fish maintained solely for recreational exploitation (represented mainly by "put and take" rainbow trout fisheries).
- 4) Fish Farms - those sites supporting the artificial propagation and growing-on of fish under controlled conditions for commercial and/or management purposes.

### 3.11.2 Local Perspective (Refer to Map 14)

Fish population surveys are undertaken on all major rivers in the plan area once every three years. Extensive data on the fish populations are available, and these are used to derive a fisheries classification scheme based on the biomass (grams per square metre of water surface area -  $\text{gm}^{-2}$ ) of the stocks present.

The principal fluvial fisheries are to be found in the main reaches of the Rivers Colne, Pant/Blackwater, Chelmer, Can and Wid. Less significant but still important stocks are found in their larger tributaries, namely the Rivers Brain and Ter and Sandon Brook. The smaller catchments of Roman River, Holland Brook and Asheldham Brook are also capable of supporting significant numbers of the larger species. Lesser streams nearly always contain small fish such as minnow, stickleback, bullhead and stone loach.

Coarse fish are dominant throughout. The most numerous cyprinids are roach, dace, gudgeon, chub and bream. Eels, pike and perch are also common, although pike do not occur upstream of Coggeshall on the Pant/Blackwater. Brown trout are rare in relation to the coarse fish and are present only in the River Ter and in the upper reaches of the Rivers Pant and Chelmer. Those in the River Chelmer are supplemented by periodic, privately sponsored introductions designed to maintain a small scale brown trout fishery.

Reservoirs, lakes and ponds supporting fish stocks occur throughout the area; there are too many of them to identify individually. Little precise data exist on these stocks, although it is abundantly clear that they represent a very important and large scale fisheries resource. All of the maintained "put and take" rainbow trout fisheries fall into this category.

There are three fish farms in the area; these are located at Hanningfield and Ardleigh Reservoirs, and at the Chigborough Fisheries Lakes. All three concentrate on the rearing of rainbow trout, although a smaller number of brown trout are also

raised at Ardleigh. The farms primarily support major trout fisheries at the locations concerned, whilst surplus stocks are sold on for introduction to other waters.

### 3.11.3 Freshwater Fisheries Requirements

The overall requirement is to sustain natural trout and coarse fish populations appropriate to fluvial fisheries throughout the catchment area. Due regard should also be given to the maintenance of the smaller species of fish in minor watercourses, and of all species of fish in reservoirs, lakes, ponds and fish farm sites.

### 3.11.4 Environmental Objectives

#### Water Quality

The following stretches are designated under the *EC Freshwater Fisheries Directive 78/659/EEC*.

<i>River</i>	<i>From</i>	<i>To</i>	<i>Kilometres</i>	<i>Fish Species</i>
River Colne	Sible Hedingham	Halstead	8	Cyprinid
River Colne	Earls Colne	Colchester	20	Cyprinid
Roman River	Stanway	Abberton	9	Cyprinid
River Pant	Great Sampford	Wethersfield	12	Salmonid
River Blackwater	Wethersfield	Langford	44	Cyprinid
River Chelmer	Churchend	Heybridge Basin	50	Cyprinid
River Can	River Wid	River Chelmer	4	Cyprinid
River Ter	Great Leighs	River Chelmer	13	Cyprinid

The NRA has an obligation to ensure that water quality in the above stretches complies with the appropriate specifications in the Directive.

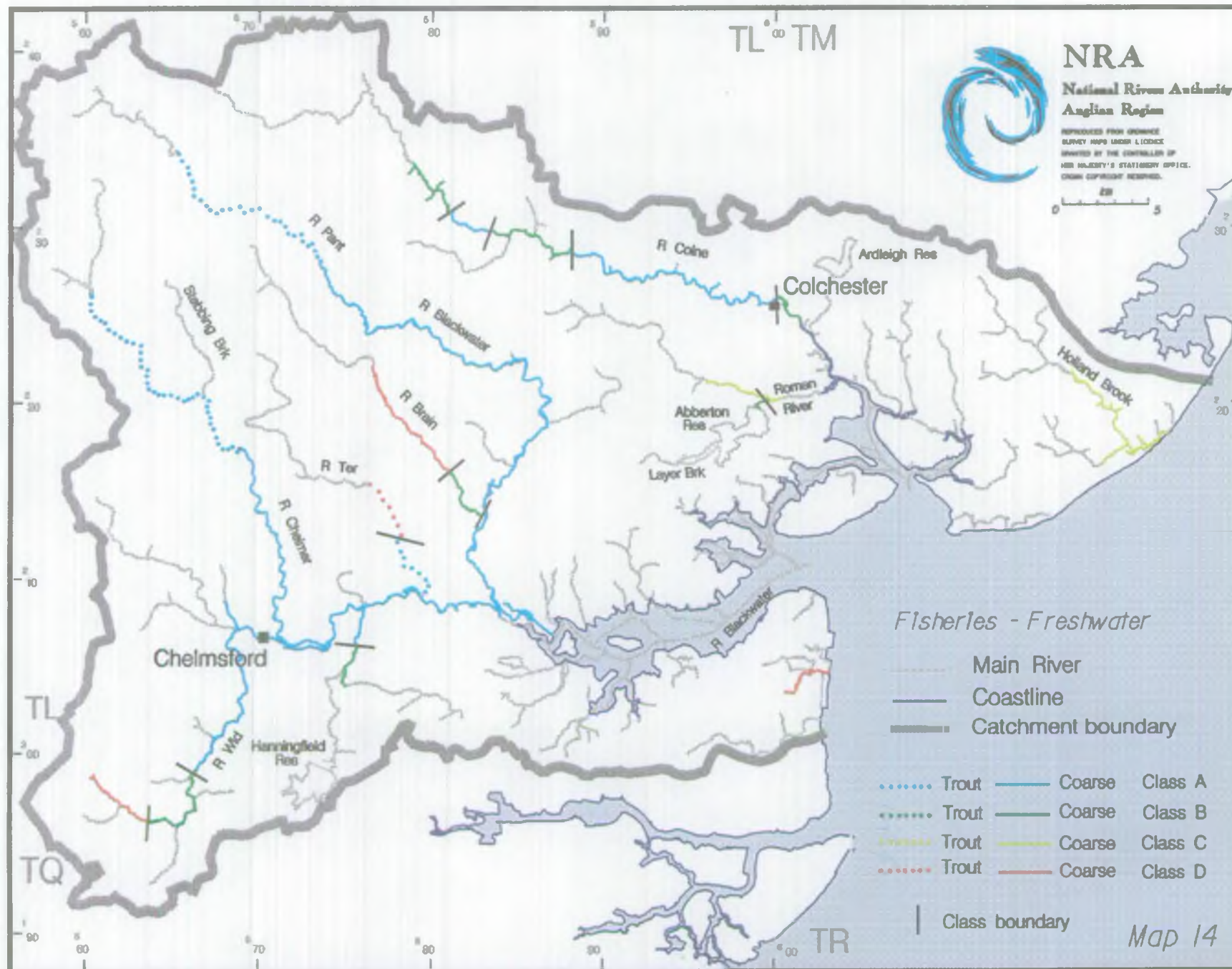
All other stretches containing a viable fishery are to be protected from any impact that may adversely affect the fish stocks.

#### Water Quantity

River flows should be adequate to sustain both game and coarse fishery uses as appropriate. Control structures should be operated so as to minimise the impact of flow and level changes, and of saline incursions, on the fish stocks present.

The Ely-Ouse to Essex Transfer Scheme should be operated so as not to artificially enhance flows (in the Colne or Pant/Blackwater) to the point where the physical habitat of the rivers is adversely affected, or the existing species balance is significantly disrupted. It is most desirable that augmentation flows are regulated to take account of the spawning requirements of the fish stocks present. Water levels in reservoirs, lakes and ponds supporting fish stocks should not be subject to derogation by third party interests.







### Physical Features

A diversity of natural (and artificial) features should be maintained, so as to ensure the best possible variety of both river and lake habitats, and consequently to contribute to optimum fish production. These features should include variable depth profiles, impounding structures, riffle/pool sequences, gravel beds, in-channel weed beds and marginal vegetation up to and including trees.

River maintenance operations should be designed to have the minimum possible impact on fish populations, and to ensure that the physical habitat is not adversely affected.

Opportunities for enhancement works on all waters should be acted on wherever possible.

## 3.12 Angling

### 3.12.1 General

The NRA has a duty under Section 25 of the *Salmon and Freshwater Fisheries Act 1975* to regulate the taking of salmon, trout, freshwater fish and eels by rod and line for recreational (or commercial) purposes, by means of a system of licensing. The Fisheries Byelaws specify demarcation points, generally at the limits of tidal waters, downstream of which licences are no longer required. Freshwater anglers also require permission to fish from the owner or controller of the fishing rights on the water in question.

The capture of brackish or salt water species in estuaries and coastal waters is not regulated by licensing or other means, although certain byelaws enacted by various statutory bodies can impinge on its conduct. There is a public right to fish in virtually all tidal waters, which was established by *Magna Carta*.

Freshwater angling use covers all interests concerned with the taking of fish by rod and line from all inland waters upstream of the demarcation points.

Saltwater angling use covers all interests concerned with the taking of fish by rod and line from estuaries and coastal waters, downstream of the demarcation points.

### 3.12.2 Local Perspective (Refer to Map 15)

Angling is a very common and widespread recreational activity throughout the catchment area, and is widely practised on both freshwater rivers and lakes, on estuaries, and at sea.

### Freshwater

The majority of freshwater angling takes place under the auspices of clubs or syndicates, of which there are approximately 60 existing examples. The activities

of about seven of these are confined to rivers, whilst about 29 are confined to reservoirs, lakes or ponds. The remainder have interests on both categories of water. Membership can range over two orders of magnitude, from tens to thousands per club. Some of the larger clubs control a wide range of waters, which may be owned, leased or rented.

An increasing number of still waters are open to anglers on a commercial ticket basis. These venues vary enormously in both origin and scale. They include the major public water supply reservoirs, and a range of farm reservoirs, disused gravel and clay pits, ornamental lakes and purpose built ponds.

Free public fishing has a very limited availability, and is confined to river bank under Local Authority control.

The majority of anglers are interested in the pursuit of coarse fish, such as bream, carp, chub, dace, roach, perch, pike and tench. Chub and dace stocks are generally confined to the rivers, whereas the best carp fishing is to be found on still waters. In some instances anglers will simply try to catch what they can, but other individuals develop particular specialisms, and only fish for specific species such as carp or pike. Fly fishing for trout is perhaps the most widespread and distinctive specialist category. Competitive match fishing is widely practised for both coarse fish and trout, although the majority of angling is non competitive in nature.

Coarse angling is dominant on both rivers and still waters. There is virtually no formally organised river trout fishing although this still occurs on private waters in the Chelmer catchment. Despite the dominant interest in coarse angling, most of the large commercial fisheries are dedicated to trout. These include Essex and Suffolk Water's Hanningfield Reservoir, which has an outstanding and nationwide reputation.

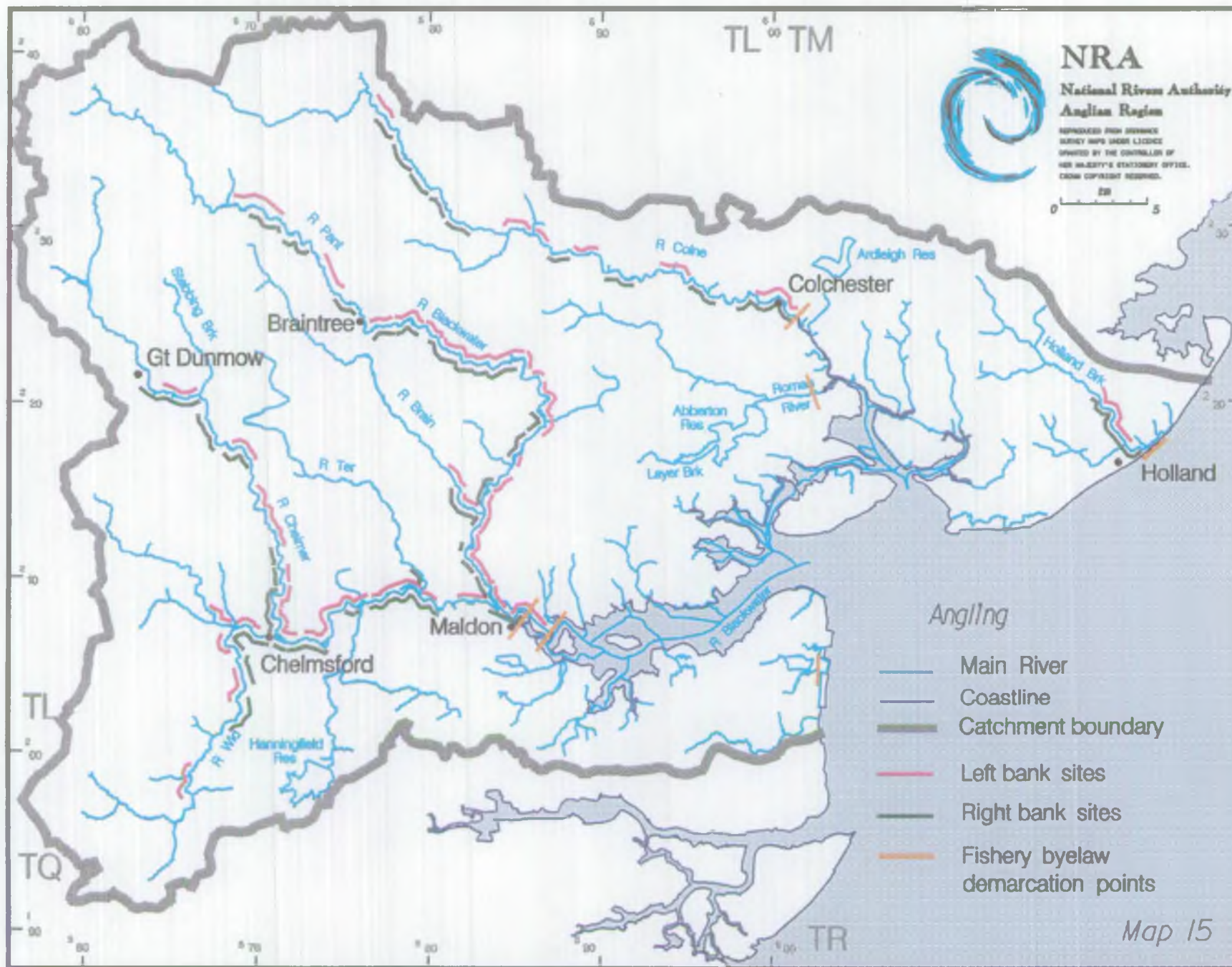
The distribution of the principal angling river venues is shown on the map. These occur primarily on the Colne, Pant/Blackwater and Chelmer, with smaller and tributary rivers represented by the Brain, Can, Wid, Ter and Holland Brook. There are far too many reservoirs, lakes and ponds used by anglers to show individually.

### Saltwater

The existence of a public right to fish in tidal waters means that saltwater angling takes place mainly on an informal basis. Sea angling clubs exist either in their own right or as a wing of a larger organisation with interests in all aspects of the sport. These clubs concentrate primarily on social, commercial and competitive aspects, since they cannot undertake ownership or management of waters in the same way as their freshwater counterparts.

Saltwater angling can and does take place from the shore in almost any location where access is possible. The extensive saltings and mudflats that occur along much of the coast can inhibit angling at low water, and lead to a concentration of activity at or around high tide.









Angling from both privately owned and commercially chartered vessels is commonplace in the main estuarine reaches and along the open sea coasts. Charter vessels operate primarily from Brightlingsea, Bradwell and West Mersea.

Unlike freshwater species, the majority of saltwater fish are regarded as palatable and are retained for the table upon capture. Bass are probably the most highly prized quarry in this respect. Other species regularly taken include cod, whiting, skate, stingray, sole, dogfish, tope and grey mullet. A significant number of freshwater eels are also caught in saltwaters.

Digging of baits for saltwater fishing along the foreshore is a controversial activity which is potentially damaging, particularly if undertaken mechanically and/or on a commercial scale. Bait digging within coastal SSSIs and NNRs can threaten their conservation value by reducing the food resource available to other wildlife. In the Dengie Flats NNR, bait digging is licensed exclusively by English Nature to the Dengie Bait Diggers Association, which is empowered to issue a maximum of 50 permits to its members. In some locations bait digging is prohibited by Local Authority Byelaws.

### **3.12.3 Angling Requirements**

The principal requirement is to provide and sustain suitable and safe conditions for the pursuit of successful angling in all environments where appropriate fish stocks can exist.

### **3.12.4 Environmental Objectives**

#### Water Quality

All waters used for angling are to comply with the quality objectives appropriate to them, which should reflect both their freshwater or commercial (marine) fisheries use, and their basic amenity value. They should also be aesthetically acceptable, and free of surface films, litter, excessive vegetation growths, discolourations and unpleasant odours.

#### Water Quantity

All waters used for angling are to comply with the quantity objectives appropriate to them, which should reflect their freshwater fisheries use. It is not possible to specify quantity objectives for tidal waters.

Particular attention should be given to the operation of the Ely Ouse to Essex Transfer Scheme such that the artificially enhanced flows generated (in the Colne and Pant/Blackwater) do not detract from angling success, or decrease the occurrence of flow regimes which allow angling to take place.

River water levels in all locations should be maintained within satisfactory limits, especially at times of marked flow change.

### Physical Features

Sufficient access points to all kinds of waters used for angling should be maintained, to include adequate access for the disabled.

The management and maintenance of all waterside environments used for angling should reflect the requirements of the sport as well as those of other legitimate interests.

## **3.13 Fisheries - Commercial and Marine**

### **3.13.1 General**

The NRA is responsible for regulating commercial fishing for eels, salmon and migratory trout in all waters, in accordance with Section 25 of the *Salmon and Freshwater Fisheries Act 1975*. It is also responsible for implementing the *EC Shellfish Waters Directive 79/923/EEC* in tidal waters.

The control and management of marine fin fisheries and crustacean shellfisheries in the catchment is undertaken by MAFF and/or the Kent and Essex Sea Fisheries Committee.

### **3.13.2 Local Perspective**

#### Eels, Salmon and Migratory Trout

Extensive commercial eel fisheries exist in the catchment, primarily downstream (seawards) of the demarcation points specified in the Fishery Byelaws. These demarcation points generally correspond with the limits of tidal water.

Commercial eel fishing upstream of the demarcations is regulated by a system of licensing. It may only be conducted with the permission of the owner or controller of the fishing rights, and in accordance with the Fishery Byelaws. It is rarely practised, although some fishing has occurred in recent years on the River Chelmer, downstream of Chelmsford.

Seawards of the demarcation points, eel fishing is excused from licence duties and is effectively free of any constraints defined by the Fishery Byelaws. Offshore, eels are caught primarily by trawling, often by boats operating in pairs. The inshore fishery makes extensive use of fyke nets. Eels can be caught in tidal waters throughout the plan area.

Eel trawling involves the use of smaller mesh nets than are normally allowed for other forms of fishing. This can be controversial if the byecatch includes a significant proportion of marine fin fish too small to be taken legally as the intended catch. Trawling for eels in tidal waters is regulated by the Kent and Essex Sea Fisheries Committee Byelaws, and by *EC Regulation 3094/86*.

Salmon and migratory trout do not occur in any of the catchment's freshwaters. Commercial fishing for them in all waters seawards of the demarcation points is

outlawed by the Fishery Byelaws, in order to protect stocks migrating through to other localities.

#### Shellfisheries

(Refer to Map 16)

There are extensive and important molluscan shellfisheries in the Blackwater and lower Colne estuaries, around Mersea Island and in a number of the tidal creeks associated with these areas. These fisheries primarily involve bivalves, namely oysters, cockles and mussels. Significant numbers of whelks and winkles are also taken.

The oysterages differ from the other shellfisheries in that they now depend largely on the deliberate laying of juvenile stocks for subsequent harvesting, once they have reached a marketable size. The sheltered coastal waters are well suited to these fisheries, which have been exploited for hundreds of years. The Borough of Colchester in particular has a strong association with them, and still has an annual oyster feast as its principal civic event.

The laying in Goldhanger Creek of juvenile clams for growing-on is a comparatively recent shellfisheries initiative, which may become more widespread if it proves successful.

The sedentary and filter feeding habits of all bivalve molluscs means that they are prone to the accumulation of particulate pollutants and of faecal bacteria, which can render them unfit for human consumption. Regular monitoring of tidal waters, and of the shellfish themselves, is therefore required to ensure that the appropriate food hygiene standards can be met.

#### Whiteweeding

Whiteweed is harvested from the offshore banks by the local fishermen: it is dependant upon its abundance at any one time and the profit in conventional fishing.

### **3.13.3 Commercial and Marine Fisheries Requirements**

The requirements of commercial fisheries are that the biological, chemical and physical characteristics of the fishing areas are maintained and managed in such a way as to allow the exploitation of the commercially viable stocks on a long term and sustainable basis.

### **3.13.4 Environmental Objectives**

Protection of the eel fisheries depends mainly on safeguards for the freshwater stages of their life cycle. These are identical to those defined for freshwater fisheries in general, and are dealt with in section 3.11.4. The objectives outlined below are therefore confined to tidal waters.

#### Water Quality

Water Quality Objectives for tidal waters are formulated nationally to protect both

local and migratory fish populations of all species. Water quality in the commercial fishery areas will then be maintained or improved to meet these objectives.

A large part of the Blackwater Estuary and part of Pyefleet Channel to the north of Mersea Island are designated shellfisheries under the *EC Shellfish Waters Directive 79/923/EEC*. These areas must comply with the quality limits laid down in the Directive.

Fifteen shellfisheries are also classified under the *EC Shellfish Hygiene Directive 91/492/EEC*. Shellfish taken for sale from these classified areas must comply with the quality limits laid down in this Directive.

There are no current plans to improve or extend the areas currently designated / classified under either of these Directives.

#### Water Quantity

It is not possible to specify water quantity objectives for tidal waters, beyond the maintenance of minimum residual freshwater flows at tidal limits, wherever such flows are prescribed.

#### Physical Features

The management and maintenance of all aquatic environments used for commercial fisheries should reflect the needs of the industry, as well as those of other legitimate interests.

Every effort must be made to ensure that offshore industries and coastal developments (including sea defences) do not disrupt the physical habitat in any way which threatens the long term viability of commercially exploited fish or shellfish stocks.

### **3.14 Ports, Harbours and Commercial Navigation**

#### **3.14.1 General**

This use relates solely to the tidal River Colne with commercial activity at Fingringhoe, Rowhedge, Colchester and Brightlingsea. There is limited commercial navigation on the Blackwater.

