GRIMSBY
CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT

NRA

National Rivers Authority

NOVEMBER 1994

GRIMSBY CATCHMENT MANAGEMENT PLAN

FOREWORD

The National Rivers Authority, NRA, was created in 1989 as an independent environmental watchdog. It has as its prime purpose the protection and improvement of the aquatic environment throughout England and Wales.

In achieving this purpose the NRA seeks to effectively manage water resources, substantially reduce pollution, and provide effective flood defence for people and property. It aims to operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters.

The NRA delivers its services in 26 operational Areas, each Area comprising of a number of river catchments. The NRA's vision for all catchments is for a healthy and diverse water environment, managed in an environmentally sustainable way, balancing the needs of all users.

The NRA believes that the best way of arriving at sustainable solutions is to take an integrated approach to river management. This treats a river, together with the land, tributaries and underground water connected with it, as a discrete unit or catchment. This approach, called catchment management planning, considers all major uses in a catchment in consultation with interested bodies and the public.

Catchment Management Plans set out the NRA's vision for individual river catchments that take account of both national policy and local community views. The plans represent an action plan for the NRA, landowners and other interests for a 5-year period.

The Grimsby Catchment includes a major regional aquifer, the Chalk, which is extensively developed for public water supply and industrial use and which supports springs and rivers of conservation and amenity importance. The coastal plain is significantly developed by industry and associated urban areas and it creates an important need for effective tidal defences. The protection of ground and surface water quality is particularly important in the catchment.

VISION FOR THE CATCHMENT

The NRA's vision for the Grimsby Catchment during the lifetime of this plan is to work towards the sustainable management and protection of surface and groundwaters and the provision of effective flood defence. To achieve this vision, the following actions are considered necessary:

- to protect the valuable groundwater resources of the catchment from over-commitment and pollution;
- to balance the needs of the water environment and those of water abstractors;
- to improve existing flood defences to accommodate rising sea levels and to maintain and/or improve their structural integrity;
- to improve the quality of surface water and reduce the incidence of pollution;
- the promotion by Planners and Developers of NRA policies and the adoption of a more strategic approach to infrastructure development;
- to increase plant and habitat diversity associated with the water environment and to protect conservation interests;
- to develop an integrated approach to resolving specific issues eg. management of the River Freshney.

The Grimsby Catchment adjoins part of the