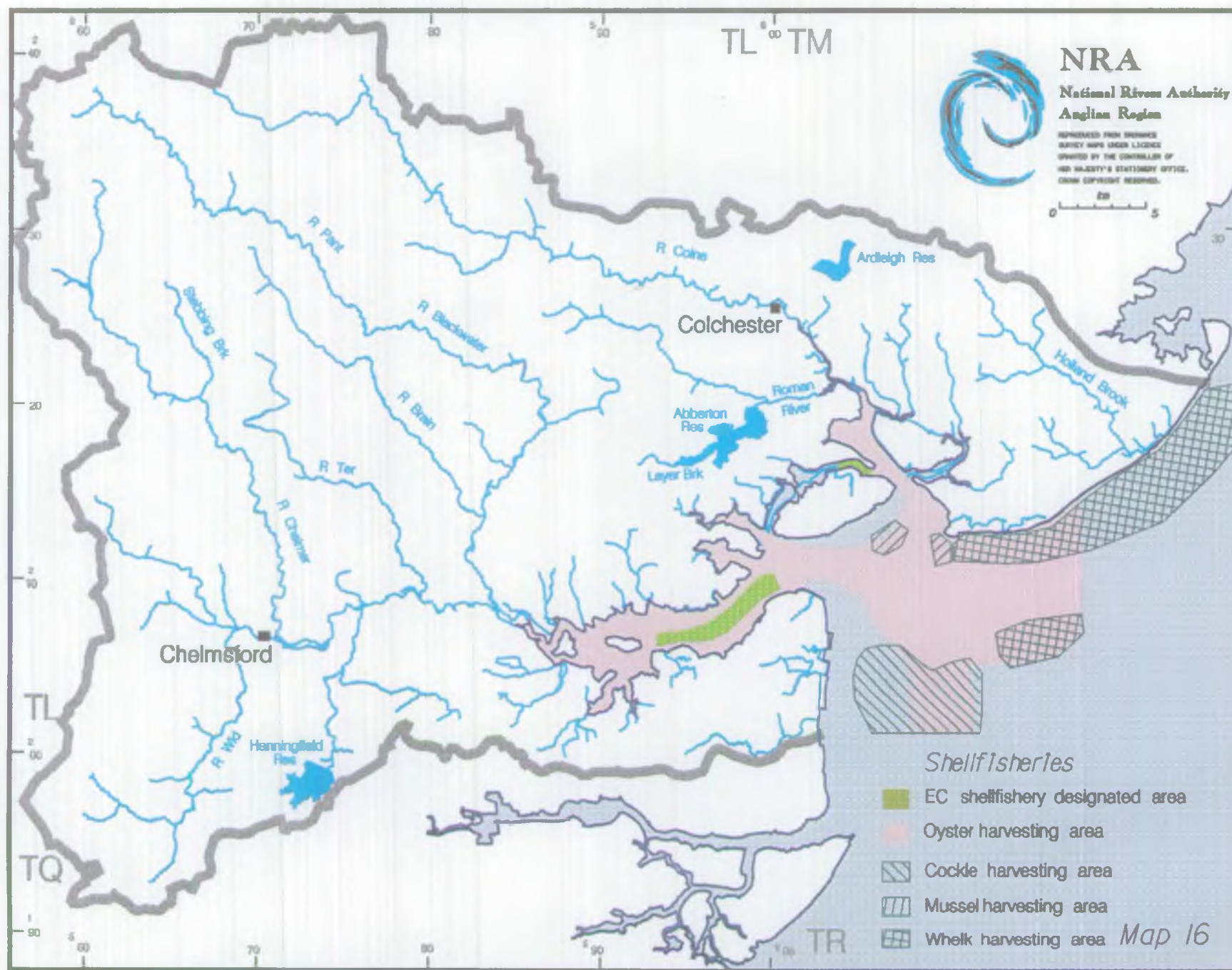
Historically the largest natural harbour was at Holland-on-Sea, but massive coastal changes destroyed this many centuries ago. Until the mid 1980s, Wivenhoe was a significant port, but shipping activity here has now ceased.

#### **3.14.2 Local Perspective (Refer to Map 17)**

##### Port of Colchester

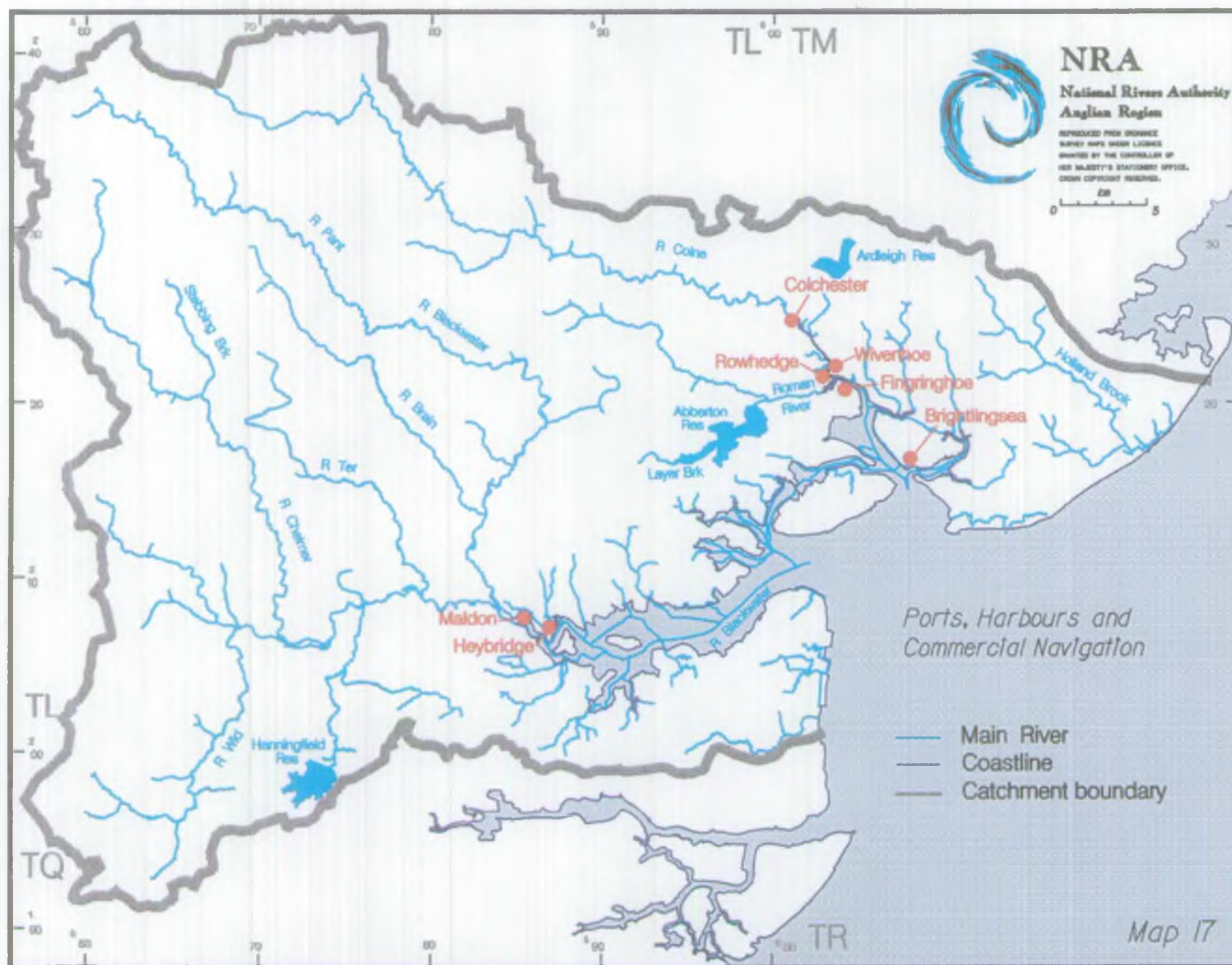
This port is operated by Colchester Borough Council whose Harbour Master













controls navigation on the Colne from North Bridge, Colchester to Colne Point (excluding Brightlingsea Creek).

The port handles approximately 700 piloted ship movements per year, mainly of vessels carrying sand and gravel. An additional 1200 non piloted movements of vessels less than 50 metres long are also monitored. (Source - Colchester Harbourmaster).

#### Ports of Brightlingsea and Fingringhoe

These ports are also of commercial significance with sand and gravel loading being of principal importance.

#### Port of Maldon

Although this port is no longer of major commercial importance, it should be noted that there is a significant usage by Thames Barges, which operate charter cruises based at Maldon Quay, with some activities based at Heybridge Basin.

### 3.14.3 Objectives

When operating the Colne Barrier, as far as possible, minimise the adverse effects of operation on commercial navigation without prejudicing flood defence.

To ensure that the operation of the Port of Colchester and commercial navigation on River Colne do not adversely affect water quality.

### 3.15 Conservation - Ecology

#### 3.15.1 General

This use specifically relates to the promotion, protection, maintenance and enhancement of flora, fauna and physical features of conservation and ecological importance.

#### 3.15.2 Local Perspective (Refer to Map 18)

Appendix III gives a comprehensive listing of SSSI's and other conservation locations which are protected by statute. The map shows their location and the extent of the Essex Coast ESA.

#### Holland Brook

This sub-catchment contains a wide range of habitats of which unimproved grazing pasture is of particular ecological value. The upper valley supports numerous broadleaved woodlands including the largest ancient woodland in the Tendring peninsular, Weeley Hall Wood. The lower valley coastal and freshwater marshes are of national importance and contain notable dyke flora and fauna.



### River Blackwater

The Blackwater valley supports important semi and unimproved grazing meadow. In the upper valley ancient and secondary woodland of particular note are present, supporting a diverse ground flora with some species uncommon or decreasing in Essex.

### River Colne and Roman River

These valleys contain nationally recognised habitats including a complex mosaic of woodland, scrub, heath, grassland, fen and grazing marshes. Supported within the associated dyke and open water habitats is an outstanding assemblage of plant species, many of which are nationally scarce.

### River Chelmer

The Chelmer valley contains a rich mosaic of woodland, heathland, fen and bog habitats, giving rise to a diverse flora. Four of the woodland types represented within this sub-catchment are considered rare in Britain and are the best examples to be found in Essex. In the lower valley, Danbury Common SSSI is one of the largest remaining areas of heathland in Essex and shows various stages in the succession from open heathland to Birch and Oak woodland.

### Reservoirs

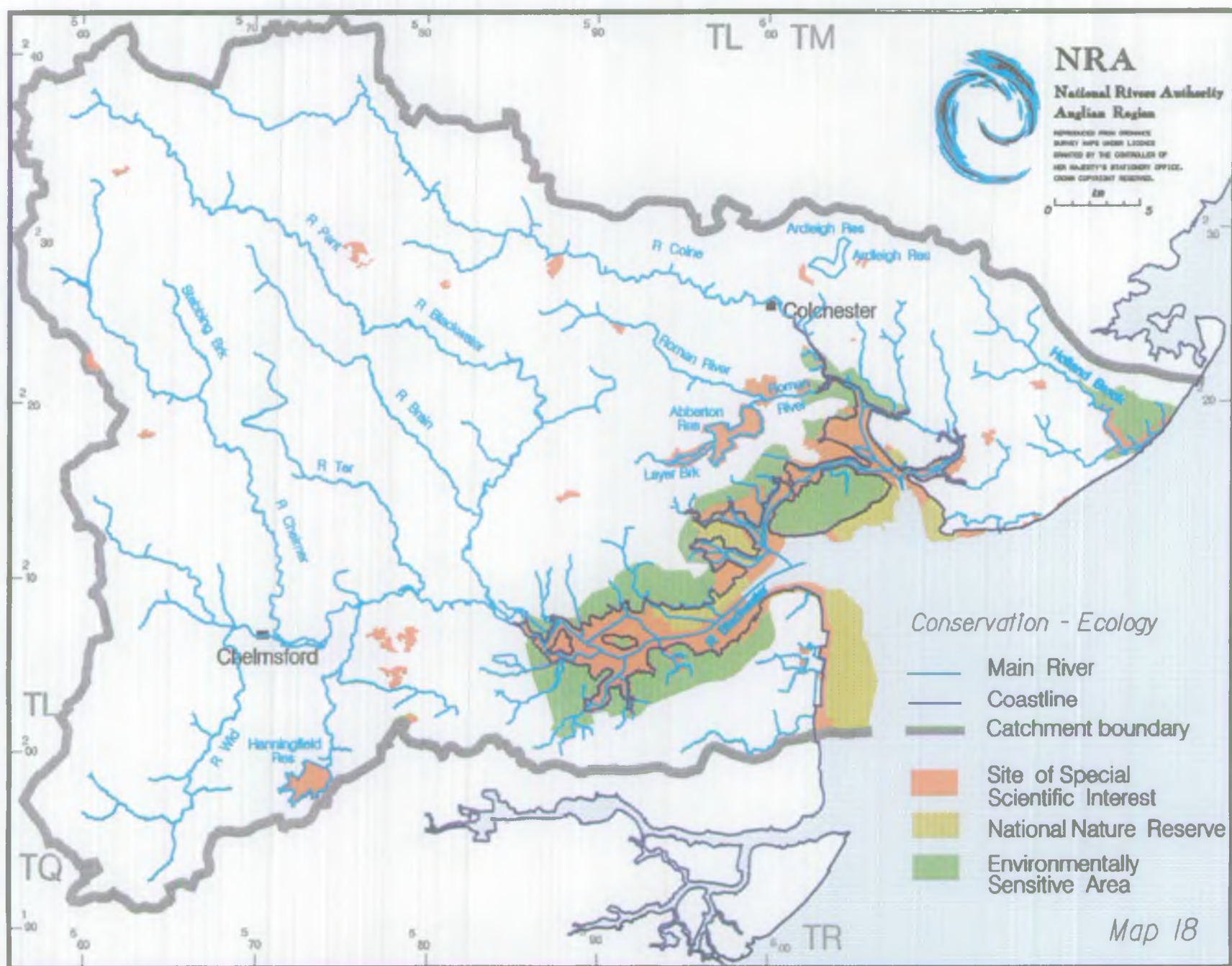
Abberton and Hanningfield reservoirs are the two largest bodies of freshwater in Essex and are of national and international importance for wildfowl. The proximity of Abberton to the coast makes it an important roost site for local estuarine populations and arrival point for overwintering wildfowl. Abberton has an SPA/Ramsar designation. Ardleigh, though not a designated site, is another large water area.

### Coast

The Mid-Essex coast comprises an extensive complex of estuaries and intertidal sand and silt flats, including several islands, shingle and shell beaches and extensive areas of saltmarsh. The interaction of estuary and sea creates a wealth of distinctive wildlife habitats which support a number of rare plants and animals and internationally important populations of overwintering wildfowl. As such the Colne Estuary, the Blackwater Estuary and Dengie have been designated SSSI's with areas also designated as National Nature Reserves. An SPA/Ramsar designation is confirmed for Dengie and is proposed for the Colne and Blackwater Estuaries.

### Environmentally Sensitive Area

The Essex Coast ESA was launched in March 1994 and includes 260 square kilometres of coast, extending from the Stour in the north to Canvey Island in the south. The area is flat or gently sloping and contains the main areas where coastal grassland is still to be found. Much of this is extensively managed grazing marsh, with networks of drainage dykes and ditches, contrasting with large areas of





adjoining arable land. For the area's wildlife, the grass on the landward side of the seawall is a vital complement to the saltmarsh, mudflats and beaches on the seaward side.

### 3.15.3 Objectives

#### Water Quality

- To improve or maintain water quality to ensure that sensitive ecosystems do not deteriorate.
- To not allow groundwater quality to deteriorate and adversely affect wetland SSSIs.
- To ensure that water quality does not adversely affect the general conservation value of watercourses, and to prevent any deterioration in water quality adversely affecting Special Conservation Areas.
- To work with other agencies to promote and maintain dykes and ditches in ESAs.

#### Water Quantity

- To protect aquifers and surface water from over commitment and to ensure that abstraction does not have an unacceptable effect on the environment.
- To identify and promote understanding of flows necessary to sustain conservation and ecological interest.

#### Physical Features

- To identify and promote the understanding of natural and man-made features which provide conservation and ecological interest.
- To ensure maintenance, enhancement and restoration of those features which provide conservation and ecological interest.
- To ensure protection, enhancement and restoration of habitat features during the design and implementation of flood defence schemes.
- To ensure that, where appropriate, river management promotes the achievements of ESA and Countryside Stewardship schemes.

### 3.16 Archaeology

#### 3.16.1 Local Perspective (Refer to Map 19)

The Essex river valleys of the Colne, Blackwater and Chelmer have a wealth of archaeological interest. The light soils which are easily worked for agriculture,

coupled with the rivers as an obvious source of food has led to continuous occupation of the area since Neolithic times. Much of the evidence for these prehistorical sites is derived from aerial photographs which reveal fields, enclosures and trackways of early settlements as differences appearing in the growth of ripening crops (crop marks). Rising sea levels since the Iron Age has meant that many archaeological features have remained encapsulated in the estuarine mud (Essex County Council Archaeology Department). The Essex Sites and Monuments Records contain evidence of over 9,000 sites and find-spots within the catchment although only a small proportion of these are Scheduled Ancient Monuments (SAMs), see Appendix IV for a list of these.

#### River Pant and Blackwater

The River Pant valley is dominated by moated buildings and fish ponds dating from the medieval period. At Coggeshall the River Blackwater flows through the 13th century Long Bridge and passes the remains of a 16th century abbey. Downstream scheduled sites predominantly date from 17th to the 19th centuries. At Rivenhall there is some evidence of a Romano-British settlement.

Throughout the Iron Age a flourishing local industry was that of salt extraction. Traces of this industry can be seen along the fringes of the Blackwater where there are mounds of waste material from the extraction process, known locally as the "Red Hills" because of the bright red colour the soil has taken from the partially fired and heated clay in the broken vessels. Most of these areas have been adversely affected in the last two thousand years through coastal erosion, ploughing and incorporation into early sea walls.

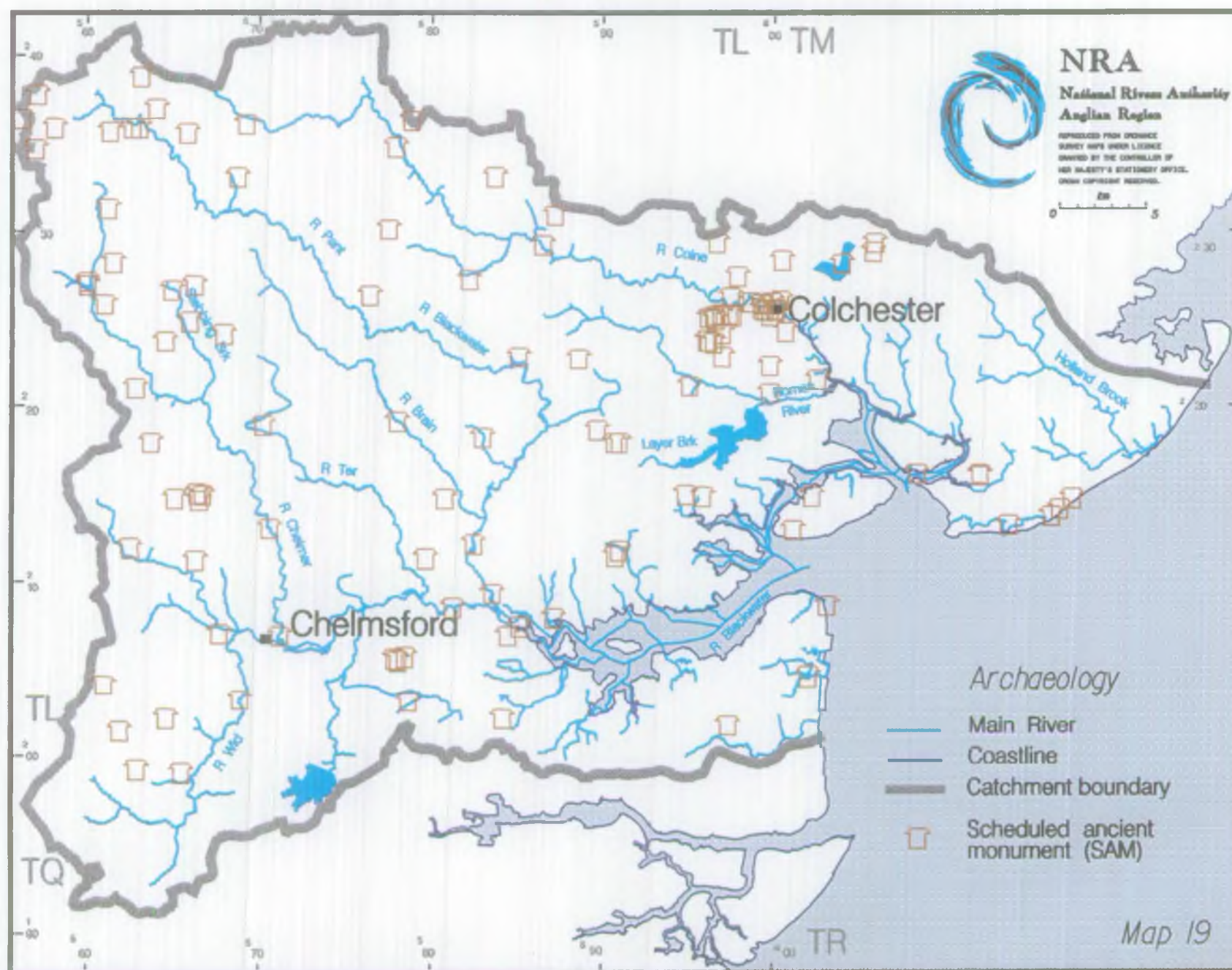
Current excavations at Elms Farm, Heybridge have revealed the greater part of a Roman "small town". Of particular note is a large circular building thought to have been an early Roman temple. A number of wells have been found with their oak timbers fully preserved. Some evidence suggests that the site had been occupied since the late Iron Age through to its abandonment in the Saxon period.

#### River Colne and Roman River

In the upper Colne Valley the scheduled sites date predominantly from the Norman period. The Norman keep at Castle Hedingham is one of the best-preserved in Britain, and lies just upstream from the moated manor house at Sible Hedingham dating from 1086.

The lower Colne valley and the Roman River valley have a dense concentration of Iron Age and Roman-British sites. The town of Colchester has numerous important Roman structures including the town walls. The small bricks favoured by the Romans are found in every historic building in the town, for example in the 15th-century gatehouse of St John's Abbey and the rebuilt tower of St Mary's Church. Bourne Mill, one of the first water-driven mills built for the manufacture of baize cloth remains as a symbol of the wealth brought to Colchester during the Elizabethan period.







### River Chelmer

Scheduled Ancient Monuments in the Chelmer valley range from the Iron Age crop marks at Woodham Walter, to the 20th century pumping station at Langford. In the upper valley the River Chelmer flows past the 12th century abbey of St Mary's and Great Easton Castle dating from around the same time. Downstream Pleshey castle, church and town enclosures are of particular note, dating from the medieval period through to the 16th century. Roman sites have also been found in the Chelmer valley at Chignall and Oxney Spring, near Chelmsford.

### Coast

The earliest evidence of man's inhabitation in this area comes from Clacton where flint tools used by Clactonian Man were found. These artifacts date back to the late Stone Age, almost half a million years ago, and are the earliest evidence of flint tool manufacture in Britain.

The earliest sea walls in Essex date from the Middle Ages and some examples survive where later sea walls were constructed further out. In several places lines of posts next to modern sea walls represent earlier sea defences.

Along the coastline many of the Scheduled Ancient Monuments are Martello Towers which formed the main coastal military defences during the 19th century. Interest in military features from the 20th century have recently come to the fore, of which there are many along the Essex coast. During the First World War Osea Island was a significant Naval base and traces of the base survive today. In 1940 the Essex coast was considered to be a likely site for the German invasion and in response to this coastal defences were constructed mainly in the form of pillboxes. Attempts are presently under way to record these structures.

## 3.16.2 Objectives

### Water Quality

- To ensure that water quality does not adversely affect the landscape and archaeological value of the land adjacent to watercourses.

### Water Quantity

- To ensure that due regard is given to the water requirements of archaeological features.

### Physical Features

- To ensure that river management does not adversely affect sites of archaeological importance.
- To protect and enhance important landscape features within the river corridors.

### 3.17 Amenity, Landscape and Recreation

#### 3.17.1 General

##### River Colne

The River Colne flows through an historical corner of Essex with the best preserved Norman Keep in England at Castle Hedingham. It then passes through the small town of Halstead whose steep main street drops down to the Colne, which is dominated by the large mill built by Courtaulds for the manufacture of silk. Colchester commands the head of the Colne Estuary and the river has attracted development of walks and restaurants situated on its banks. Mersea Island is strategically placed at the confluence of the Colne and the Blackwater, separated from the mainland by the Pyefleet Channel.

##### River Blackwater (known as the River Pant in its upper reaches)

The River Pant flows near Finchingfield, an unspoilt village focusing on the gentle sloping green with its pond and hump-backed bridge over a stream. It then carries on through Braintree becoming the Blackwater and flowing out into one of the most significant estuaries on the Essex coast.

##### River Chelmer

The River Chelmer joins the River Blackwater near Maldon, having originated near Thaxted, and come through Chelmsford on its way. Between Chelmsford and Heybridge this waterway becomes the Chelmer and Blackwater Navigation. The canal was opened in 1797 to link Chelmsford to the coast. Commercial barges no longer use the canal but there is a wide range of boating activities on this stretch of water.

##### Estuaries

It is fortunate that this catchment includes three of the 81 estuaries that English Nature have selected for their "Estuaries Initiative 1993/94". The Colne Estuary, the Blackwater Estuary and the Dengie Flat are all situated in the area of this catchment management plan. The Blackwater Estuary itself contains the largest area of saltmarsh in Essex, representing the fifth largest area in Britain.

At low tide a huge expanse of intertidal mud is exposed on each shore. This enriched mud is the feeding ground of many molluscs and crustacea, also more than 40,000 waterfowl amass to exploit the rich food supply. The sheer number of waterfowl present during the winter months can be amazingly spectacular, especially the wheeling flocks of dunlin in flight put up by the ever wary and easily disturbed oystercatchers.

The recreational and amenity potential of the estuaries is greatly increasing which puts pressure on the resource and an integrated approach to any further development in these areas is very important. They are also important as harbour facilities, recreational activities and exploitation of natural resources, such as wildfowling and

bait digging. English Nature have launched their estuaries initiative to promote sustainable utilisation of these habitats and to maintain and enhance the quality of these areas.

The demand and use of the countryside in other areas for recreation has also increased (see an example in table 1 below). At the same time the countryside has been subjected to more intensive production processes, particularly by arable farming than ever before. The resulting clash between the productive users of the countryside and the recreational users of the countryside, has become an intense and increasing land-use conflict.

Table 1 Membership of the Royal Yachting Association

Membership	1980	1989
No. of affiliated clubs	1 468	1 500
No. of individual members	41 361	67 704

(National Figures)

The upper stretches of these rivers are mostly in intensive arable farming practice, flowing down to significant estuaries that are of national and international importance for wildlife. Within the catchment is one of Britain's top five wetland areas, and it benefits from Ramsar, SSSI and SPA status. The estuaries are strategic locations on migration routes for many species of wildfowl. These areas have an extremely high recreational value for bird watching, sailing, fishing, canoeing and wildfowling.

The landscape value and the range and diversity of flora and fauna have become particularly important to the enjoyment and worth of the recreational experience. In Essex, management of recreation in the countryside is diverse and represented by different organisations. Maldon District Council and Essex County Council are producing the Blackwater Estuary Plan in close liaison with all interested organisations, including the NRA.

The projects operating within this plan are briefly described below. Each project has a steering group including an NRA representative that helps secure consistency and continuity.

**Roman River Valley** This is a countryside project established by Colchester Borough Council to give priority to protecting important public access for informal recreation. Funding is received from the Countryside Commission.

**Colne Valley Project** A joint countryside project formed by Braintree and Colchester Borough Councils. The project aims to develop the potential for informal recreation in the area.

**Chelmsford Countryways** A joint scheme by Chelmsford Borough Council and the Training and Enterprise Council to clear existing rights of way. Distinctive yellow butterflies emblems on wooden signposts denote these cleared trails.



### Access

The abundance of footpaths within Essex as a whole is such that Essex County Council have produced a "Directory of walks and rides" which gives details of the numerous choices available and where to obtain further information about each walk. "Ways through Essex" is a project set up to co-ordinate and promote rights of way through the county.

Walking has become one of the most popular leisure pursuits, with 19% of the population of the United Kingdom (20,000,000 a year) participating regularly. Public access to areas of open countryside can be established by access arrangements under the *National Parks and Access to the Countryside Act 1949*.

Two long distance walks are promoted in the "Directory of walks and rides", one being the Essex Way. This is 81 miles from Harwich to Epping, many miles of which are along the river banks in this catchment. The other is the Maldon Millennium Way which is a 22 mile circular walk focusing on Maldon around the mouth of the Chelmer and commemorates the Viking incursion and the Battle of Maldon of 991.

Some walks have been purposefully adapted for wheelchair access, in particular nature trails at Fingringhoe Wick managed by Essex Wildlife Trust. Paths around Danbury Common known as the Backwarden Trail go through heathland, woodland, old marl workings, bogs and marsh.

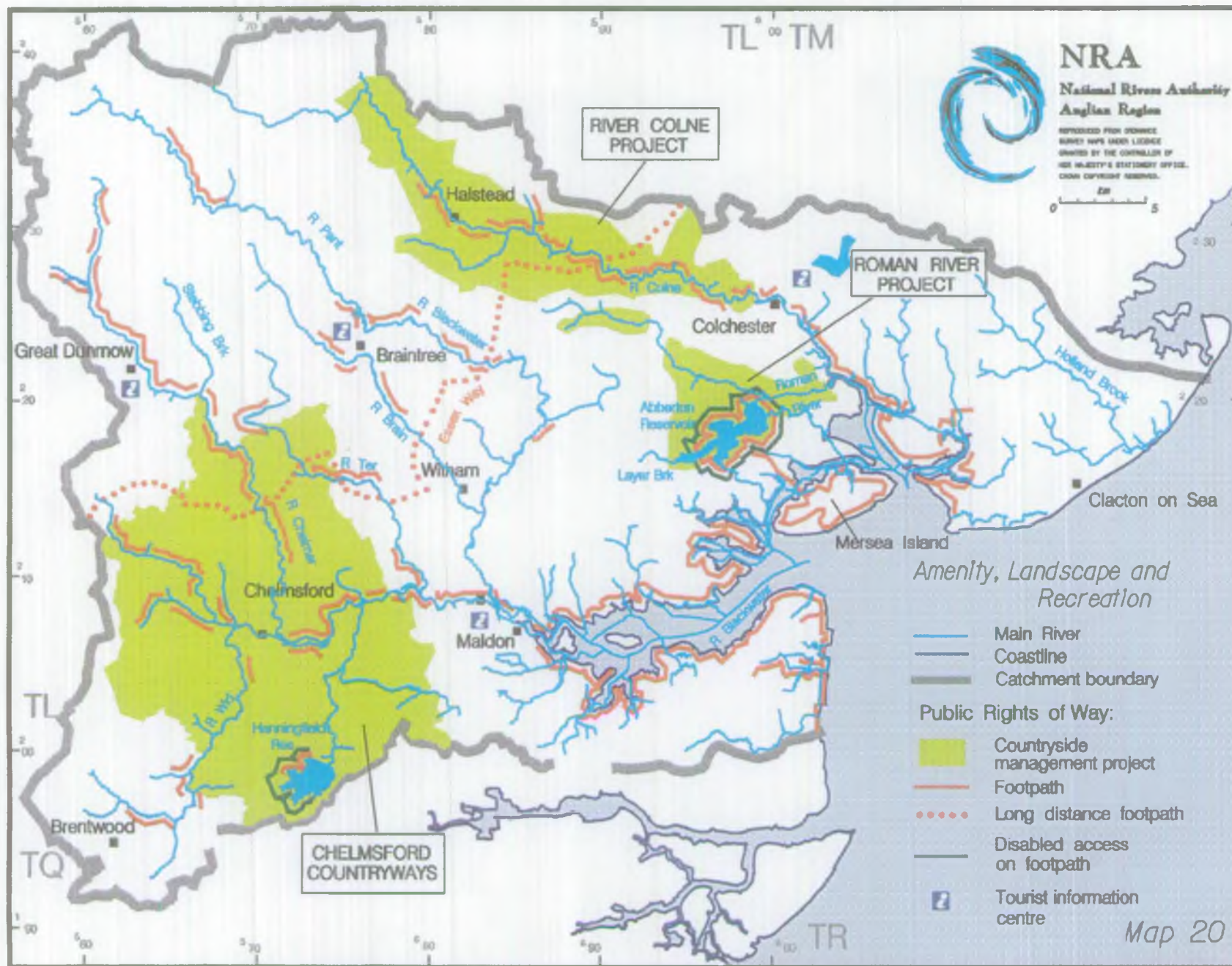
The sea walls of Essex are some of the most popular walks in the area. The Blackwater Trail is a 12 mile coastal walk along the seawall. There is a continuous walk of 19 miles from Salcott to Heybridge and a walk of 43 miles (with four short deviations inland from the seawall) from Maldon to North Fambridge. However the county of Essex lacks a continuous coastal footpath.

There are three main inland enclosed waters in the designated catchment management area, these being Abberton, Ardleigh and Hanningfield reservoirs. Their primary role is that of public water supply but they offer excellent scope for recreational purposes. Opportunities created by these reservoirs include birdwatching, fishing, sailing, canoeing and sub-aqua.

Abberton - (Essex & Suffolk Water). Recognised internationally as a Ramsar site, so is primarily concerned with bird watching, there are five well used public bird hides. In 1990 a purpose built visitors centre was opened which provides views of the reservoir. This centre is run by Essex Wildlife Trust, and includes nature trails and facilities for the disabled.

Ardleigh - (Ardleigh Reservoir Committee, comprising equal membership from AWS and Tendring Hundred Water Services). All sailing and sail boarding is arranged through the Ardleigh Sailing Club. The reservoir is an excellent mixed trout and coarse fishery. Access to the reservoir is limited due to the fact the surrounding land is in private ownership.

Hanningfield - (Essex & Suffolk Water). Bird watching is popular with wheelchair access to hides and nature trails. There is also a specially adapted fishing boat for





wheelchair use. The reservoir provides high quality trout fishing and limited wind surfing.

**Wildfowling** - Wildfowling has a long tradition on the Blackwater. Duck and geese shooting is organised by local wildfowling clubs and by individual members of the national representative body, the British Association for Shooting and Conservation (BASC). There are four main wildfowling clubs in the vicinity of the Blackwater and the Colne. The membership of these is regulated by proficiency testing. The clubs are member organisations of the Essex Joint Council of Wildfowling clubs, a body formed to communicate between 15 affiliated wildfowling clubs in Essex and the BASC.

Wildfowlers have a strong interest in conserving the wildfowl populations on which their sport depends and are actively involved with practical habitat management. Tasks undertaken include voluntary wardening, monitoring of pollution, bird population counting, litter clearance and maintenance of access routes and erosion control work.

**Puntgunning** - Puntgunning takes place on the Blackwater. It is a traditional form of wildfowling. A large bore shotgun is mounted on a small boat of shallow draft which stalks along the tideline without mechanical assistance. All puntgunners on the Blackwater are members of wildfowling clubs.

All wildfowling and puntgunning should take place within the framework of the *Wildlife and Countryside Act 1981*, the *Firearms Act 1968* and the BASC Wildfowler's code.

### 3.17.2 **Local Perspective** (Refer to Map 20)

The Essex river valleys of the Colne, Blackwater and Chelmer have considerable amenity and recreational value. The proximity of these valuable landscapes to large urban conurbations increases their popularity but also increases pressure on the area as a recreational resource. In 1990 the Countryside Commission undertook a survey that concluded at least 76% of England's population visited the countryside at least once during the year. The dominant pastimes associated with these trips are informal activities such as drives, picnics, long walks, visiting the coast and informal sport. However there is a growing trend towards more active sports in the countryside which may give rise to much greater conflict as well as put pressure on the environmental capacity to accommodate such users.

## 3.18 **Water Contact Sports**

### 3.18.1 **General**

This use includes swimming, water skiing, dinghy sailing, sailboarding, SCUBA diving and jet skiing. At the present time, the only mandatory water quality requirement is in respect of sites identified under the *EC Bathing Water Directive 76/160/EEC*, and these are restricted to marine waters. No other specific water quality requirements, related to these uses in fresh or marine waters, currently exist.

### 3.18.2 Local Perspective (Refer to Map 21)

#### Estuarv and Coastal

Popular coastal and estuarial bathing beaches exist in this catchment, with four EC identified sites at Holland, Clacton, Brightlingsea, Jaywick and West Mersea. Water quality is monitored throughout the bathing season for bacteriological compliance with EC standards. All but one of the EC identified beaches met the mandatory standard in 1993. The exception was West Mersea which failed due to the existing unsatisfactory discharge from West Mersea sewage treatment works. Compliance with the Directive standards is expected at this beach in 1996 on completion of the improvements to this sewage treatment works.

Other water contact sports take place along the coastline and in the estuaries. Water skiing takes place on the Colne estuary off Brightlingsea and the Blackwater estuary below Osea Island where jet skiing also takes place. Dinghy sailing is popular in all the estuaries, but is concentrated at Bradwell, above Osea Island, Mayland, West Mersea, Brightlingsea and Wivenhoe.

#### Inland

Dinghy sailing takes place at Ardleigh Reservoir; wind surfing occurs at Channels Lake, Chelmsford, Ardleigh Reservoir, and a limited facility exists at Hanningfield Reservoir. Water ski facilities exist at Gosfield Lake, The Lido at St Osyth and at Bradwell on Sea Lake. Jet skiing facilities exist at the Lido, St Osyth.

#### Canoeing

The River Chelmer, both through and below Chelmsford, and the River Can in Chelmsford are popular with canoeists. There are canoe slalom courses on the River Colne in Colchester and on the River Chelmer in Chelmsford.

### 3.18.3 Objectives (Water Quality)

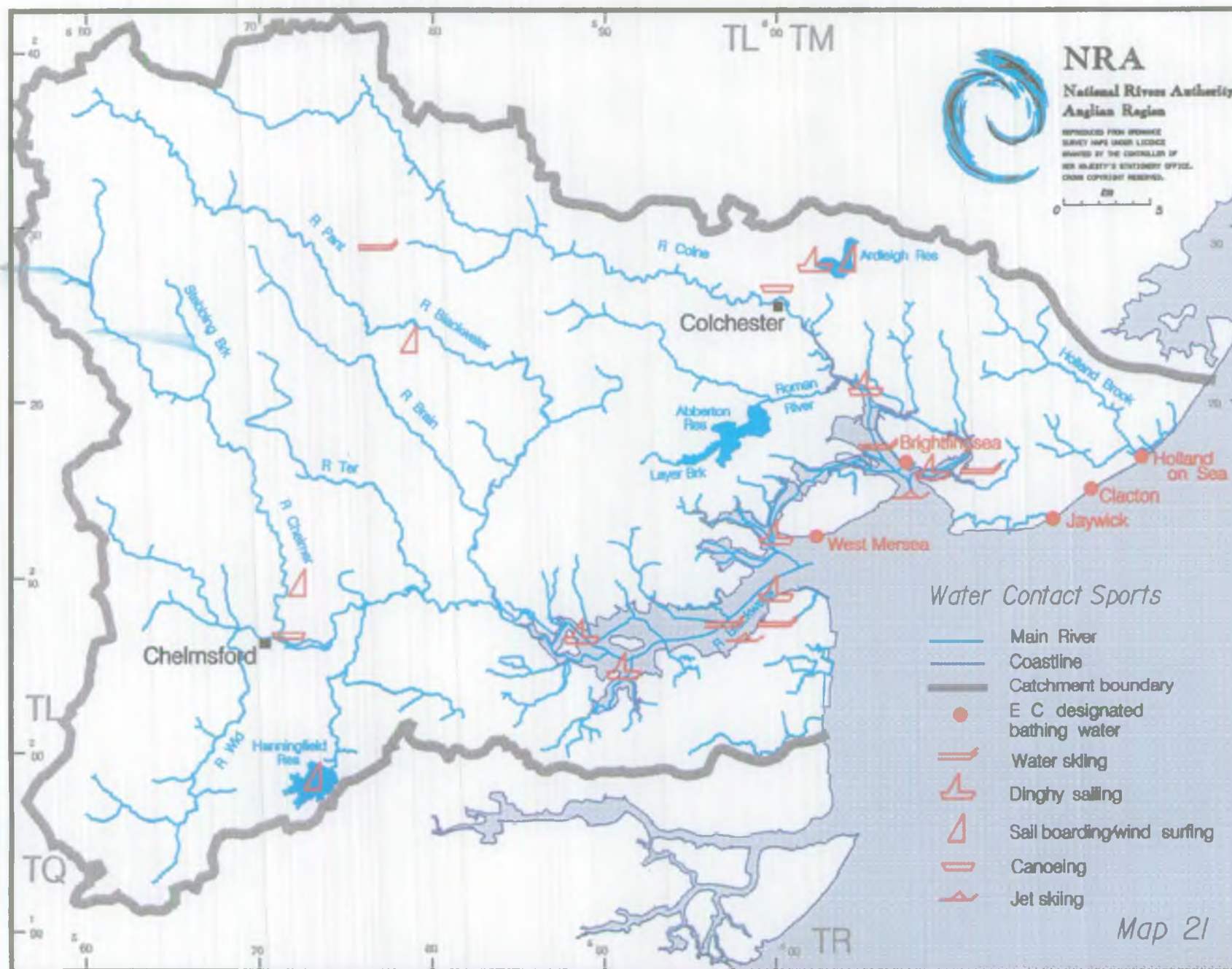
- To improve and maintain the water quality, at the EC identified bathing waters, so that the quality requirements of the *EC Bathing Water Directive 76/160/EEC* are met at all the sites.
- To maintain non-identified bathing waters and waters used for other immersion activities, the water quality will be maintained or improved to meet future water quality objectives when they have been nationally derived.

## 3.19 Navigation - Recreation

### 3.19.1 General

Popular coastal and estuarial sailing opportunities exist in this catchment, with two major marinas catering for over 550 berths. Along with these berths there are over







1,500 swinging moorings in the channels and creeks. The latest information obtained from Essex County Council in 1988 revealed that in total there are 84 sailing clubs in Essex catering for yachting, motor cruising, dinghy sailing and wind surfing. Out of an estimated 26,000 membership about 17,300 actively participate in sailing disciplines in Essex. However of the people taking part in water sports, the majority are not members, only 21% of participants are club members. Participation is therefore not often indicative or associated with the governing bodies of the sports.

### 3.19.2 Local Perspective (Refer to Map 22)

#### Inland

The Rivers Colne, Blackwater and Chelmer are of designated recreational value downstream between the limits detailed in Table 1 below. These points are recognised nationally by the Eastern Council for Sport and Recreation, in their "Sport in The East -A Strategy for the Nineties". In general none of the rivers themselves are suitable for sailing upstream of their tidal limits. However there are some stretches that are suitable for boats and canoes, with the permission of the riparian owners, although generally their main recreational value is for angling, rambling and nature study.

Table 1

<u>River</u>	<u>Upstream Limit</u>	<u>Downstream Limit</u>
Colne	Castle Hedingham	East Mill, Colchester
Pant/Blackwater	Great Sampford	Beeleigh
Chelmer	Dunmow	Chelmsford
Chelmer-Blackwater Navigation	Springfield Basin	Heybridge Basin

The Navigation is controlled by the Chelmer & Blackwater Navigation Company and since the termination of barge traffic, now supports a range of boating activities. The canal was actually built to link Chelmsford with the coastal trading ships and was opened in 1797. All powered craft using the canal are controlled and monitored by the Chelmer-Blackwater Navigation, and a licence needs to be obtained from them to navigate on the canal. There are several narrow boats that can be hired from Paper Mill.

Few stretches of the rivers exceed 16 metres in width and only these are suitable for multi-recreational use. The use of high-powered craft on these rivers could lead to bank erosion and damage spawning areas, generally detracting from the overall amenity value of the rivers.

#### Coast and Estuaries

The coast of Essex is extensively used for a variety of recreational purposes. The upper reaches of the Blackwater Estuary in the Maldon area are heavily used for sailing purposes. Moorings in this area are administered by Maldon District Council. All moorings and berths are administered and arranged by different

organisations, as highlighted in the table below. These figures are not comprehensive but give a clear indication of the numerous bodies involved in the mooring facilities on this stretch of the Essex coast.

Table 2

Location	Type of Mooring	Number	Administered by
Bradwell	Berths	300	Bradwell Marina
Bradwell	Swinging	200	Essex County Council
Maldon	Swinging	470	Maldon District Council
Heybridge	Berths	180	Chelmer & Blackwater Navigation
Mersea	Swinging	250	Mersea Haven Ltd
Mersea	Swinging	500	Private/Freehold
Brightlingsea	Swinging	400	Brightlingsea Harbour Commission
Brightlingsea	Swinging	150	Private/Freehold
Colchester	Swinging	112	Colchester Borough
Colchester	Mudberths	25	Colchester Borough
Tollesbury	Berths	250	Tollesbury Marina
Tollesbury	Swinging	130	Tollesbury Saltings Ltd

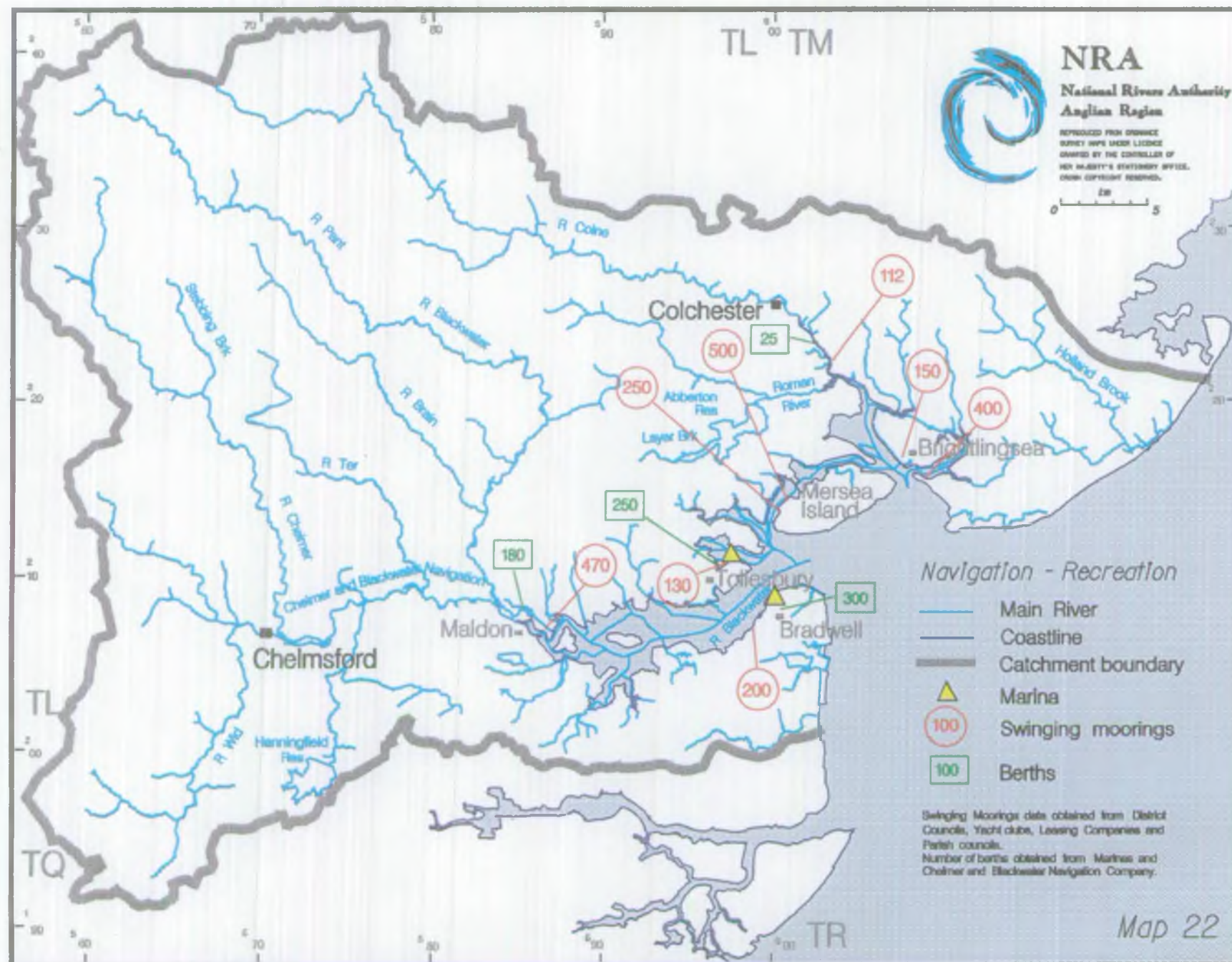
Many stretches of the banks along the Colne and Blackwater estuaries are privately owned and over 50 of these have berths for many sailing craft.

The central area of the River Blackwater, to the south of Osea Island, is used for sailing and the popularity increases further as you reach Bradwell and its marina towards the mouth of the River Blackwater. Mersea Island supports a wide range of recreational activities, including sailing, boardsailing, water skiing and sea angling.

The whole of the Blackwater Estuary is a Ramsar site and an SSSI which makes it a very sensitive area from a nature conservation viewpoint. Any further development of facilities for navigation will need to take account of these designations and involve close liaison with English Nature.

The Colne Estuary is heavily used for sailing purposes. Navigation along the River Colne is the sole responsibility of the Harbour Authority. The Harbour Authority are able to enforce byelaws and regulations to ensure safe passage along the river.









Brightlingsea Creek, off the River Colne is already heavily congested, partly due to the commercial traffic using this stretch. However, this commercial traffic is decreasing and Colchester Borough Council are investigating the possibility of expanding further the recreational aspect. The Tendring District Council 1993 Local Plan (Deposit Draft) indicates a site and need for enhanced marina facilities at Brightlingsea. Various creeks such as that at Alresford are virtually empty of water at low tide and so limited in navigation value, but contains many moorings. Many of these are SSSIs and any further developments in the area should take into account the interests of existing users.

A combined effort from all interested parties is required in the future to protect and develop leisure, sport and countryside activities. This is set against the fact that more people will be taking part in more varied leisure activities in an area of countryside that has high recreational value for a wide range of sports plus a high value for a diverse range of wildlife.

## **4.0 CATCHMENT TARGETS**

### **4.1 Catchment Targets - Water Quality**

#### **4.1.1 General**

This section considers the overall quality requirements of the catchment. Water quality in the Anglian Region has been assessed by reference to a number of control measures. These are:-

- Compliance with relevant EC Directives
- Compliance with statutory Water Quality Objectives (WQOs) and non-statutory River Quality Objectives (RQOs)
- National Water Council (NWC) target classes and General Quality Assessment (GQA) scheme
- Biological target classes

#### **4.1.2 EC Directives**

EC Directives stipulate standards for relevant parameters which the Directives seek to control. See Appendix V for the list of relevant EC Directives.

#### **4.1.3 River Quality Objectives (Refer to Map 23)**

Until recently the Anglian Region of the NRA has set targets based on non-statutory River Quality Objectives which relate given water standards to river Use. The DoE is producing a series of Water Quality Objectives (WQOs), which will replace the RQOs and provide a clear indication of the desired water quality in a given length of watercourse. Each river stretch will be accorded Uses which have their own requirements for water quality. These will include River Ecosystem Class (RE1-5), Potable Water Supply (PA), Industrial/agricultural Abstraction (IR), Water Contact Activity, Special Ecosystem and Commercial harvesting of marine fish/shellfish.

For this catchment plan only those WQOs which have agreed quality specifications (River Ecosystem & Potable Water Supply) are being used to set targets and determine compliance.

Although the River Ecosystem Classes do not refer to fish, the following descriptions may be helpful to gauge target water quality:

**RE1** Water of very good quality suitable for all fish species

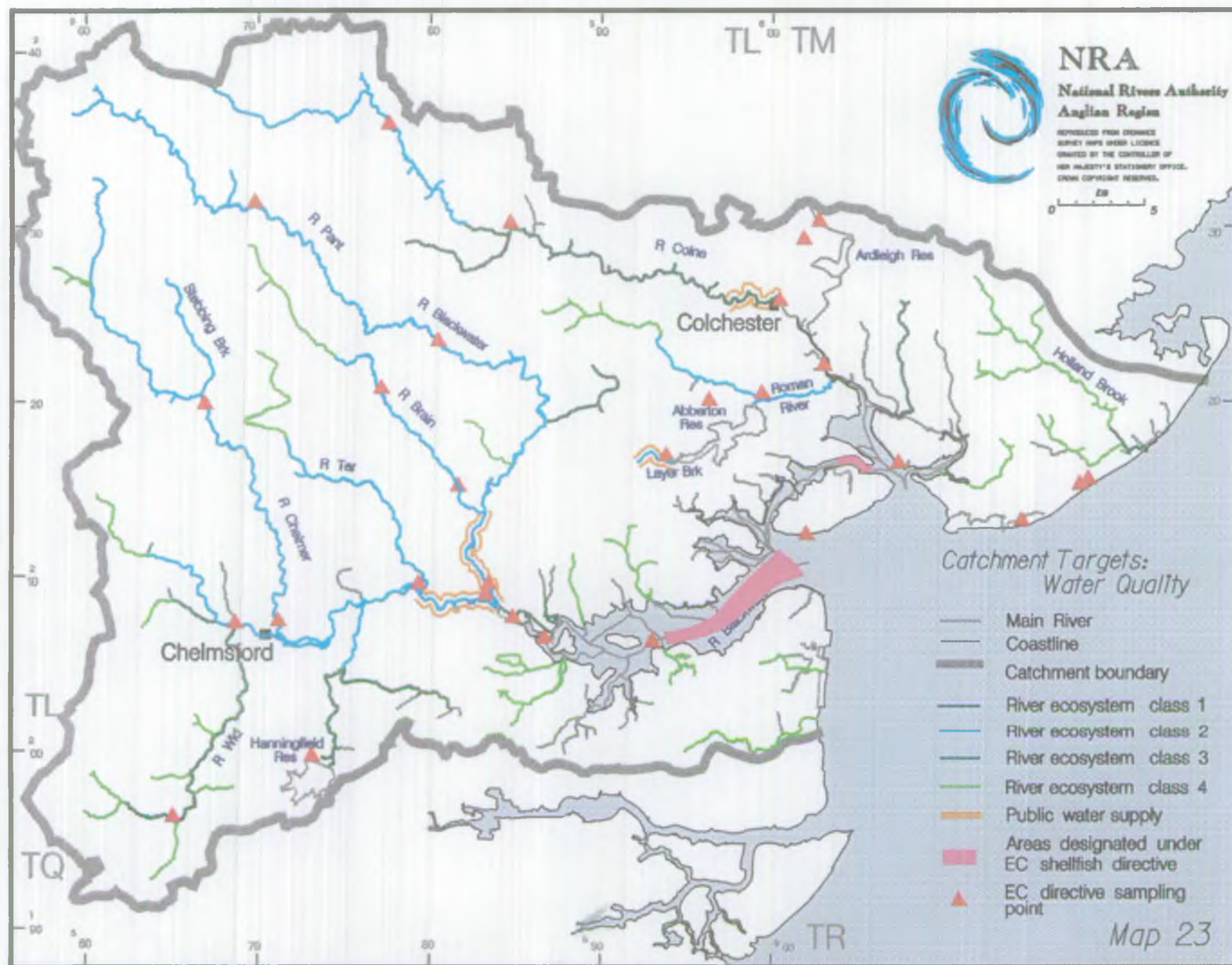
**RE2** Water of good quality suitable for all fish species

**RE3** Water of fair quality suitable for high class coarse fish populations

**RE4** Water of fair quality suitable for coarse fish populations

**RE5** Water of poor quality which is likely to limit coarse fish populations

In time the NRA will recommend to the Secretary of State where to make the WQOs statutory but these will not apply in this CMP.







#### 4.1.4 NWC Target Classes

The NRA has replaced the existing NWC classification system by a 'General Quality Assessment' scheme (GQA). Like the NWC system, it is based upon a limited range of criteria; Biochemical Oxygen Demand, Dissolved Oxygen and ammonia. At regular intervals river quality will be assessed and reported using this scheme.

#### 4.1.5 Biological Target Classes

Biological classification, by reference to the presence and abundance of species, provide an alternative indication of water quality to sampling and analysis for some chemical parameters. Biological Sampling is undertaken regularly at about 90 points on rivers throughout the catchment and the results are assessed against a prediction for the particular watercourse.

### 4.2 Catchment Targets - Water Quantity

#### 4.2.1 General

This section considers the requirement to manage water resources, where possible, in such a way as to meet all reasonable demands, including those of the environment, whilst having due regard to overall costs.

This is achieved through the NRA's statutory duties:-

- To manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.
- To ensure the proper use of water.
- To conserve water resources.
- To augment and/or redistribute water resources, where appropriate to meet water demands to appropriate standards of reliability.

The NRA Anglian Region is producing a *Water Resource Development Strategy* in 1994 which describes how future demands will be met in the Region. The key options relevant to this catchment are:

- demand management.
- transferring water into the catchment.
- the re-use of Chelmsford sewage effluent.
- a new reservoir (the siting, sizing and timing is to be determined).
- making more water available for transfer into the catchment by reducing the MRF of the Ely Ouse at Denver.

These options are currently under consideration and any outcome will have an effect on the future allocation and management of water resources in this catchment.

The Future Targets for this region and this catchment have been listed for each duty:

**4.2.2 To manage Water Resources to achieve the right balance between the needs of the environment and those of the abstractor.**

NRA Anglian Region is actively reviewing the methodology used for the allocation of water resources between human and environmental uses. In addition, resource calculations are being reviewed in light of the 1989 - 1992 drought statistics. This provides the basis upon which licensing policies are determined within the Region.

The NRA aims to carry out ecological and hydrological studies to examine the existing ecology of the river system and to define the minimum water level, flow and quality required to maintain the system. Such "in river needs" studies will use data already available as well as further field work.

The NRA is carrying out a National Research and Development study on the "Determination of Minimum Acceptable Flows" (MAFs). The overall objective being to develop the concept of MAFs and a policy for their application. The first phase of the study is due for completion by the end of the year which reviews current perspectives and practices associated with MAFs, and will define and "scope" any further studies required to develop a methodology for defining and assessing MAFs.

The NRA reviews and updates the Ely Ouse to Essex Flow Simulation Model. A review of Naturalised Flows, (ie. the flow that would occur naturally in the absence of abstraction from or effluent discharge to the system) has recently been carried out to better assess yield potential and has been used to evaluate development options identified in the Region's *Water Resource Development Strategy*. This model is used to simulate flow conditions in the Region's largest river to river transfer system. The transfer system is used to export water from Norfolk which would otherwise be lost to tide, via a network of rivers and tunnels, through the catchment to reservoirs located in Essex. This scheme is, and will continue to be, designed and operated to avoid it having any unacceptable environmental effects on receiving watercourses, and on the legitimate uses of the watercourse.

The means by which the NRA will be better able to protect wetlands is currently being investigated by a regional contract "The Protection of East Anglian Wetlands" which is due for completion in 1994. This should provide a framework for dealing with wetlands in general. However, there will still be a need for more site specific investigations where an individual wetland's hydrology is of particular concern.

As demand continues to rise, plans are established for optimum water resource development. These are produced in collaboration with others; essentially water companies, abstractors of significant quantities and conservation bodies.

Groundwater simulation models are useful management tools for the allocation of water resources. Currently, a model exists for the Pant sub-catchment which is used to simulate groundwater levels and impacts within the area based on various

abstraction regimes at a variety of locations. A model covering the whole catchment would lead to further understanding of the processes involved and enable better assessment of resource availability.

All these studies together with local information will assist the NRA to identify minimum flow requirements and minimum control levels for rivers within the catchment.

It is NRA policy not to allow abstraction in excess of the renewable resource. Planning horizons for these allocations of up to 30 years (for public water supply) means that in many instances full licensed potentials are not realised for some time. It could be argued that this apparent "surplus" could be utilised in the short term to meet other abstractive needs. Administratively this could be achieved through the issue of phased stepped increased licences addressing the longer term plan. Meanwhile, time limited licences could be issued to other abstractors to take up these apparent surpluses. Holders of the intermediate short term time licences, however, would need to be fully aware of the potential risks and consequences associated with time limited licences and the likelihood of non-renewal after expiry.

#### 4.2.3 To ensure the proper use of Water Resources.

The NRA will give priority to existing protected rights to abstract and to established environmental needs before allocating any further water for abstraction.

The NRA must decide on whether the future requirement for water meets "reasonable needs". The consideration of alternative supplies or demand management must be shown as well as consideration of recycling. In areas where water resources are shown to be over exploited and/or affecting existing user rights, including the water environment, licence revocation will be considered. In such cases compensation payments would normally be incurred by the NRA.

Licensed water abstractors who do not utilise their full water quota are highly unlikely to give up their current spare licensed capacity. A system of "tradeable permits" may be an economic solution to release this spare capacity ("paper water") and allow a free market in licensed abstraction rights, with a regulatory role by the NRA.

Specific requirements according to each use, are as follows:

##### Public Water Supply

The planning horizon for the allocation of licences is currently the year 2021. It is not considered reasonable at this time to allocate additional water for needs beyond this.

The water companies must have demonstrated that they have carried out effective demand management, leakage control, and where water resources are under stress, at least considered metering of domestic use before extra water resources are allocated.

### Spray Irrigation and Agriculture

The requirements of water needed with respect to the type of crops, soil conditions, stock types and numbers are taken into account.

### Industrial

The industrial process is examined as well as the expected life of the plant along with consideration of water efficient appliances, the quality of water required and the potential for recycling.

#### **4.2.4 To conserve Water Resources.**

The NRA encourages the use of on-farm winter fill storage of surface water in reservoirs for subsequent use during the growing season.

The NRA will encourage groundwater abstraction in preference to summer surface water abstraction, other than at or near the tidal limit of the river. This is not applicable to Chalk groundwater which in this catchment is fully utilised and no longer available for development.

Efficient water use is encouraged and where possible re-use promoted for purposes appropriate to the quality of the resource, this being particularly relevant where diversion of Chelmsford sewage effluent to the Chelmer may enable re-use of valuable resources. The 1989 - 1992 drought served to develop better practice of water resource management both by the NRA and abstractor. The promotion of efficient water use will continue in the future.

A future target for the whole of the NRA is to seek to revoke unused licences and to reduce under-used ones.

The NRA is committed to alleviating problems where allocation of water in the past has caused unacceptable stress on the water environment ie. river flows and wetland sites of conservation value. The NRA has a programme for investigation and action grouped under the heading of "Alleviation of Low Flow Schemes". Currently, none have been identified for this catchment.

The NRA will set discharge consents appropriate to anticipated future flow regimes, rather than historic flow regimes.

There are benefits to water resources (ie the impact of abstraction upon river flows can be minimised) if discharge of water is made within the catchment as far upstream as possible. Water quality objectives however, will need to be satisfied.

#### **4.2.5 To augment and/or redistribute Water Resources to meet water demands to appropriate standards of reliability.**

The NRA already owns and operates a major raw water transfer scheme in this catchment. River to river and/or groundwater to river support schemes will continue to be considered as development options.

Future abstractions likely to cause unacceptable effects on river flows or levels will not be authorised without appropriate river support or associated ameliorative works.

The NRA ensures compliance with existing minimum residual flows and minimum control levels and will continue to consider the setting of these to protect other environmental interests such as Ramsar and wetland SSSI's.

#### **4.3 Catchment Targets - Flood Defence and Physical Features**

##### **4.3.1 General**

This section relates to the need to maintain and develop the natural physical features of the catchment.

**The NRA's flood defence aim is to provide effective defence for people and property against the risk of flooding from rivers and the sea and to provide adequate arrangements for flood forecasting and warning.**

The targets in relation to physical features of this catchment therefore take into consideration both the NRA's statutory obligation to protect and enhance the geological and physiographic features and its aim to provide effective defence for people and property against the risk of flooding.

##### **4.3.2 Target Standards of Service for Flood Defence.**

Flood defence levels of service are well established and minimum standards of flood protection adopted by the Anglian Region are shown in Appendix VI. The standards applied are related to land use and need to be shown to be economically viable, technically sound and environmentally acceptable. A major part of the funding towards flood defence work is via MAFF grant in aid (65% in Essex). All new proposals need to meet the criteria laid down in MAFF's "Project Appraisal Guidance Notes" (PAGN) which works upwards from a "do nothing" option to the option which gives the maximum benefit : cost ratio. This may be below or above the minimum target standard. A Standards of Service exercise is being undertaken to determine the existing standard of service afforded by the flood defences within the catchment.

##### **4.3.3 Infrastructure and Information**

###### **4.3.3.1 Essex Sea Walls Management Strategy**

In 1990 the NRA produced a strategy for the Essex Rural Sea Walls which assessed the existing standard of some of the defences and considered the economic viability of sustaining or improving walls under MAFF rules.

The NRA is now building on the first plan with a view to developing a strategic plan for the future management of all the sea and estuarine defences under its control in Essex. The output from this strategy study will draw on existing information and will ensure that:



- An integrated management plan is developed which incorporates sound environmental principles.
- Broad opportunities for the conservation and enhancement of landscape, amenity and natural resources are identified.
- Future schemes are based on an understanding of natural processes and, as far as possible, work with these processes as identified in the Shoreline Management Plan.
- Chosen defence options are sustainable.
- There is a rational and realistic basis for the planning and prioritisation of future works.

#### 4.3.3.2 Shoreline Management Plan

A Shoreline Management Plan for the Essex frontage is also being produced and will in particular draw together information about natural processes, condition surveys and other available data related to existing defences. This information is integral to and will feed into the overall Essex Sea Walls Management Strategy.

In addition to these specific plans, the provision of an effective flood defence will also require:

- Development of strategies for warning, and responding to emergencies. (eg. information technology improvement).
- Support research and development which will identify future flood defence needs arising from climatic change, improvements in best practices for operating methodology, increasing and enhancing efficiency and value for money.
- Review and develop the hydrometric network to ensure the continued adequacy of data to meet all requirements.

#### 4.3.4 **Development**

To discourage development within flood risk areas and minimise the loss of flood plain including areas of conservation value.

#### 4.3.5 **Coastal and Estuarine**

To participate in coastal zone management groups and continue an integrated approach to sea defence management, in particular:-

- Utilise natural coastal processes.
- Maintain and enhance beach profiles and sea defences.
- Ensure minimum disturbance to sensitive habitats during works.

- Maintain existing flood defences to meet target standards of service where it is technically feasible, economically viable and environmentally acceptable.
- Liaise with external organisations over protection of sensitive archaeological sites adjacent to NRA maintenance and minor capital works.
- Minimise saltmarsh loss and encourage growth where appropriate.
- Further develop the recreational potential of coastal waters with improved liaison with appropriate organisations and water sport users.
- Incorporate, where possible, recreational facilities into programmes of flood defence works.
- Co-operate with other relevant authorities to enable marine bait digging to continue in ways which do not lead to conflict with other interests.

#### 4.3.6 Non-Tidal Rivers

- Maintain the essential flood carrying capacity of river channels through regular maintenance (eg. weed cutting and de-silting) while ensuring that practical physical features such as bankside trees and marginal vegetation are maintained by carrying out ecological surveys in advance of all maintenance work.
- Review the channel capacity of rivers in the catchment to assess the potential for incorporating features that can enhance the environmental value of the river.
- Identify areas where habitat creation would benefit fish populations and investigate how this can be carried out within existing economic constraints.
- Identify river stretches which could be conserved, enhanced or restored.
- Identify any needs for artificial off-river fish nursery areas.
- Ensure as far as possible that river control structures, such as weirs and sluices, are operated in such a way as to minimise flooding and to maintain water levels appropriate for a diversity of users.
- Identify priorities for automation of river control structures.
- Ensure, where practical, that the design and operation of river structures does not impede the passage of migratory species and takes account of the needs of all users.
- Minimise the loss of flood plain habitat of conservation value and look for opportunities to encourage landowners to put land adjacent to the river into one of the schemes promoted by the Countryside Commission or MAFF.

- Resist the connection of gravel pits and lakes to rivers if water quality problems could develop as a result.
- Explore with other agencies the potential for buffer zones.
- Liaise with external organisations over protection of sensitive archaeological sites adjacent to NRA maintenance and minor capital works.
- Ensure that construction of river control structures does not unnecessarily impede the legitimate passage of river craft.
- Balance and co-ordinate engineering and operational activities so that the successful pursuit of angling activities is not unnecessarily affected.
- Incorporate angling and fish habitat improvements into maintenance programmes, for example by the creation of new fish holding areas.
- Encourage the provision of access and other facilities for anglers, including the disabled, on both fresh and tidal waters. Preference will be given to those areas open to angling by all members of the public.

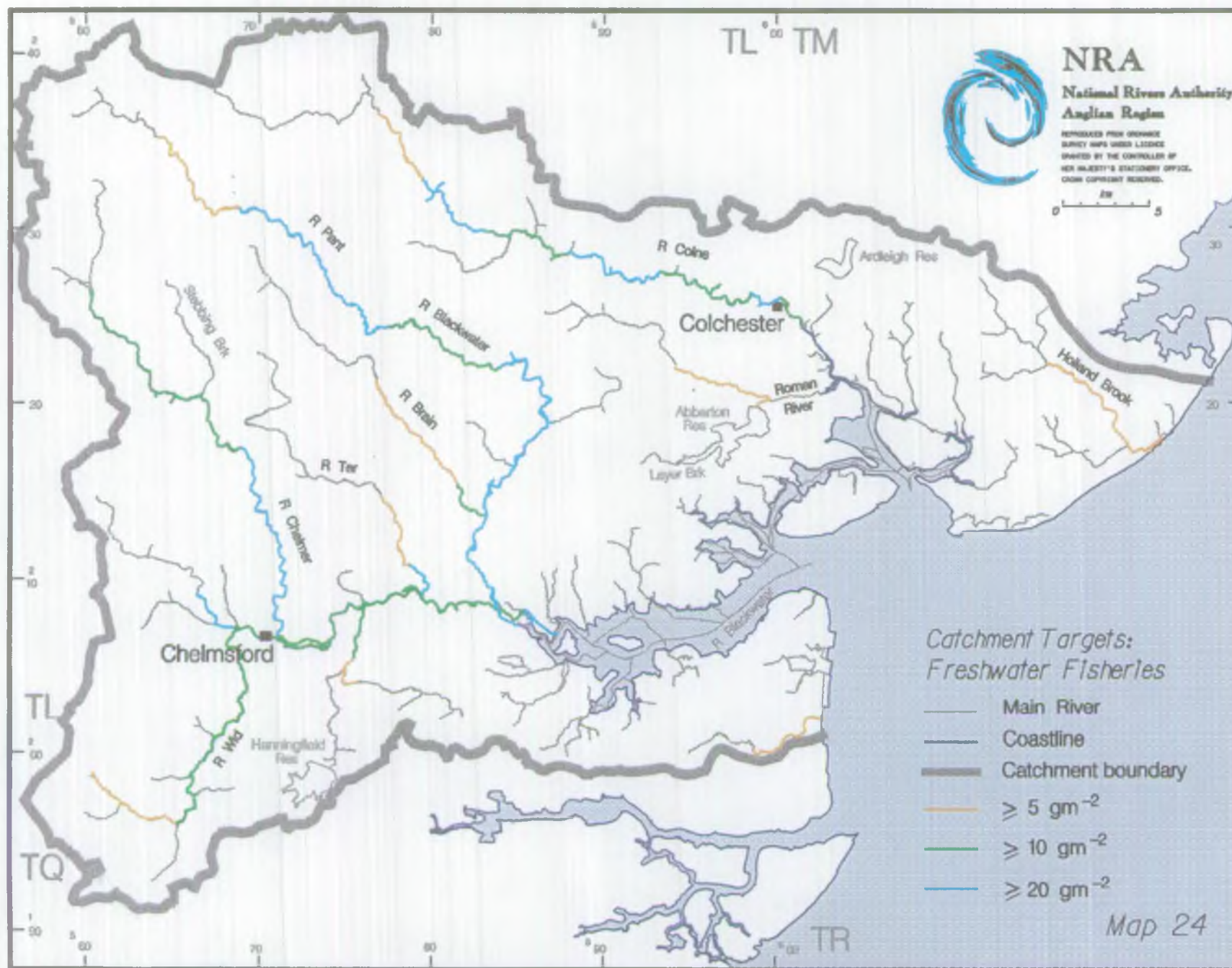
#### **4.4 Catchment Targets - Fisheries**

##### **4.4.1 Freshwater (Refer to Map 24)**

Catchment targets for freshwater fisheries revolve solely around stock levels in the rivers. This is because it is impractical for the NRA to set individual targets for the hundreds of still water fisheries which are known to occur, and because it is in any case more appropriate for targets on such waters to be set, if required, by the individuals or organisations responsible for their management.

For the rivers a system of biomass target classes has been derived, against which the current status of the fisheries can be assessed. Surveys conducted every three years not only ensure that these assessments are as up to date as possible, but also provide new data which is used to refine and reinforce their validity.

The targets are founded on the assumption that all waters included in the fisheries survey programme are capable of supporting at least 5 gm<sup>-2</sup> of fish where physical conditions may be limiting, and at least 10 gm<sup>-2</sup> where no such limits are recognised. Thereafter, scope exists for setting increased targets where experience has shown that greater stock levels have been sustained over a minimum 7 year period, as represented by three consecutive surveys. The target classes thus provide both a minimum acceptable standard, and a means of ensuring that higher and regularly achieved standards are not allowed to erode unnoticed, through lack of an appropriate benchmark.







All river lengths subject to fisheries survey are categorised into one of the three target classes. These are defined as follows:-

- 1) Waters where fish stocks may be subject to some physical habitat and/or flow limitation, and which have not reached a biomass of  $10 \text{ gm}^{-2}$  in three or more consecutive surveys since 1984, target biomass of at least  $5 \text{ gm}^{-2}$ .
- 2) Waters where fish stocks may be subject to some physical habitat and/or flow limitation, but which have reached a biomass of  $10 \text{ gm}^{-2}$  in three or more consecutive surveys since 1984, or waters not subject to any known physical habitat or flow limitation, which have not reached a biomass of  $20 \text{ gm}^{-2}$  in three or more consecutive surveys since 1984, target biomass of at least  $10 \text{ gm}^{-2}$ .
- 3) All waters where fish stocks have reached a biomass of  $20 \text{ gm}^{-2}$  in three or more consecutive surveys since 1984, target biomass of at least  $20 \text{ gm}^{-2}$ .

Details of the target classes applicable within the plan area are shown on the map. All these waters have been surveyed on at least three occasions, and consequently there are no limitations on the applicability of the target class system.

## 5.0 CATCHMENT SHORTFALLS AND IDENTIFICATION OF ISSUES

### 5.1 Water Quality (Refer to Map 25)

#### 5.1.1 General

Having set water quality targets it is possible to assess the state of the catchment against the targets. Data from routine water sampling and biological surveys have been used to facilitate this comparison.

The map identifies failures to meet the use related targets, relevant EC Directives, River Ecosystem targets and biological targets.

#### 5.1.2 Shortfalls Identified

1. Non compliance with the EC Bathing Water Directive 76/160/EEC.

The existing discharge from West Mersea STW causes non compliance with the *EC Bathing Water Directive 76/160/EEC*. Proposed improvements to the West Mersea STW should resolve this issue when they are complete by 1996.

2. River Wid - Chain Bridge to River Can.

River stretches variously fail to meet target class for ammonia, BOD or dissolved oxygen. Problems associated with enrichment may be resolved by phosphorus removal at Shenfield STW under the *EC Urban Waste Water Directive 91/271/EEC*.

High ammonia and BOD levels and associated depletion of dissolved oxygen may be due to a combination of sewage effluents, storm sewage discharges and agricultural sources.

3. Holland Brook - downstream of Thorpe STW.

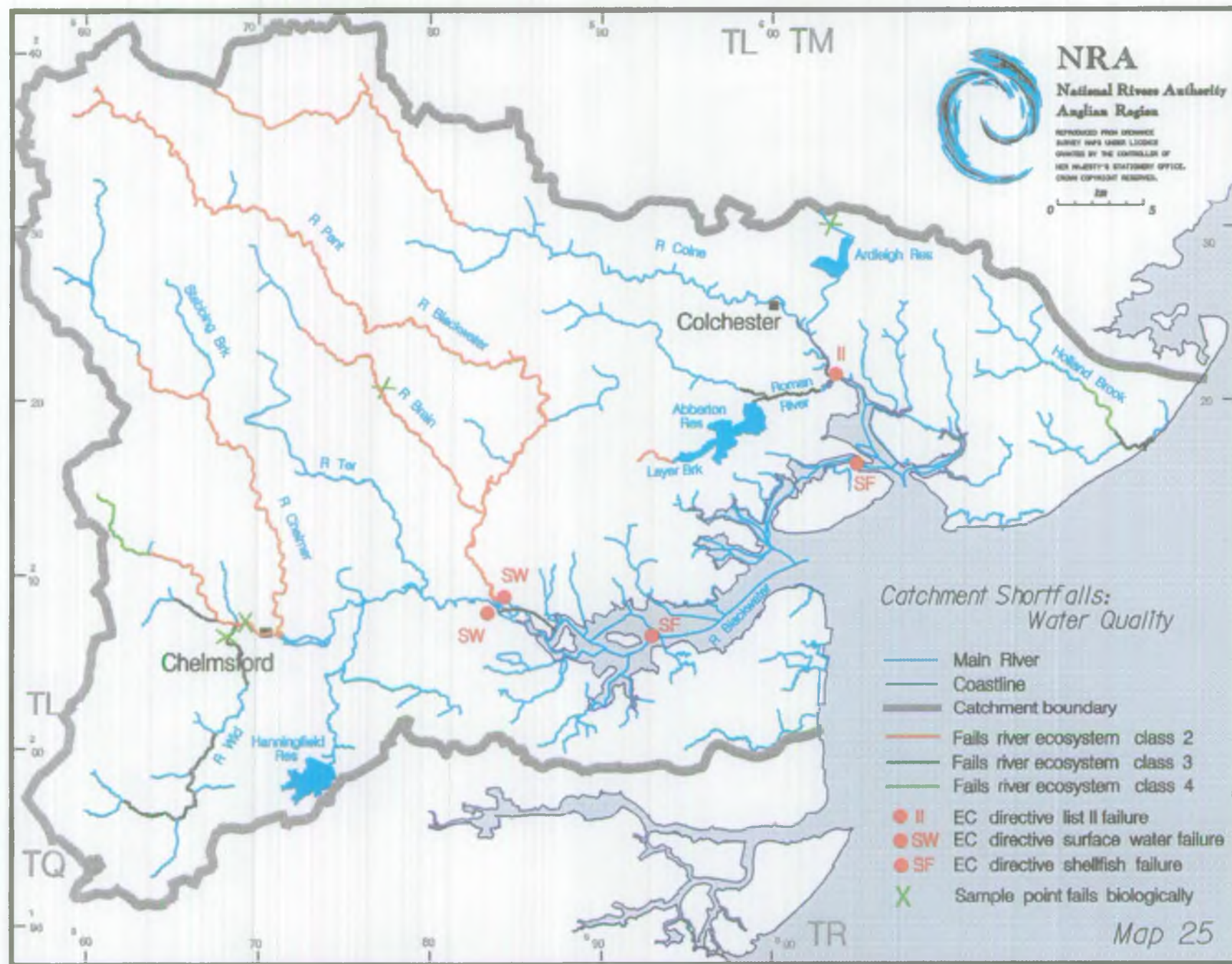
Failure to meet target class for dissolved oxygen probably due to enrichment from agricultural sources and sewage effluent which results in algal growth. Flows are depleted by excessive abstraction and the static nature of the lower river due to tide-locking.

4. R.Colne - Headwaters to Halstead.

Failure to meet target class for dissolved oxygen due to low river flows, enrichment and mill impoundments which entrap surface weed.

5. Laver Brook - upstream of Abberton Reservoir. and  
Roman River - downstream of Abberton Reservoir.

Failure to meet target class for dissolved oxygen possibly due to the effects of sewage and trade effluents.





6. River Pant/Blackwater - Headwaters to Langford.  
River Brain - Rayne to River Blackwater.  
River Colne - Lexden to East Mills (Colchester).  
River Chelmer - Great Dunmow to Chelmsford.  
River Ter - Great Leighs to the River Chelmer.  
Bourne Brook - downstream of Gosfield Lake.

Failure to meet target class for DO and BOD.

The above stretches suffer from excessive surface weed growth and algal activity due to enrichment from agricultural sources and sewage effluents. The problem may be eased on the rivers Blackwater, Brain and Colne by application of the phosphorus removal requirements, at appropriate sewage treatment works, under the *EC Urban Waste Water Directive 91/271/EEC*. Diffuse sources from agriculture are difficult to control but pollution prevention education may offer best prospects.

7. Chelmer/ Long Pond - Beeleigh to Hevbridge Basin.

Failure to meet target class for BOD due to low flow and algae.

8. Colne Estuary - Rowhedge.  
Blackwater Estuary - Marconi Sailing Club.  
Pvefleet Channel.

Failure to meet EC limits for copper and zinc. The reason is uncertain but it is suspected that it may be caused by the use of copper antifoulings and sacrificial anodes on pleasure craft.

9. R.Blackwater - Langford.  
R.Chelmer - Langford.

Failure to meet *EC Surface Water Directive 75/440/EEC* level for nitrate mainly due to agricultural sources.

10. River Brain - downstream of Braintree STW.

Failure to meet biological target due to low dilution of sewage effluent and urban drainage.

11. Salary Brook - Blue Barns Farm.

Failure to meet biological target possibly due to private, inadequate sewage effluents, and pesticide usage.

12. Agricultural pollution from diffuse sources.

The rise in the number of intensive livestock units coupled with changes in arable farm practices over the last few decades has resulted in the increasing wash-off from land of farm wastes, nitrates and pesticides. Increasing volumes of sewage sludge to land, as an agricultural conditioner, may also contribute to the problem. Pollution of this type, from diffuse sources, is difficult to control.



13. Odour problem - River Pant/Blackwater.

Water transferred from the River Stour to the headwaters of the River Pant has suffered in the past from an unacceptable intermittent odour related to trade effluent discharges to sewer in Haverhill. This problem is presently under investigation by NRA and AWS.

14. Colne Estuary - Colchester to Colne Point.

Unsatisfactory water quality in the upper Colne Estuary results from the existing quality of effluent from Colchester STW. In addition, there is the possibility that nutrients from Colchester STW are adversely affecting the estuary. This is the NRA's major water quality concern in the catchment.

15. Concern over blue-green algae.

There is concern that occasional blooms of toxic blue/green algae affect recreational and amenity lakes and enclosed waters across the area. High levels of algae are also a problem to the water companies who abstract the water.

16. Concern over pollution / potential pollution, from waste disposal sites.

In some instances problems with leachate could arise from old and existing waste disposal (landfill) sites which were constructed on the old dilute and disperse principles. There is particular concern at Martins Farm, St Osyth. This problem is under discussion with Essex County Council who are presently undertaking remedial action.

17. Effect on the River Chelmer of the proposed scheme for effluent reuse.

Essex & Suffolk Water (ESW) are presently considering a scheme whereby the effluent from Chelmsford STW is reused for public supply purposes. The effluent currently discharges via a long pipeline to the head of the Blackwater estuary, and is consequently lost as a water resource. The scheme entails diverting the effluent away from the estuary and further treating to an acceptable quality then discharging it into the River Chelmer adjacent to the sewage treatment works. This effluent will enhance the flow in the river enabling ESW to abstract a greater volume at Langford. The NRA has determined the effluent quality limits which are required in order to meet the various use objectives of the river between Chelmsford and Langford. Many different river interests may be affected by this scheme and hence an environmental study has been prepared by ESW. This is presently being considered by the NRA. An acceptable scheme would be adopted by AWS but funded by ESW who could benefit from an increased abstraction licence.

18. Concern over bacterial concentrations in the West Mersea & Tollesbury oyster fisheries.

Recent investigation by the NRA has identified a bacteriological impact on the West Mersea and Tollesbury oysterages by sewage effluent. Further investigations will be undertaken once the improvements to West Mersea STW have been completed

(see issue 1). Further remedial action will be considered should the oystering continue to be affected.

19. Impact on water environment by major new highways.

It is recognised that problems may exist related to the drainage of highways, and associated land, of substances from vehicle emissions. Their significance and means of control require further investigation.

20. Litter on river banks, estuaries and coastal waters.

This problem gives rise to much public complaint which undermines the general trend of improved water quality. In some areas sewage derived litter can be a great nuisance.

21. Problem of quality of surface water from industrial estates.

A frequent problem within the catchment is the discharge of contaminated surface water from multi-purpose industrial estates. The position is complicated as the sewerage system is often owned by absentee landlords and receives drainage from many individual premises. There are questions as to legal liability and responsibility. Much effort and time is spent tracing intermittent pollution on estates with many occupiers.

22. EC identification of St Osyth beach.

This length of bathing beach is not currently identified under the *EC Bathing Water Directive 76/160/EEC* despite being a popular bathing site. It may fail Directive limits and monitoring is currently being undertaken.

23. Some unsewered villages have problems of sewage pollution.

(Refer to Map 26)

There are a number of villages and hamlets which are without the benefit of mains sewerage. In some of these local ditch pollution exists to varying degrees, often leading to public complaint. This is an increasingly important NRA concern.

24. Designation of Blackwater and Colne Estuaries as Eutrophic Sensitive Areas and Polluted Waters.

The control of nutrient enrichment and eutrophication is the subject of two EC Directives; the *EC Urban Waste Water Directive 91/271/EEC* and the *EC Nitrate Directive 91/676/EEC*. Further data is required to be able to justify designation of the Colne and Blackwater estuaries in the future. If designation can be justified, inputs of nutrients will have to be controlled.

25. Designation of High Natural Dispersion Areas.

Under the *EC Urban Waste Water Directive 91/271/EEC*, secondary treatment of sewage effluent discharged via coastal outfalls is required for towns of more than

10,000 people. Primary treatment of sewage effluent will be permitted if the water company can justify to the DoE that they will have an insignificant effect on water quality. AWS are undertaking comprehensive studies to designate the coast around Clacton and Jaywick as High Natural Dispersion Areas.

## **5.2 Water Quantity**

### **5.2.1 General**

Having set targets for water quantity the issues identified below detail where there is a current shortfall.

### **5.2.2 Shortfalls Identified**

#### **26. Actual flows are perceived to be inadequate to meet river needs.**

It is considered that actual flows may at times be inadequate in some river stretches. These effects are perhaps more marked in Anglian rivers than others where flows tend to be sluggish due to relative flat terrain, and may, in part at least, relate to factors of channel geometry rather than flow alone. This can cause water to stagnate and undesirable weed growth to develop with subsequent implications on the river environment and its aesthetics. Stretches where flows are perceived to be inadequate are the headwaters of the Rivers Colne and Pant, the lower River Colne and parts of Holland Brook. The recent 1989-92 drought further highlighted these concerns. Until flow requirements are quantified (see issue 27), the adequacy of flows will remain uncertain and subject to debate.

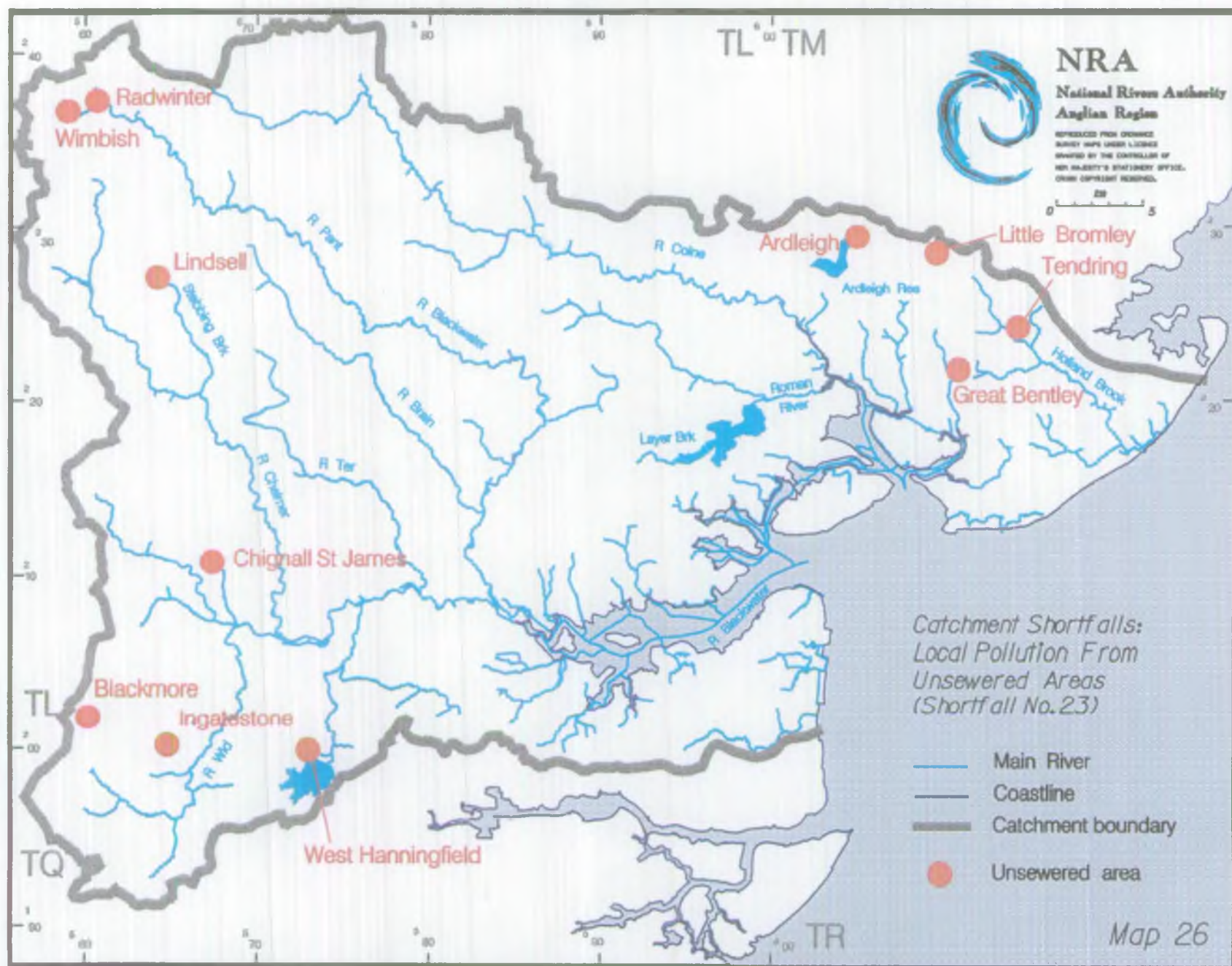
#### **27. In-river needs are not quantified and Minimum Acceptable Flows are not defined.**

Extensive ecological and hydrological studies are required to establish minimum acceptable water level, flow and quality (ie. in-river needs) required to maintain the ecosystem. This is also essential for quantifying environmental demands to be used in groundwater balances for assessing water resources.

The *Water Resources Act 1963* required River Authorities to set Minimum Acceptable Flows (MAFs). This requirement was revised in the *Water Resources Act 1991* giving the NRA the power to recommend MAFs to the DoE for approval. To date no MAFs have been set Regionally or Nationally. In the absence of MAFs the Anglian Region NRA have set Minimum Residual Flow (MRF) targets at a number of points on rivers in the catchment. In essence these are similar to the concept of MAFs. MRFs are used for river management and to guide decisions on licence applications to protect other existing uses and users of the rivers.

There is a requirement to review the methodology used for assessing water resource availability in the light of perceived environmental demands ie. the amount of groundwater allocated to the river as baseflow.

Groundwater resource estimates are based on the long term average recharge into the underlying storage rocks called aquifers; these sustain base flows to the rivers.







In the parts of the catchment where the river is in hydrological continuity with the aquifer, the environmental demand for water is currently represented by an allowance of total groundwater resource, provisionally set at the natural 95 percentile flow (the flow that would be exceeded naturally 95 percent of the time), less the reliable contribution of effluent discharges. Any variation in these allowances will impact on water resource availability estimates.

28. There is a lack of detailed understanding of the working of the Essex Chalk and superficial aquifers.

The hydrogeology of the catchment is complex and not fully understood. A significant area of the Chalk aquifer located to the south east of the catchment is confined by Boulder Clay cover which effectively restricts natural recharge to the aquifer. The water abstracted from this aquifer is met by underflow of surplus recharge from the upper part of the catchment which is not confined. There is a lack of understanding of how much water moves through the aquifer by this process and what quantities are involved. This makes management of water resources in this catchment difficult.

To provide a better understanding of how the aquifer "works" and so enable better water resource management, requires development of a simulation model similar to that which currently exists for the Pant sub-catchment. The model could also be used to predict responses to varying development/abstraction scenarios and better estimates of water availability. A model is unlikely to identify an overall surplus of water for the catchment but could identify areas of local surplus and predict impacts on ground and surface waters if developed incorporating options for remedial works such as river support schemes.

29. Available water resources are inadequate to meet present and future demands compared against current resource assessments.

Future demands for water in the Anglian Region are progressively rising. Demand for public water supply is assessed by reference to predicted changes in population and consumption habits as well as considering the potential for demand management practices such as leakage control and metering policies. Demand management is a strong influence affecting the rate of increase in this catchment. Demand for industrial and agricultural growth are also allowed for.

Groundwater resources are already fully committed to existing abstractions and any future increases will have to be met from elsewhere. Surface water, with the exception of supported rivers, is only available in winter.

This is the most important water quantity issue.

30. Catchment areas for wetland sites of conservation value need to be identified.

Wetland sites exist where the geomorphology, geology and land use maintain water levels near to, or above the ground surface for all or the majority of time. The proportions of these contributing factors will vary for each site adding to the complexity of the study of wetlands. The area of groundwater contributing to the

wetland site can be defined as the wetland catchment area. Once defined this will identify areas of the catchment where future abstraction boreholes can be sited.

31. Opportunity exists to consider more flexible methods of allocating water resources.

A significant proportion of water resources are effectively tied up as "paper water" and are consequently under-utilised until and unless longer term demands materialise (essentially public water supply licences to meet demands up to the year 2021). This apparent surplus could be temporarily re-allocated to meet other shorter term demands.

32. Inclusion of effluent discharges to supplement river flows is unreliable.

Treated discharges which outfall into the inland river systems benefit both river flows and water resources. The standard for treatment of discharges is dictated by the quality requirements of the receiving water course. In the pursuit of cost efficiency it is possible that dischargers may wish to review existing discharge practices which may deprive existing abstractors of this important resource. This occurs when treatment plants are closed and all sewerage inputs are diverted to alternative works.

33. Concern over potential impacts of the operation of the Elv Ouse Transfer Scheme on river users, and

34. There is concern over regulation of river levels and flows - Elv Ouse to Essex transfers.

It is perceived by some that operation of this major raw water transfer system may have had adverse impacts by way of increased flows and levels. Conversely it is felt by others that these increases have been beneficial to the water environment. In order to gain a better understanding and appreciation of the impact of the scheme the NRA has commissioned a study to collate information to date. This study will provide a baseline understanding of the schemes operation against which existing and future operation of the scheme can be assessed, whilst ensuring secure water supplies into the catchment are maintained.

### 5.3 Flood Defence and Physical Features

#### 5.3.1 General

Having set target standards of service, the NRA has identified the issues below, where there are current shortfalls.

#### 5.3.2 Shortfalls Identified

35. Excessive ingress of saltwater through sluices.

Some of the flapped tidal sluices allow seawater to seep back through the sluices over periods of high water. In some cases this may be aggravated by sub-soil leakage through underground gravel layers. This has been happening for many

years in some locations. There is uncertainty as to the effect this is having on flora and fauna in the borrow ditches and on some of the larger watercourses such as Holland Brook and Asheldham Brook.

Where there is an important freshwater fishery such as Holland Brook, this can be seriously damaged by saltwater ingress. However, on some of the smaller channels by marsh edges, a brackish zone of water can create important features which would not exist elsewhere. From a flood defence point of view this small amount of back leakage is insignificant; from an environmental point of view it is a mixed blessing.

- 36. Flood defences below NRA target standards. and
- 37. Sea level rise and managed retreat.

Many of the defences date back hundreds of years. There have been many improvements made to the seawalls, particularly following the 1953 flood disaster. The combination of sea level rise and sinking of the land in south-east England, however, produces an effective annual sea level rise of 6mm per annum. This is also exacerbated by the erosion of beaches and foreshores together with salting decline. The result is increasing wave attack which damages defences and causes gradual reductions in the protection levels. Most urban frontages are now up to standard, but some rural walls offer reduced protection. Changes in agricultural practice and economics, however, make it difficult to justify conventional improvements to many rural frontages. Alternatives such as sustain, and in only very few situations consideration of managed retreat, have now to be considered only where it is economic to maintain the current defence. (Options to overcome or address these concerns are examined thoroughly in the forthcoming Essex Sea Walls Management Strategy Report).

- 38. Operation (and financing) of river control structures.

Throughout the fluvial river system, control structures regulate and maintain water levels. The majority of the structures are old, manually operated and some are operationally unsound. They are in need of regular repair and many need major investment to counter deterioration, upgrade their flood flow capacity and automate their monitoring and control systems.

The management of water levels to meet the needs of a diversity of users should be addressed. The ownership and operation of river control structures is vested with either the NRA, or is under private control. Where private mill rights exist, the NRA have no powers to influence their operational regime and retention levels. This can lead to conflict with riparian owners both upstream and downstream of the structure and may conflict with any proposed NRA integrated river management policy.

- 39. Development Control

The NRA seeks to minimise the damaging impacts that new development can have upon the water environment. Development in flood risk areas will be discouraged, and the NRA will strongly resist plans involving the loss of fluvial floodplain; this is because the property will be put at unnecessary risk of flooding or will increase

the risk of flooding to existing development. However, the statutory powers of the NRA are limited, and the *Town and Country Planning Act* legislation offers only limited scope to impose conditions on new development through Council planning processes.

40. Concern over the effects of past river management practices on the river environment.

Past land drainage activities have adversely affected the environmental value of certain channels. The maintenance and enhancement of habitat will therefore depend on more management regimes.

An essential pre-requisite underpinning the NRA's strategic objectives to further conservation, is to develop and implement effective standard methods to describe, classify and monitor the conservation " resource."

A methodology based on analysis of the Rivers Environmental Database (REDs) has been used to help ascertain the environmental status of each river in the catchment and to identify conservation targets. Conservation targets for each 500m river section are divided into the following three categories:

1. **Conserve:** includes all sections that are botanically valuable ( ie posses a high plant diversity and/or rare plants and/or important plant communities).
2. **Enhance:** includes all sections that posses no rare species and have a high or average bird diversity but only an average botanical interest. Enhancement work should improve the ecological shortfalls whilst conserving the features of specific interest.
3. **Restore:** Ecologically degraded - includes all sections that posses a low plant diversity, no rarities and/or low bird diversity.

Of the 481km of Main River analysed, 42.7% requires to be conserved, 29.7% requires enhancement and 27.6% requires restoration. See Map 27 for typical data on river conservation targets.

Given a sufficient lead-in time most of these requirements can be incorporated into the annual maintenance programme.

A standard, habitat-based River Corridor Survey (RCS) methodology has been developed and adopted as the NRA's Conservation Technical Handbook No.1. It highlights important features within the corridor and identifies opportunities to rehabilitate and enhance degraded habitats. An NRA National River Habitat Survey methodology is currently being developed to compliment RCS, and will classify the environmental conditions of rivers with regard to physical features such as riffles, pools, wet shelves and cliffs.

*Catchment Shortfalls: Typical River Conservation Targets  
(Shortfall No. 40)*

- Conserve
- Enhance
- Restore



**NRA**  
National Rivers Authority  
Anglian Region

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Map 27





41. Concern about degradation of traditional lowland landscape.

Landscape imparts a sense of place, plays a fundamental role in everyday life and is an immediate reflection of the ecology, habitat diversity and historical heritage. Many of the river corridors, including associated lands, have been subjected to a long history of change, increasingly since the 1940s. Activities such as land drainage, land clearance, quarrying, farming, industry, residential development and forestry have all played a part in landscape degradation.

Landscape conservation and management aims to maintain and increase diversity. To achieve this aim, an assessment and description of the landscape will be produced and appropriate management and enhancements progressed. The NRA Conservation Technical Handbook No.2 on River Landscape Assessment will provide a consistent framework which will assist the NRA in contributing to the restoration and enhancement of impoverished river valley landscapes within the catchment.

There is a need to work collaboratively with riparian owners, Countryside Management Projects and conservation organisations to improve the status and management of riparian trees and bushes.

42. Concerns about the adverse effects of bait digging on the foreshore.

Bait digging is a frequent source of enquiry, controversy and complaint. Much of this stems from misunderstandings and/or ignorance of its legality, and of its actual or potential impacts, under various circumstances and in various locations. No single authority is responsible for its regulation, which makes it difficult for the public to obtain adequate information on the subject. This inhibits the dissemination of appropriate advice to interested parties. There is clearly a need to improve upon this unsatisfactory position.

43. Requirement to identify rolling programme opportunities at an early stage within the river maintenance programme.

In order to maximise conservation input to Flood Defence maintenance programmes a longer lead-in time is necessary. Given this lead-in time many of the conservation issues raised within this catchment can be dealt with by incorporating enhancements into routine maintenance.

44. Requirement to investigate opportunities for long term set-a-side land as riparian buffer strips.

Many opportunities exist for the NRA to encourage landowners to put land adjacent to the river into one of the schemes promoted by the Countryside Commission or MAFF. This will enhance the river corridor through restoration of the floodplain and creation of buffer zones.

45. Concern about loss of saltmarsh habitat

Opportunities exist to minimise saltmarsh damage and in some locations recreate them. Where these opportunities arise they should be exploited in consultation with landowners.

46. Need to improve liaison with other organisations over protection of sensitive archaeological sites adjacent to NRA maintenance and minor capital works.

A system for contacting appropriate organisations when precise details of NRA work have been finalised is necessary to ensure that no sensitive archaeological sites are damaged. Many of the sites within this catchment are not scheduled but are still of significant historical interest.

47. Requirement to promote appropriate public access to rivers in conjunction with other organisations.

Riverside footpaths could be improved by linking together the existing paths and promoting this access in conjunction with the appropriate organisations.

Collaboration with the River Valley Projects should continue. In this way there is close liaison with all interested parties that work collaboratively to enhance appropriate public access to rivers.

48. There is a lack of public information boards.

Information boards supplying details of the wildlife and flood protection value of the sea walls would provide the public with useful information.

It is an excellent opportunity to publicise the NRA's involvement and give details of collaborative projects undertaken with local conservation groups along the sea walls.

49. Investigate the impact of linking Springfield Basin (Chelmsford) to the Chelmer and Blackwater Canal.

A feasibility study should be initiated to assess the advantages and disadvantages of linking these waters for navigation.

The project would need close liaison with the Proprietors of the Chelmer and Blackwater Navigation Company Limited, the Inland Waterways Association and Chelmsford Borough Council.

50. Need to improve liaison over recreational strategies.

There is a recognised requirement to liaise with all appropriate organisations over recreational activities occurring on the rivers, estuaries and coast. Water sport users need to be involved as well as the statutory organisations.

There are many strategies concerning water sports and leisure pursuits in the countryside that are being devised locally and nationally. These strategies and the overriding common principles require combined efforts from all organisations in partnership. This will enable a unified and coherent approach to protecting and developing sport, leisure, wildlife and other countryside activities.

#### 5.4 Fisheries - Freshwater

##### 5.4.1 General

Of the surveyed river lengths, 71% currently fall into the top biomass class A (not less than 20 gm<sup>-2</sup>), and thereby reach or exceed the appropriate target class. These lengths include all reaches of the Rivers Pant/Blackwater, Chelmer and Can, together with extensive lengths of the Rivers Colne, Ter and Wid. Sustained trends to improvement have been noted over the past ten years in the River Blackwater, and more particularly in the River Chelmer downstream of Chelmsford. A further 17% of river meets its class B or C targets. Taken overall, this represents a very satisfactory position.

The remaining 12% of the river length supports less than satisfactory class D stocks, which fall short of their target classes. These all occur in comparatively minor reaches, namely the headwaters of the Rivers Brain, Wid and Ter, and in the small coastal catchment of Asheldham Brook. Details of these reaches are shown on Map 28.

Failure to meet target class in the Ter has been noted only in survey results from 1992, which may well reflect the drought conditions which prevailed throughout the region from 1988 until that time. These conditions may also have contributed to other failures. However, these have been observed more frequently and over longer time periods, indicating that other factors are at least partly responsible.

##### 5.4.2 Shortfalls Identified

51. Fish stocks in the headwaters of the Rivers Brain, Wid and Ter, and those throughout Asheldham Brook, do not reach their target class.

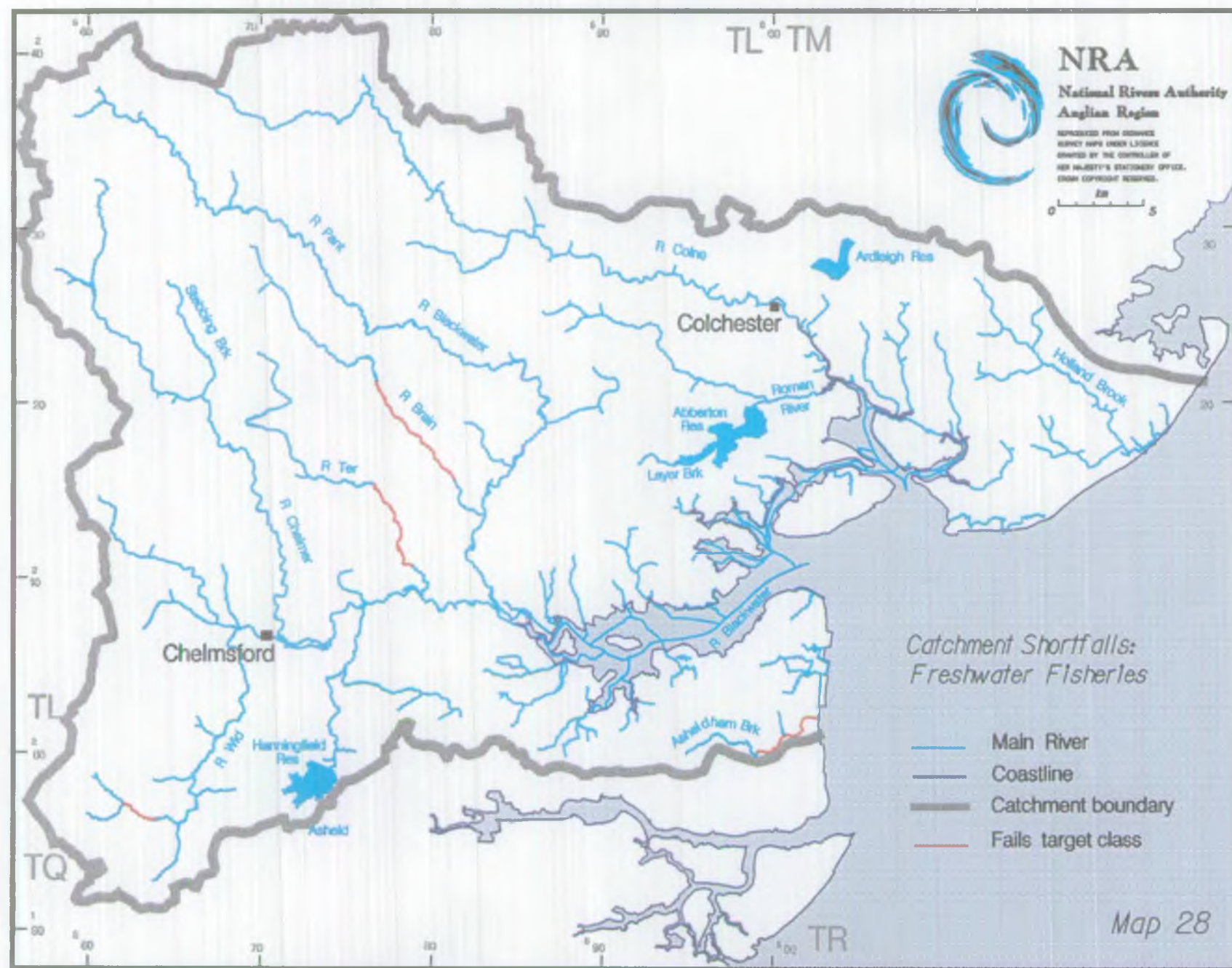
Only poor Class D fish stocks occur in the headwaters of the Rivers Brain, Wid and Ter, and throughout Asheldham Brook. This is thought to be due to various reasons or combinations of reasons, including water quality, high effluent volumes, low natural flows and, in Asheldham Brook, saline intrusions. It is unlikely that the full range of limiting factors has been identified in any one case.

52. Sluice design and operation at Grange outfall is damaging to the freshwater fishery in Asheldham Brook.

This tidal sluice drains a large area of low, flat arable land where, in the summer months, there is little or no natural flow to prevent excessive siltation in the sluice itself and its long tidal channel. Sluice pegging is undertaken whereby controlled quantities of salt water are allowed to flow back through the sluice then freely

discharge on the next low tide. This artificial flow picks up the soft sediments and clears the brook's long tidal channel where conventional engineering machinery cannot access due to excessively soft marsh and salting. This method of de-silting is good from the land drainage point of view, but is damaging to the potential freshwater fishery upstream of the tidal sluice. The situation is aggravated by seepage of salt water through the sluice structure which has only one flap valve on each of its barrels, and is prone to poor closure by debris fouling the flaps. Abandonment of sluice pegging and the addition of a secondary set of flap valves would reduce the salinity of the lower reaches of the watercourse and improve its fishery.







## 6.0 ISSUES AND OPTIONS

### 6.1 General

This section of the plan considers options to address the issues that have been raised in the preceding sections. The options as presented are the initial thoughts of the Anglian Region of the NRA and do not constitute policy statements. It must be re-emphasised that at this stage, it is not the objective to present a detailed programme of action or to prioritize the issues and options identified. It is recognised that considerable consultation and negotiation will be necessary before an acceptable and practicable final report can be drawn up. This will be the next stage. Comments on the issues and options are therefore requested together with any new ideas/suggestions.

Wherever possible the body responsible for carrying out each option has been identified. In some cases this is identified as someone other than the NRA. However, the options as presented are intended as a plan to facilitate improvements to the water environment for the benefit of all users. Obviously this will entail many bodies and individuals working together to fulfil the aims and objectives as detailed in this Catchment Management Plan.

6.2 Issues and Options

**Issue No. 1:** Non compliance with *EC Bathing Water Directive* - West Mersea.

Options	Responsibility	Advantages	Disadvantages
1. Monitor effects of improvements to West Mersea STW scheduled for completion by 1996.	NRA	Confirms compliance with EC limits or identifies need for further action.	Cost. Cost to AWS.

**Issue No. 2:** River Wid - Chain Bridge to River Can;  
River stretches variously fail to meet target class for BOD, ammonia or dissolved oxygen, possibly due to nutrient enrichment.

Options	Responsibility	Advantages	Disadvantages
1. Survey catchment to identify reasons.	NRA	Identifies causes leading to remedial action.	Cost to NRA. Cost to potential polluters.
2. Phosphorus removal at Shenfield STW and possibly at other sources, to limit the effects of eutrophication.	AWS	Reduces nutrient levels in river.	Cost to AWS.

**Issue No. 3:** Holland Brook - downstream Thorpe STW;  
Failure to meet target class for dissolved oxygen.

Options	Responsibility	Advantages	Disadvantages
1. MAF to be assessed and maintained to take account of effluent dilution.	NRA	Compliance with target levels.	Cost to NRA.
2. Improvements to, or diversion of, Thorpe STW to meet river needs consent limits.	AWS	Compliance with target levels.	Cost to AWS.
3. Study of flow regime in lower reaches, related to the operation of the tidal sluice.	NRA	May identify improvements to sluice operation and river management.	Cost to NRA.

**Issue No. 4:** River Colne - Headwaters to Halstead;  
Failure to meet target class for dissolved oxygen.

Options	Responsibility	Advantages	Disadvantages
1. Survey in upper catchment to identify reason.	NRA	Identifies cause leading to remedial action.	Cost to NRA. Potential cost to polluters.
2. MAF to be assessed and maintained to required level.	NRA	Increased river flow resulting in high dissolved oxygen.  May enhance other river uses.	Cost to NRA.
3. Do nothing.		No cost or resource implications.	Does not resolve the issue.



**Issue No. 5:** Roman River - downstream of Abberton Reservoir;  
 Layer Brook - upstream of Abberton Reservoir;  
 Failure to meet target class for dissolved oxygen.

Options	Responsibility	Advantages	Disadvantages
1. Survey in upper catchment to identify reason.	NRA	Identifies cause leading to remedial action.	Cost to NRA.  Potential cost to polluters.
2. Do nothing.		No cost or resource implications.	Does not resolve the issue.

**Issue No. 6:** River Pant/Blackwater - Headwaters to Langford;  
 River Brain - Rayne to River Blackwater;  
 River Colne - Lexden to East Mill;  
 River Chelmer - Great Dunmow to Chelmsford;  
 River Ter - Great Leighs to River Chelmer;  
 Bourne Brook - downstream of Gosfield Lake;  
 Failure to meet target class for DO and BOD.

Options	Responsibility	Advantages	Disadvantages
1. Removal of phosphorus at Braintree, Halstead and Bocking STWs.	AWS	Reduces phosphorus levels in the river.	Cost to AWS.  May not achieve objective.
2. Possible phosphorus removal at additional STWs.	AWS	Reduces phosphorus levels in the river.	Cost to AWS.  May not be acceptable under national policy.
3. Pollution prevention visits / education to farmers within the catchment.	NRA	May reduce nutrient levels and other pollutants in the rivers.	Cost to NRA.  Potential cost to farmers.

**Issue No. 7:** Chelmer/Long Pond - Beeleigh to Heybridge Basin;  
Failure to meet target class for BOD.

Options	Responsibility	Advantages	Disadvantages
1. Increase in flow to reduce retention in system.	NRA	Achieves target level by reducing algae.	Loss of fresh water.  Potential cost to ESW and NRA.
2. Do nothing.		No cost.	Target level not achieved.

**Issue No. 8:** Colne Estuary - Rowhedge;  
Blackwater Estuary - Marconi Sailing Club;  
Pyefleet Channel;  
Failure to meet EC limits for metals - copper and zinc.

Options	Responsibility	Advantages	Disadvantages
1. Research to confirm reasons for high levels of metals.	NRA	Confirms source.	Cost.
2. Await results of present review by EC of metal limits.	NRA	Relaxed targets may be met.	Existing EC levels may be maintained.

**Issue No. 9:** River Blackwater at Langford;  
River Chelmer at Langford;  
Failure to meet EC levels for nitrate.

Options	Responsibility	Advantages	Disadvantages
1. Designate Blackwater / Chelmer catchment as a nitrate vulnerable zone.	DoE	Reduction of river nitrate levels.	Cost to farmers.  Potential enforcement cost to MAFF.
2. Do nothing.		No cost to farmers.	Does not comply with EC requirements.  Will not resolve the issue.

**Issue No. 10:** River Brain - downstream of Braintree STW;  
Failure to meet biological target.

Options	Responsibility	Advantages	Disadvantages
1. Assess and maintain MAF to provide additional dilution.	NRA	Achieves objective.	Cost to NRA.
2. Review of "River Needs Consent" quality limits for Braintree STW.	NRA	May achieve objective.	Cost to AWS.
3. Diversion of Braintree sewage to Bocking STW.	AWS	May achieve objective.	Cost to AWS.
4. Pollution prevention investigation within Braintree.	NRA	Reduces pollution.	Cost to NRA.  Potential cost to polluters.
5. Do nothing.		No cost.	Continued failure.

**Issue No. 11:** Salary Brook - Blue Barns Farm;  
Failure to meet biological target.

Options	Responsibility	Advantages	Disadvantages
1. Survey to be undertaken to identify sources of pollution.	NRA	May resolve problem.	Cost to NRA.  Potential cost to polluters.
2. Provision of sewerage scheme for area.	Tendring District Council	May resolve problem.	Cost to Tendring DC and householders.
3. Do nothing.		No cost or resource implications.	Does not achieve objective.

**Issue No. 12: Concern over agricultural pollution from diffuse sources.**

Options	Responsibility	Advantages	Disadvantages
1. Buffer zones encouraged by set-aside, ESAs and Countryside Stewardship.	NRA MAFF Countryside Commission	Reduction in river pollution.  Formation of river corridor for wildlife.  Attenuation of surface water run-off.	Limited life.
2. Pollution prevention, enforcement and encouragement of Code of Good Agricultural Practice.	NRA  Farmers  MAFF	Reduction in pollution.	Staff resources.
3. Application of nitrate vulnerable zones where applicable.	DoE	Reduction in polluting run-off.	Cost to farmer.
4. Do nothing.		No resource implications.	Does not address the concern.

**Issue No. 13: Odour problem - River Pant and Blackwater**

Options	Responsibility	Advantages	Disadvantages
1. Continue present investigation to determine source of odour.	NRA  AWS	Locates source(s).	Cost.  All sources may not be identified.
2. Set odour consent limits at STW to limit problem.	NRA	May only be a partial solution.	Cost to AWS.  Does not identify source.  May not be permitted if condition is appealed against.  Potential cost to traders.

**Issue No. 14:** Colne Estuary - Colchester to Colne Point;  
Unsatisfactory water quality.

Options	Responsibility	Advantages	Disadvantages
1. Improve effluent from Colchester STW.	AWS	Improve water quality in estuary.	Cost to AWS.
2. Study to assess trophic state of Colne Estuary.	NRA	May lead to identification as a "Eutrophic Water".	Cost to NRA. Potential cost to AWS if nutrient removal required.
3. Do nothing.		No cost or resource implication.	Does not improve quality of estuary.

**Issue No. 15:** Concern over blue-green algae.

Options	Responsibility	Advantages	Disadvantages
1. Develop an "Action Plan" for each water, in a priority order, which will identify practical remedial measures.	NRA	Identifies options leading to reduction in problem.	Cost of "Plan" and potential cost to owners of the waters concerned.
2. Application of phosphorus removal requirements under <i>EC Urban Waste Water Directive</i> to appropriate STWs.	AWS	Reduces nutrient levels in rivers and reservoirs.	Cost to AWS. May not achieve objective.
3. Do nothing.		No new cost / resource implications.	NRA monitoring costs continue.



**Issue No. 16:** Concern over pollution / potential pollution from waste disposal sites.

Options	Responsibility	Advantages	Disadvantages
1. Discussion with site operators and County Waste Regulation Authority leading to remedial measures.	Site Operator  WRA	Resolves problem.	Cost to site operators.
2. Consider prosecutions.	NRA	May act as a warning to others.	Will not overcome concerns.  Drain on resources.
3. Do nothing.		No cost or resource implications.	Does not resolve the problems.

**Issue No. 17:** Concern over the effects on River Chelmer of the proposed scheme to re-use treated sewage effluent.

Options	Responsibility	Advantages	Disadvantages
1. Retain existing scheme for effluent disposal.	ESW	No effect on existing river users.	Water resource remains unresolved.  Cost of maintaining/renewing effluent pipeline.  Possible adverse effects from increased Ely-Ouse transfer flows.
2. Diversion of effluent to Chelmer.	ESW (with AWS agreement)	Increased water resource availability.  Reduces effluent content within the estuary.	Cost to ESW.  Potential effect on river uses.  Emotive.

**Issue No. 18:** Concern over bacterial concentrations in the West Mersea/Tollesbury oysterages.

Options	Responsibility	Advantages	Disadvantages
1. Assess improvements to bacterial concentrations following extensions to West Mersea STW.	NRA	Identifies any further sources of pollution.	Cost.  Potential cost to AWS.
2. Do nothing.		No cost or resource implications.	Does not identify problems.

**Issue No. 19:** Impact of major new highways upon the water environment.

Options	Responsibility	Advantages	Disadvantages
1. Await the results of the national research and development project.	NRA	Co-ordinated national policy.	Time.  Local decisions to be made in interim.  Cost to Highway Authority.
2. Continue to implement local discussions / actions.	NRA	No new resources required.	May not be the best practice.

**Issue No. 20:** Litter on riverbanks, estuaries and coastal waters.

Options	Responsibility	Advantages	Disadvantages
1. Reconstruction of offending overflows and outfalls.	AWS	Prevent discharge of sewage derived litter.	Cost.  DoE policy will inhibit action beyond the end of the decade.
2. Installation of temporary measures.	AWS	May work at some sites.	Limited use.  Cost.
3. Regular clear up campaigns.	NRA  AWS  Councils	Removes unsightly objects.	Does not solve problem.  Organisation.  Cost.
4. Education of the public regarding disposal of sanitary waste - "bag it and bin it".	NRA  Councils	Improves situation in popular areas.	Often does not work.

**Issue No. 21:** Concern over the quality of surface water discharges from industrial estates.

Options	Responsibility	Advantages	Disadvantages
1. Prosecution when sources are proven.	NRA	May effect an improvement.	Action is taken after pollution has occurred.  Difficulty often in tracing source.
2. Diversion of risk areas to foul sewer when available.	NRA  AWS	Reduction in pollution.	Cost to dischargers.
3. Install pollution reduction measures on sewage systems.	AWS  Estate owner	Reduces/prevents pollution.	Cost to AWS or estate owner.

**Issue No. 22:** EC Identification of St Osyth beach.

Options	Responsibility	Advantages	Disadvantages
1. Identify beach under the <i>EC Bathing Water Directive</i> .	DoE Tendring District Council	Water quality required to meet Directive limits.	Potential cost to Anglian Water Services.
2. Do nothing.		No potential cost to Anglian Water Services.	Water quality may not meet Directive requirements.

**Issue No. 23:** Some unsewered villages have problems of sewage pollution.

Options	Responsibility	Advantages	Disadvantages
1. Implementation of mains sewerage in identified problem areas.	Councils AWS	Resolves the problems.	Cost to District Councils and property owners.
2. Strict enforcement of pollution legislation in problem areas.	NRA	May resolve the problems.	Does not ensure resolution of the problems.  May result in numerous private sewage treatment plants.  Legal action against individual property owners.  Cost to property owners.
3. Do nothing.	NRA Councils	No cost to property owners or District Councils.	Does not resolve the problem.

**Issue No. 24:** Designation of Blackwater and Colne Estuaries as Eutrophic Sensitive Areas and Polluted Waters.

Options	Responsibility	Advantages	Disadvantages
1. Gather information to see whether or not designation is justified.	NRA	If designated, phosphorus and nitrogen discharges will be controlled.	Cost to dischargers.
2. Do nothing.		No Cost.	Estuarine quality may deteriorate.

**Issue No. 25:** Designation of High Natural Dispersion Areas.

Options	Responsibility	Advantages	Disadvantages
1. AWS to prepare comprehensive studies.	AWS DoE	Unnecessary treatment may be avoided.  Higher quality effluent may be discharged.	The outcome may result in primary treated effluent being discharged.  Cost to AWS if secondary treatment is required.
2. AWS to do nothing.		Higher quality effluent must be discharged.	Cost.



**Issue No. 26:** Actual flows are perceived to be inadequate to meet river needs.

Options	Responsibility	Advantages	Disadvantages
1. Review/set minimum flow requirements (MRFs or MAFs).	NRA	<p>Improved resource management.</p> <p>Provide better understanding of in-river needs.</p> <p>Confirm/identify stretches of river concerned.</p> <p>Protection to river environment.</p>	<p>Cost of investigations.</p> <p>Any increase in flow requirements will reduce estimates of water resource availability.</p> <p>Any reduction in present minimum flows may have implications on existing discharge consents and the water environment.</p> <p>Possible implications for existing abstractors.</p>
2. "In-river needs" study to assess actual requirements.	NRA	<p>Needed for setting river flow objectives.</p> <p>Quantifies the protection required for the river environment.</p>	<p>Cost of studies.</p> <p>Time.</p>
3. Increase flows artificially ie. by river to river or groundwater to river augmentation.	<p>NRA</p> <p>Water Company</p>	<p>Increased flow.</p> <p>Protection to river environment.</p>	<p>Need to identify "target" flow regime first.</p> <p>Cost.</p> <p>Possible change in water quality.</p>
4. Undertake river engineering works to modify channel characteristics.	NRA	<p>Create enhanced flows in some river sections.</p> <p>Discourage standing water and weed growth.</p>	<p>Cost.</p> <p>Particular section of river may not lend itself to engineering modifications.</p> <p>Cost:benefit ratio.</p>

## Issue No. 27:

In-river needs are not quantified and Minimum Acceptable Flows are not defined.

Options	Responsibility	Advantages	Disadvantages
1. Carry out extensive ecological and in-river needs studies.	NRA	Enables better protection and understanding of river ecology.  Improved resource management.  Verification of water resources availability.	Cost and timescale.  Reduction in current MRFs may impact on water quality.  Increase in current MRFs would impact on water resource availability.
2. Await outcome of National R&D Study on defining MAF's.	NRA	Better understanding of in-river needs.  National standardised approach identified for setting MAF's.	Timescale.  Local issues could be "masked" by National approach.  Cost of study.
3. Set MAFs based on review of existing MRFs and experience.	NRA	Quicker implementation.	Possible lack of National consistent approach.  Subjective.
4. Do nothing.		No additional staff or implementation costs.	Inability to adequately assess water resource availability.  Need to rely on existing MRFs which may be inappropriate.  Actual minimum flows in some stretches may continue to be perceived as inadequate.

**Issue No. 28:** There is a lack of detailed understanding of the working of the Essex Chalk and superficial aquifers.

Options	Responsibility	Advantages	Disadvantages
1. Detailed investigation and modelling of system.	NRA	Better understanding of how catchment aquifers respond to water resource developments.	Timescale.  Costs may outweigh results/benefits of study - outcome unlikely to identify additional resource availability for development.
2. Do nothing.		No additional staff costs required.	Continued lack of detailed understanding of aquifer systems and interactions.  Poor management of water resources preventing optimum water resource management and development.

**Issue No. 29:** Available water resources are inadequate to meet present and future demands compared against current resource assessments.

Options	Responsibility	Advantages	Disadvantages
1. Await the outcome/ strategic development recommendations of Water Resources Strategy.	NRA Water Companies Developers	Comprehensive and co-ordinated development approach.  Multi-disciplinary approach.	Timescale.  Cost.
2. Use more surface water via enhanced transfer schemes optimising conjunctive use of ground and surface water.	NRA  Water Companies	Meets demand.  Optimises use of existing scheme.  Could meet demands in the short term.	Cost.  Possible environmental implications.  Limited to rivers receiving support.  Availability of water and reliability uncertain.
3. Demand Management.	NRA  Water Companies	Reduces demand and delays future development / expenditure.	Installation costly if by metering.  Impact on local users.
4. Aquifer recharge.	NRA	Re-establishment of groundwater levels.  Better utilisation of water resources.  Storage of surplus water for use in times of shortage.	Limited yield.  Requires suitable geological conditions.  Aquifer pollution risk.  Unproven technique.  Cost.

(continued over)

## Issue No. 29. (contd.)

Options	Responsibility	Advantages	Disadvantages
5. Re-use of sewage effluents.	NRA  Water companies	Better utilisation of water resources.  Provides opportunity for additional resource development.	Loss of flow in existing receiving waters.  Emotive.  Enhanced treatment/costs.  Could involve different companies.  Cost.
6. Revocation of under-used and unused licences.	NRA	Make more water available for reallocation to environment/abstractors.  Re-allocates water to valid use.	Possible compensation costs.  Possible implications for existing abstractors.
7. Encourage on-farm winter fill storage reservoirs.	NRA  Abstractors	Does not deplete summer resources.  Efficient utilisation of existing water resources.  Provides more reliable supply.  Potential amenity/recreational opportunities.	Cost to abstractor.  Loss of land.
8. Encourage more water efficient agricultural practices.	NRA  MAFF  NFU  Farmers Countryside Commission	Minimal cost to NRA.  Effective use of government subsidies.	Limited in effect.  May require change in agricultural practice.  Cost to farmers.



**Issue No. 30:** Groundwater catchment areas for wetland sites of conservation value need to be identified.

Options	Responsibility	Advantages	Disadvantages
1. Environmental studies at sites of particular concern.	NRA  Water Companies  Conservation bodies	Better hydrological understanding of wetland behaviour.  Provide effective protection to wetlands.  Improved management opportunities.	Timescale and cost. Possible lack of National consistency in approach.  Possible implications for existing abstractors.
2. Await outcome of R&D Study on wetlands.	NRA	Consistent approach.  Cheaper than site specific studies.	May not be appropriate for local issues - site specific investigations may still be necessary.
3. Use empirical assessments.	NRA	Quick.	Potential to be inaccurate.  Subjective.

**Issue No. 31:** Opportunity exists to consider more flexible methods of allocating water resources.

Options	Responsibility	Advantages	Disadvantages
1. Temporary allocation of committed licensed amounts to other applicants in the short term.	NRA	More efficient utilisation of water resource allocation.	Suitable for short term requirements only. High risk of non renewal.  Requires co-operation of existing licence holders. Difficult to administer and police. Removes flexibility of operation for existing longer term licence holders.
2. Issue stepped incremental licence quantities. (New licence issues only).	NRA	More efficient utilisation of water resource allocation.	As above - except does not require co-operation of longer term licence holder.

**Issue No. 32:** Inclusion of effluent discharges to supplement river flows is unreliable. (Sewage works may be closed and local resource lost).

Options	Responsibility	Advantages	Disadvantages
1. Co-operation of dischargers - Water Companies and Industry.	NRA Water Companies Industry	Maintains existing level of support to river flows.	Companies subject to economic pressures.
2. Incentives through charging schemes to encourage non-relocation of outfalls.	NRA AWS Industry	Maintains existing level of support to river flows.	Cost.  Requires change in legislation/charging policy.

**Issue No. 33:** Concern over the potential impacts of the operation of Ely Ouse Transfer Scheme.

Options	Responsibility	Advantages	Disadvantages
1. Await outcome of the study identifying impacts.	NRA	Co-ordinated approach to identifying aspects of concern.	Further studies likely to be recommended.  Timescale.  Cost.
2. Restrict the scale of the transfer.	NRA	Environmental benefit.  Limits impact.	May result in shortfall in meeting public water supply and other demands.  Does not make best use of the scheme's potential.
3. Timing of transfer operation.	NRA	Environmental benefit.  Limited impact.	Transfers may not be available when required.
4. Establish levels of service with the users likely to be affected by operation of the scheme (angling clubs).	NRA  Angling clubs	Users' requirements recognised and catered for.	Potential cost.  May not reduce physical impact.
5. Do nothing.		No additional staff costs.	Continued "ad hoc" approach to problem identification and appreciation.

**Issue No. 34:** Concern over regulation of river levels and flows - Ely Ouse to Essex transfers.

Options	Responsibility	Advantage	Disadvantage
1. Construction of surface water reservoir strategically located north of the catchment (operated in conjunction with Ely Ouse to Essex Transfer Scheme).	NRA Developer	Better regulation of flows and quality.  Create recreational, conservation, fishery and amenity opportunities.  Optimise resource facilities.	Cost.  Timescale for construction.  Potential loss of agricultural land and dwellings.  Likely to be subject to public inquiry.
2. Automated gates throughout river with monitoring of river level and gate setting.	NRA	Better regulation of flows and levels.	Cost.  Possible visual effect.

**Issue No. 35:** Excessive ingress of saltwater through sluices.

Options	Responsibility	Advantages	Disadvantages
1. Prioritise and implement remedial measures to sluices on a phased basis.	NRA Landowners	Prevents back drainage.	High costs for uncertain benefits.  Will change nature of some coastal drains.
2. Carry out study into extent of problem and its advantages / disadvantages on wildlife.	NRA EN	Clearly defines extent and nature of ingress, determines if this is damaging or beneficial to the environment.	Cost.
3. Develop NRA policy on brackish habitats and implement works.	NRA EN Landowners	Clear way ahead for NRA and landowners.  Funding can be identified.	May make effective management of Land Drainage on flat coastal drains difficult.
4. Do nothing.		No cost.	Damaging effects may not be resolved.

**Issue No. 36:** Concern that Flood Defences may not meet NRA target standards.

Options	Responsibility	Advantages	Disadvantages
1. Undertake Standards of Service exercise.	NRA	Identifies existing conditions and shortfalls.  Integrated approach to defence needs.  Aids feasibility studies.  Provides data for planning and performance measures.	Needs continually updating.  Cost implications.
2. Continue to develop 10 year needs programme.	NRA	Integrated approach to defence needs.  Known priorities and costs.  Aids capital investment.  Utilised resource economically.	May identify more work than funding allows.
3. Do nothing.		Short term - cost savings.	Fragmented approach to Flood Defence needs.  Lack of priority.



**Issue No. 37: Concern over the effects of sea level rise on tidal defences.**

<b>Options</b>	<b>Responsibility</b>	<b>Advantages</b>	<b>Disadvantages</b>
1. Sustain defences at existing levels.	NRA	Short term - cost savings.	Standard of protection is reduced.  Increased maintenance requirement.  Increased frequency of flooding.
2. Managed retreat where economically, technically and environmentally viable.	NRA	Medium to-long term - cost savings.  Development of saltmarsh as soft defence.  Environmental enhancement opportunities.	Loss of land to sea.  Loss of coastal frontage protection.
3. Improve sea defences.	NRA	Maintains target standards of protection.	Cost.
4. Do nothing.		Short term - cost savings.	Increased frequency of flooding.  Likelihood of sudden failure.  Increased risk to life and property.

**Issue No. 38:** Concern over the management and financing of river control structures.

Options	Responsibility	Advantages	Disadvantages
1. Rebuild structures to NRA requirements.	Private owner  NRA	Co-ordinated approach.  Retains structures and associated benefits to river users.  Allows intro. of more automation into river level control where appropriate.	Cost.  Possible conflict between requirements and apportionment of costs.  May damage the architectural/historical interests of sites.  Many are privately owned in "gardens".
2. Investigation into overall management policy of river system related to structures.	NRA	Identifies real needs and environmental impact.  Includes co-ordinated approach.	Cost.  Conflicts of responsibility/interest.
3. Do nothing.		No cost in short term.	Loss of water levels.  Loss of amenity.  Possible flood defence problems.  Environmental concerns.

**Issue No. 39:**

Development control in flood risk areas.

Development often increases risks to the water environment but NRA has only limited powers to impose conditions on development.

Options	Responsibility	Advantages	Disadvantages
1. Endeavour to persuade planning authorities to adopt NRA Guidance notes for Development Plans in their structure and local plans. In addition, raise awareness of planning authorities to DoE Circular 30/92, and its importance in formulating structure and local plans and in the determination of planning applications.	Local Authorities  NRA  Developers  Landowners	Ensures that matters for which the NRA are responsible are fully taken into account in all development proposals.	Implications on local authority control.  Possible cost implications to landowners / developers.
2. Do nothing.		Staff savings.	Uncontrolled development in flood risk areas and damage to the water environment.

**Issue No. 40:** Concern over the effects of past river management practices on the river environment.

Options	Responsibility	Advantages	Disadvantages
1. To develop and implement effective standard methods to describe, classify and monitor the conservation resource.	NRA	Provide basis for decision making.	Cost.
2. Identify areas with potential for restoration and enforcement and determine costs.	NRA	Provide basis for decision making.	Cost.
3. Undertake restoration and enhancement schemes.	NRA Landowners River Valley Projects	Improve habitats and landscape and meets NRA's responsibilities to promote conservation.	Cost.  Requires agreement of the landowner and lead-in time to plan work.

**Issue No. 41:** Concern about degradation of the Traditional Lowland Landscape.

<b>Options</b>	<b>Responsibility</b>	<b>Advantages</b>	<b>Disadvantages</b>
1. To develop and implement effective standard methodology to describe, classify and monitor the conservation resource.	NRA	Provide basis for decision making.	Cost.
2. Identify areas with potential for landscape restoration and enhancement.	NRA MAFF Wildlife Trusts Riparian owners	Provide basis for decision making.	Cost.
3. Undertake restoration and enhancement schemes.	NRA MAFF Wildlife Trusts Riparian owners Councils	Improve habitats and landscape and meets NRA's responsibilities to promote conservation.	Cost. Requires agreement of the landowner and lead-in time to plan work.
4. NRA continue to develop a programme of riverside tree replacement and management within its maintenance operations.	NRA Riparian owners	Improvement of habitats and landscape. Meet NRA's responsibility to promote conservation.	Cost. Possible conflict with Flood Defence requirements.



**Issue No. 42:** Concern about the adverse effects of bait digging on the foreshore.

Options	Responsibility	Advantages	Disadvantages
1. Issue a leaflet outlining the legal position regarding bait digging, and explaining its impacts and effects.	NRA Crown Estate Commissioners English Nature Landowners	Provide a common approach to a recurring problem by explaining legal and illegal actions of bait diggers.  Identifies bodies responsible for taking action.  Improves public awareness.	May result in more reports of incidents over which NRA has no control.
2. Liaison with English Nature and Crown Commissioners to agree a common approach without producing leaflets.	NRA Crown Estate Commissioners English Nature	Standard approach to problem.	No leaflet production for public information.
3. Introduce byelaws to control bait digging.	Councils	Provides cohesive legal framework.	Time taken to introduce byelaws.
4. Do nothing.		No cost.	Does not address problem.

**Issue No. 43:** Requirement to identify rolling programme opportunities at an early stage within the river maintenance programme.

Options	Responsibility	Advantages	Disadvantages
1. Extend the lead-in time for the Flood Defence maintenance programme to allow adequate liaison with landowners, conservation and recreation bodies.	NRA  Landowners  LFDC	Provides the required lead-in time to identify all conservation and recreation opportunities linked to NRA works.	Requires longer term planning by Flood Defence and Landowners.
2. Do nothing.			Inability to maximise opportunities for conservation and recreation.

**Issue No. 44:** Requirement to investigate opportunities for long term set-aside land as riparian buffer strips. (See also Issue 47)

Options	Responsibility	Advantages	Disadvantages
1. Investigate possibilities of riparian buffer strips which coincide with long-term set aside.  Liaise with landowners, MAFF and ADAS.	Landowners  MAFF  ADAS  NRA	Significant improvement in river corridor habitats.  Gives potential access for NRA maintenance.  Reduction in pollution and nutrient run-off to rivers.	May not be possible.  May be necessary to get agreement with several landowners.
2. Identify suitable trial site.	NRA  River Colne Project	Trial site could indicate advantages of wider application.	Cost.  Trial site will only reflect particular/local characteristics.
3. Do nothing.			Possible missed opportunities.

**Issue No. 45:** Concern about loss of Saltmarsh Habitat.  
(See also issue 38)

Options	Responsibility	Advantages	Disadvantages
1. Foreshore recharge.	NRA MAFF	Medium to long-term cost savings.	Limited application.  Limited supply of appropriate material.
2. Managed retreat.	NRA MAFF Landowners	Medium to long term cost savings.  Development of salt marsh as soft defence/protection.  Environmental enhancement opportunities.	Loss of land to the sea.  Loss of coastal frontage protection.
3. Await outcome of research into causes of saltmarsh depletion.	NRA MAFF Landowners	Identifies the problem(s).  May indicate optimum strategy for reducing loss of saltmarsh.	Time.  Unlikely to be a single cause.  Likely to need estuarial refinement of techniques to arrest saltloss.
4. Take physical interim measures.	NRA	Provides some immediate relief.	May be uneconomic.  May worsen the problem.
5. Do nothing.		No immediate cost.	Continuing loss of valuable habitat.  Increased cost of sea defences maintenance. Disruption of estuary hydrology.

**Issue No. 46:** Need to improve liaison with other organisations over protection of sensitive archaeological sites adjacent to NRA maintenance and minor capital works.

Options	Responsibility	Advantages	Disadvantages
1. Improve procedures for contacting appropriate organisations when precise details of NRA works have been finalised.	NRA  Councils  English Heritage	Enhances protection given to archaeological sites and identifies possibilities to enhance archaeological interests of river valleys and foreshore.	Requires time for identification of non-scheduled archaeological sites.  May delay NRA works.
2. Await outcome of national R&D study on current liaison practice.	NRA	Consistent approach.	Timescale.
3. Do nothing.			Continued risk of damage to archaeological sites.

**Issue No. 47:** Requirement to promote appropriate public access to rivers in conjunction with other organisations. (See also issue 44)

Options	Responsibility	Advantages	Disadvantages
1. Continue participation in Countryside Management Projects and liaison with other bodies to work collaboratively to enhance appropriate public access to rivers.	NRA Countryside Management Projects Councils Countryside Commission	Meets NRA's recreation objectives.  Promotes wider public use of countryside especially appropriate public access to rivers.	Needs co-operation of riparian landowners.  Limited opportunities.
2. Investigate possible use of riparian set-aside land for use in enhancing public access to river via permissive paths.	Landowners  NRA  Councils	Good use of set aside land adjacent to rivers.	Require landowners agreement.
3. Do nothing.		No cost.	Failure to meet recreation objective.

**Issue No. 48:** There is a lack of public information boards detailing NRA activities.

Options	Responsibility	Advantages	Disadvantages
1. Provide information boards, and other interpretive material at suitable locations.	NRA  Local Conservation Groups  Landowners  Councils	Better public information on NRA's activities and functions.	Initial cost.  On-going maintenance cost.
2. Do nothing.		No cost.	Missed opportunity for providing information and good publicity.



**Issue No. 49:** Investigate the impact of linking Springfield Basin (Chelmsford) to the Chelmer & Blackwater Canal.

Options	Responsibility	Advantages	Disadvantages
1. Initiate a feasibility study to assess advantages and disadvantages of linking these waters for navigation.	NRA  Chelmer & Blackwater Navigation Company  Inland Waterways Association  Chelmsford Borough Council  Landowners	May provide enhanced navigation opportunities.	May have adverse effects on conservation and fisheries.  Cost.
2. Do nothing.		No cost.	Possible missed opportunity.

**Issue No. 50:** Need to improve liaison over recreational strategies.

Options	Responsibility	Advantages	Disadvantages
1. Identify ways in which the NRA can set up a liaison network with which to co-ordinate and plan recreational strategies.  (The group would contain participants of the sporting activities to ensure a broad overall view).	NRA (Catchment Panels)  Councils  Sports Council	Provide basis on which to plan and co-ordinate recreational strategies.  Enhancement of NRA recreational profile.  Likely to generate ideas for collaborative funding.	Time constraints.  Cost.
2. Do nothing		No cost.	Missed potential for enhancing recreational opportunities.

**Issue No. 51:** Fish stocks in the headwaters of the Rivers Brain, Wid and Ter, and those throughout Asheldham Brook, do not reach their target class.

Options	Responsibility	Advantages	Disadvantages
1. Restock.	NRA	Rapid action possible.	Probability of failure if conditions are unsuitable.
2. Address conditions already identified as limiting.	NRA	Improved environmental conditions leading to fish stock enhancement.	Cost. Cost may out-weigh benefit. Possibly incomplete solution.
3. Investigate conditions to determine full range of limiting factors.	NRA	Comprehensive problem definition leading to restoration plans.	Cost. Time delay. Findings may be inconclusive.
4. Do nothing.		No cost.	Poor fish stocks likely to persist.

**Issue No. 52:** Sluice design and operation at Grange outfall is damaging to the freshwater fishery in Asheldham Brook.

Options	Responsibility	Advantages	Disadvantages
1. Discontinue sluice pegging.	NRA	<p>Salt penetration reduced.</p> <p>Improved conditions for freshwater flora and fauna, including fish.</p> <p>Water quality more suited to agricultural use.</p> <p>Fishery Byelaw and Abstraction Licence charging demarcation points could be moved downstream.</p>	<p>Increased maintenance cost.</p> <p>No Flood Defence benefit.</p> <p>Uncertain scale of improvement.</p>
2. Replace sluice so as to exclude all saline incursion.	NRA	<p>Salt penetration stopped.</p> <p>Freshwater flora and fauna including fish, could establish throughout the Brook.</p> <p>Water quality no longer too saline for agricultural use.</p> <p>Fishery Byelaw and Abstraction Licence charging demarcation points could be moved to the outfall.</p>	<p>Cost (potentially poor cost-benefit ratio).</p> <p>Loss of brackish water habitat.</p>

(continued over)

## Issue No. 52 (contd.)

Options	Responsibility	Advantages	Disadvantages
3. Construct an adjustable weir in the brook, upstream of the tidal sluice.	NRA	Will reduce the salt incursion.  Fishery Byelaw and Abstraction Licence charging demarcation points could be precisely defined.	Cost.  Liable to cause flood defence problems.  May only be a partial solution.
4. Do nothing.		Continues cost effective maintenance strategy.	Freshwater flora and fauna, including fish stocks, absent from lower reaches.  Fishery Byelaw and Abstraction Licence charging demarcation points ill defined and well inland from the sea wall.

**APPENDIX I****FLOOD DEFENCE: PROPOSED MAJOR CAPITAL EXPENDITURE**  
**(BLACKWATER CATCHMENT)**

Flood Defence Scheme:	1994 / 95	1995 / 96	1996 / 97
Brightlingsea Tidal Defences	300,000	650,000	880,000
Colne Barrier	203,000	10,000	10,000
East Mersea (Rewsalls)	220,000	220,000	-
Essex Seawalls Strategy	80,000	90,000	-
Millbeach-Goldhanger Tidal Defences	250,000	1,500,000	-
Orplands Tidal Defences (Bradwell)	100,000	-	-
Steeple Stone Tidal Defences	500,000	-	-

Extract from the NRAs Flood Defence Medium Term Plan (Cost in £)

## APPENDIX II

LICENSED WATER ABSTRACTIONS

Subcatchment	Spray Irrigation		General Agriculture		Industrial		TOTAL	
	GW	SW	GW	SW	GW	SW	GW	SW
37/21	6	75	57	-	109	-	172	75
37/22	-	182	39	-	-	-	39	182
37/23	99	428	140	-	307	51	546	479
37/24	158	368	14	-	3512	55	3684	423
37/25	1434	1094	260	-	3027	203	4721	1297
37/26	303	669	63	-	490	-	856	669
37/31	87	2237	120	-	549	106	756	2343
37/32	5	379	16	-	79	-	100	379
37/33	-	325	21	-	-	-	21	325
37/34	66	494	65	-	227	-	358	494
37/35	45	504	47	-	558	452	650	956
37/36	46	1351	9	-	451	9	506	1360
37/37	0.5	297	4	-	-	23	4.5	320
37/38	36	1653	85	-	15	-	136	1653
37/39	177	833	42	-	391	750568*	610	751401*
37/43	52	389	90	-	406	-	548	389



## APPENDIX III

ESSEX CATCHMENT SSSI'S

- Abberton Reservoir SSSI, SPA/Ramsar** TL 970 180  
Largest freshwater body in Essex and one of the most important for wildlife. Internationally Important wetland and SPA.
- Ardleigh Gravel Pits SSSI** TM 052 281, TM 055 281  
Geological. Deposits of international significance.
- Belcher's and Broadfield Wood SSSI** TL 810 267  
Ancient coppice-with-standards woodland. Varied ground flora with some species uncommon or decreasing in Essex.
- Blackwater Estuary SSSI, NNR, PSPA/RAMSAR** TL 940 070  
One of the largest estuary complexes in East Anglia. Supports internationally and nationally important numbers of waterfowl. Habitats include mudflats, saltmarsh, ancient grazing, fleet and dyke systems and semi-improved grassland.
- Blake's Wood and Lingwood SSSI** TL 774 067, TL 778 060  
Mosaic of woodland, heathland and bog habitats. Four of the woodland types are considered rare in Britain.
- Bovingdon Hall Woods SSSI** TL 752 290, TL 758 286, TL 758 283, TL 762 279  
Eight adjacent woods, predominantly ancient coppice-with-standards.
- Bullock Wood SSSI** TM 019 277  
Ancient coppice-with-standards woodland. Principal woodland type is nationally rare lowland Hazel-Sessile Oak.
- Chalkney Wood SSSI** TL 873 275  
Ancient woodland. Includes one of the best examples of Small-leaved Lime in Essex.
- Clacton Cliffs and Foreshore SSSI** TM 146 128, TM 156 134, TM 173 143  
Geomorphological interest. One of the most important Pleistocene interglacial deposits in Britain.
- Colne Estuary SSSI, NNR, PSPA/RAMSAR** TM 075 155  
Estuary of national and international importance. Supports internationally important populations of wintering Brent Geese and nationally important numbers of waterfowl.
- Colne Marshes, Upper SSSI** TM 022 232, TM 050 209  
Grazing marshes with associated ditch and open water habitats, tidal saltmarsh and intertidal mudflats. Supports an outstanding assemblage of nationally scarce plants and an unusual diversity of brackish ditch species.
- Danbury Common SSSI** TL 782 043  
One of the largest remaining areas of heathland in Essex and demonstrates various stages in the succession from open heathland, through bracken and gorse scrub, to birch and oak woodland.

- Dengie SSSI, NNR, PSPA/RAMSAR** TM 045 030  
Tidal mudflat and saltmarsh. The saltmarsh is the largest continuous example of its type in Essex. Internationally and nationally important wintering populations of wildfowl and waders.
- Garnetts Wood / Barston Lays SSSI** TL 648 065  
Mainly ancient coppice-with-standards. Contains the best example of Lime woodland in Essex.
- Hanningfield Reservoir SSSI** TQ 730 980  
One of the two most important breeding sites for Gadwell in Essex. Also important for wintering wildfowl.
- High Wood, Dunmow SSSI** TL 603 220  
Wet Ash-Maple and Pedunculate Oak-Hornbeam wood. Rich and varied flora.
- Holland Haven Marshes SSSI, LNR** TM 211 170  
Coastal and freshwater grazing marsh with extensive ditch system.
- Holland-On-Sea Cliff SSSI** TM 211 167  
Geomorphological interest of great significance in the reconstruction of the Pleistocene history of the Thames.
- Maldon Cutting SSSI** TL 842 068  
Geological. A rare stratigraphical site in Essex.
- Newney Green Pit SSSI** TL 648 065  
Geological.
- Riddles Wood SSSI** TM 129 180  
Ancient coppice woodland with rich and varied ground flora. Some species uncommon in Essex.
- Roman River SSSI** TM 000 210  
Complex mosaic of woodland, scrub, heath, grassland and fen.
- Sandbeach Meadows SSSI** TM 021 050, TM 022 057  
Grazing marsh, semi-improved which supports nationally important numbers of Brent Geese.
- St Osyth Pit SSSI** TM 119 170  
Geological.
- Thrift Wood, Woodham Ferrers SSSI** TL 792 018  
Ancient semi-natural wood with two rare woodland habitats.
- Tiptree Heath SSSI** TL 882 146  
Largest surviving heathland in Essex. Complete succession from acid grassland and dwarf scrub heath, through gorse and birch scrub to secondary woodland.

**Weeleyhall Wood SSSI****TM 159 210**

Largest ancient woodland in the Tendering peninsula. Best example of Essex base poor springline Alder woodland, rare in Essex. Also, spring and flush feed streams and two ponds.

**West Wood, Little Sampford SSSI****TL 622 333**

Ancient woodland. Rich and varied flora.

**Wivenhoe Gravel Pit SSSI****TM 050 236**

Geological. Organic sediments of interglacial origin.

**Woodham Walter Common SSSI****TL 791 065**

Ancient woodland and botanically rich flushes in the stream valleys.

## APPENDIX IV

SCHEDULED ANCIENT MONUMENTS (SAMs)**District: Braintree**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
87	Bocking Mill	TL 763 259
3	Hedingham Castle	TL 787 359
19	The Long Bridge	TL 850 224
95	Coggeshall Abbey	TL 855 223
190	Monument in Colne Park	TL 871 305
211	Cressing Temple	TL 799 187
92	Guildhall	TL 686 327
183	Gosfield Hall well-house and donkey wheel	TL 774 297
165	Hatfield Priory	TL 796 109
111	Moated site south of Sugar Loaves Lane	TL 778 344
152	Romano-British settlement, Rivenhall	TL 829 178
191	Moated site at Blunts Hall	TL 807 143
20723	Jekylls Farm earthworks	TL 691 357
20642	Colne Priory	TL 864 288
20731	Stanley Hall	TL 836 327
20732	Claverings Farm earthworks	TL 821 268

**District: Brentwood**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
157	Fingrith Hall moated site	TL 609 037
47	Barn at Ingatestone Hall	TQ 654 986
144	Mill Green Roman villa	TL 645 017
124	Thorby Priory	TQ 628 988
158	Maple Tree Lane earthworks	TL 618 010

**District: Chelmsford**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
52	Moulsham Bridge	TL 711 065
193	Site of a Roman courtyard villa	TL 662 108
79	Danbury camp hill fort	TL 778 052, TL 780 051
188	Medieval tile kiln north of Eves Corner	TL 784 053
160	Paslowes moated site	TL 624 115
125	Leez Priory, inner gatehouse, conduit and priory foundations	TL 701 185
189	Settlement site, Ash Tree Corner	TL 705 126
167	Killigrews moated site	TL 688 028
22	Pleshey Castle and town enclosure	TL 663 146, TL 665 147, TL 665 145, TL 664 144, TL 664 145 & TL 666 145

138	Roman villa, Oxney Spring	TL 650 143
139	The College	TL 664 142
51	Bicknacre Priory	TL 786 027
94	Barn near King John's Palace	TL 676 066

**District: Colchester**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
197	Remains of St Mary's Church	TL 950 207
1	Colchester Castle	TL 998 254
4	St Botolph's Priory	TM 000 250
7	Town Wall	TL 992 250, TL 993 250, TL 993 255, TL 994 255, TL 995 255, TL 996 250, TL 998 250, TM 001 254, TL 998 255-TM 001 255, TM 001 254-TM 001 252, TM 001 252-TM 001 251, TL 995 250, TL 998 250-TL 994 250, TL 992 250-TL 992 251, TL 992 250-TL 992 254-TL 993 255
8	Balkerne Gate	TL 992 251
9	Bourne Mill	TM 006 238
10	Earthworks west of Colchester	TL 978 270-TL 974 258, TL 973 248, TL 968 248, TL 964 232, TL 960 233, TL 997 219-TL 997 203, TL 961 246, TL 961 233, TL 964 232
10a	Lexden Straight Road earthworks	TL 965 245-TL 964 247
46	Site of pre-Roman settlement	TL 986 255
53	Town ditch	TM 000 256-TM 003 256-TM 003 253
57	Gosbecks Iron-Age and Romano-British settlement site, inc. Roman fort at Stanway	TL 969 224
58	St John's Abbey gate	TL 997 247
147	Dyke between Lexden Straight Road and Gilwell Park Close	TL 969 237
166	Lexden tumulus and cemetery	TL 975 247
173	SE corner of Roman Town, Easthill House Gardens	TM 001 251
177	Earthworks in Blinkley Grove	TM 004 279
172	Tumulus NW of East Donyland Hall	TM 025 211
45	Pitchbury Ramparts	TL 966 289
200	Ramparts south of Haynes Green	TL 906 175-TL 909 175
118	Barrow in Conyfield Wood	TL 896 182
181	Mound east of Paynes Farm	TL 948 145
31	Mersea Mount	TM 022 144
32	Roman round building	TM 011 125

**District: Maldon**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
134	Camp at Asheldham	TL 973 013
33	Bradwell Roman fort	TM 031 082
220	Langford pumping station	TL 835 089
21	St Giles Hospital	TL 844 065

85	Moot Hall	TL 851 070
86	St Peter's Church Tower	TL 851 071
112	Mound east of Basin Road	TL 871 075
38	Purleigh moated mound	TL 841 017
168	Decoy pound, Marsh House Farm	TM 020 042
30	Beckingham Hall	TL 909 113
113	Round barrow SW of Beckingham Hall	TL 907 110
217	Wickham Bishops timber trestle viaduct	TL 824 117
176	Complex of cropmarks including barrows, Hoemill Barns	TL 812 081
20718	Circular enclosure, crop mark	TL 958 144

**District: Tendring**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
89	Spring Valley mill	TM 039 277
199	Crop mark site, Ardleigh	TM 057 284, TM 058 289
119	Martello Tower (F)	TM 174 143
120	Martello Tower (E)	TM 167 137
121	Martello Tower (D)	TM 162 133
122	Martello Tower (C)	TM 137 128
24	St Osyth Priory and gatehouse	TM 120 157, TM 120 156
216	Martello Tower (A) and battery	TM 083 157

**District: Uttlesford**

<u>SAM No.</u>	<u>Monument Title</u>	<u>Grid Ref.</u>
15	Great Easton Castle	TL 609 254
27	Stebbing Mount	TL 658 244
195	Medieval tile kiln	TL 664 233
29	Thaxted Guildhall	TL 611 309
88	Tilty Abbey	TL 599 265
20701	Great Garnetts barn and enclosures	TL 636 175
20721	Moathouse Farm moat	TL 614 278
20706	Lashley Hall	TL 648 262
20692	Holts Farm house and manor	TL 661 265
20720	Clopton Hall	TL 627 206
20691	Porters Hall	TL 678 237
20716	Wincelow Hall manor and moat	TL 630 384
20710	Great Brockholds	TL 612 353
20694	The Rookery moat and fish pond	TL 625 355
20693	Godd's Farm moat	TL 629 355
20697	The Howes moat	TL 639 366
20696	Maynard's Farm moat & enclosure	TL 657 352
20686	Thunderley Hall earthworks	TL 561 360
20712	Parsonage Farm earthworks	TL 580 355
88a	Tilty Mill	TL 599 267
20687	Tiptofts manor	TL 570 374
20687	Freemans Farm moat	TL 569 343



**APPENDIX V****WATER QUALITY - EC DIRECTIVES**

1. EC Surface Water Directive 75/440/EEC
2. EC Groundwater Directive 80/68/EEC
3. EC Urban Waste Water Directive 91/271/EEC
4. EC Nitrate Directive 91/676/EEC
5. EC Protection of the Quality of Groundwater Directive 80/68/EEC
6. EC Bathing Water Directive 76/160/EEC
7. EC Freshwater Fisheries Directive 78/659/EEC
8. EC Shellfish Waters Directive 79/923/EEC
9. EC Shellfish Hygiene Directive 91/492/EEC

## APPENDIX VI

ANGLIAN REGION FLOOD DEFENCE LEVELS OF SERVICE

Land Classification Band	Minimum target standard of flood protection expressed as flood return period (years)	
	Fluvial	Tidal and Sea Defences
A	100	200
B	50	100
C	20	50
D	10	20
E	—	—

**Band A**

Areas of dense conurbations where widespread flooding would cause serious infrastructure failure and endanger life. Major trunk roads and/or motorways and railways may be included in this band.

**Band B**

Predominantly urban areas, including housing, industry and commerce. The flood plain will include 'A' and 'B' class roads. Little agricultural land is likely to be present.

**Band C**

High grade agricultural land suitable for cereal and cash crops. Residential and industrial property, as well as roads, amenity and/or navigation interests may also be prominent.

**Band D**

Typical land use incorporating average gross - margin crops, and permanent pasture. Little residential or industrial property will be present. Conservation and water ecology interests may significantly influence the standard of service to be applied.

**Band E**

This covers areas which are generally of low grade land use. Residential or industrial property is unlikely to be present. Agricultural use is likely to be limited to horse paddocks, forestry and scrubby grazing land. Land within this category may have a high conservation value requiring a lower standard of service than would be expected otherwise. Flood storage washlands or land which is deliberately allowed to flood may fall into this band.

**GLOSSARY**

**AQUIFER** - A water bearing-stratum situated below ground level. The water contained in aquifers is known as groundwater.

**BASE FLOW** - The proportion of river flow that is provided by groundwater discharge from an aquifer.

**BEACH RECHARGE** - The creation or restoration of a beach by the use of imported material.

**BIOCHEMICAL OXYGEN DEMAND (BOD)** - A standard test which measures over 5 days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.

**BIVALVE** - A twin-shelled mollusc.

**BORROW DITCH** - An excavation made in order to obtain material to construct an embankment - also known as a Delph ditch.

**CONSENT** - A statutory document issued by the NRA. It can authorise entry and indicate any limits and conditions on the discharge of an effluent to a controlled water. A drainage consent is an approval for specified structural works in areas under NRA control.

**CONTROLLED WATERS** - All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore, including the bed and channel which may for the time being be dry.

**CYPRINID FISH** - Coarse fish eg. Roach, Dace and Bream.

**DIFFUSE SOURCES** - Pollution from non-point sources.

**ENVIRONMENTALLY SENSITIVE AREA (ESA)** - An area where traditional farming methods may be supported by grant aid from the Ministry of Agriculture, Fisheries and Food (MAFF) to support distinctive landscape, wildlife habitats or historic features.

**EUTROPHIC** - A description of water which is rich in nutrients. At worst, such waters are sometimes beset with unsightly growths of algae.

**FLASHY** - A river or river catchment area where rainfall moves rapidly from the land surface to the river, causing sudden high flows shortly after the peak rainfall event.

**FLOOD DEFENCES** - Anything natural or artificial that protects against flooding, to a designed return period.

**FLOOD PLAIN** - An area liable to inundation in times of flood.

**FYKE NET** - A conical net used to trap eels.

GENERAL QUALITY ASSESSMENT (GQA) - A new scheme replacing the NWC Classification system. It provides a means of assessing and reporting environmental water quality in a nationally consistent and objective way. The chemical grades for rivers introduced in 1994 uses BOD, Ammonia and Dissolved Oxygen limits for water quality between A (Good) and F (Bad). Other grades for estuarine and coastal waters are being developed and aesthetic components will be measured and graded by a system under trial now.

GROUNDWATER - Water which saturates a porous soil or rock substratum (or aquifer). Water held in storage below ground level.

HOGGIN - A natural mixture of gravel, sand and clay.

MANAGED RETREAT - The deliberate abandoning of an existing tidal defence in order to obtain economic and ecological advantage. A new defence may be constructed landward of the old line.

MAIN RIVER - Statutory length of river or watercourse over which NRA has permissive powers.

MINIMUM ACCEPTABLE FLOW (MAF) - The minimum acceptable flow as defined in Section 21 of the Water Resources Act 1991.

MINIMUM RESIDUAL FLOW (MRF) - Target flow set locally and not legally defined.

NATIONAL NATURE RESERVE (NNR) - An area of national importance for nature conservation.

NATIONAL WATER COUNCIL CLASS (NWC CLASS) - A summary of the quality of river water based largely on the measured chemical quality for the purposes of classification and reporting. To be replaced at the end of 1994 by a "General Quality Assessment" scheme.

OFWAT - Office of Water Industry's Regulator.

PEGGING - A drainage maintenance system which permits backflow of saltwater through sluices, then the release of this water at low tide. During periods of low flows, the process will flush out accumulations of silt in sluices and their channels.

POLLARD - To cut a tree so as to produce a close rounded head of young branches. The cut is made above the level reachable by grazing animals.

RAMSAR - Wetland site of International Importance that is designated under the Ramsar convention.

RECHARGE - Water which percolates downwards from the surface into groundwater.

RIFFLE - A shallow area in a river where the substrate is composed of gravel and the flow is faster.

**RIVER CORRIDOR** - The continuous area of river, river banks and immediately adjacent land alongside a river and its tributaries.

**RIVER QUALITY OBJECTIVES** - The level of water quality that a river should achieve, in order to be suitable for its agreed use. Is being replaced by Water Quality Objectives (WQO'S).

**SACRIFICIAL ANODE** - A zinc block found on boats. Designed to dissolve and prevent corrosion of other metal fittings on the boat.

**SALMONID FISH** - Game fish eg. trout and salmon.

**SALTINGS** - Meadowland or marsh that is periodically flooded by seawater.

**SALTMARSH** - Expanses of herbaceous plants in the supratidal zone.

**SITE OF SPECIAL SCIENTIFIC INTEREST (SSSI)** - A site given a statutory designation by English Nature or the Countryside Council for Wales because it is particularly important, on account of its nature conservation value.

**SPECIAL PROTECTION AREA (SPA)** - Statutorily protected habitats for wild birds under EC Regulations.

**STORM SEWAGE DISCHARGES** - The discharge of untreated sewage in times of heavy rainfall and high flows.

**SURFACE WATER** - Water collecting on and running off the surface of the ground.

**TELEMETRY** - A means of directly collecting data from remote sites.

**TRANSFER STATION** - A place where refuse, collected from premises, is compacted into large containers and transported onward for disposal.

**TRANSMISSIVITY (T)** - The rate at which water moves through a unit depth of aquifer at a given gradient. It can be defined by:  $T = k \times b$ , where  $k$  = hydraulic conductivity (speed of water movement in soil expressed in metres per day), and  $b$  = saturated aquifer thickness.

**WATER QUALITY OBJECTIVES (WQO'S)** - Statutory water quality targets to secure specific formal minimum quality standards for specific stretches of water by given dates. A new component of these is introduced by "The Surface Waters (River Ecosystem Classification) Regulations 1994"; a classification scheme to be applied by NRA to the rivers and watercourses of England and Wales. Other existing standards operate already to give effect to various EC Directives for water quality.

**WET SHELVES** - An area of river bed just below water level.

**WHITE WEED** - An animal colony of plant like appearance and physical characteristics, used mainly for decorative purposes.

## ABBREVIATIONS

ADAS	....	Agricultural Development Advisory Service
AWS	....	Anglian Water Services
BASC	....	British Association for Shooting and Conservation
BOD	....	Biochemical Oxygen Demand
CMP	....	Catchment Management Plan
DC	....	District Council
DO	....	Dissolved Oxygen
DoE	....	Department of the Environment
EC	....	European Community (European Union)
EN	....	English Nature
ESA	....	Environmentally Sensitive Area
ESW	....	Essex & Suffolk Water Services
gm <sup>-2</sup>	....	Grams per square metre (a unit of biomass)
GQA	....	General Quality Assessment
km	....	Kilometre (a unit of length)
LA	....	Local Authority (County, Borough or District Council)
LFDC	....	Local Flood Defence Committee (Essex committee for this catchment)
m	....	Metre (a unit of length)
MAFF	....	The Ministry of Agriculture, Fisheries and Food
MAF	....	Minimum Acceptable Flow
MI/a	....	Mega litres per annum (flow rate of millions of litres per year)
MI/d	....	Mega litres per day (flow rate of millions of litres per day)
MRF	....	Minimum Residual Flow
NFU	....	National Farmers Union
NRA	....	National Rivers Authority
NWC	....	National Water Council
OD	....	Ordnance Datum -Newlyn- the datum for all land level survey in Britain
R&D	....	Research and development
RCS	....	River Corridor Survey
RQO	....	River Quality Objective
SAM	....	Scheduled Ancient Monument
SPA	....	Special Protection Area
SSSI	....	Site of Special Scientific Interest
STW	....	Sewage treatment works
THWS	....	Tendring Hundred Water Services
TVWS	....	Three Valleys Water Services
WQO	....	Water Quality Objective
WRA's	....	Waste Regulation Authorities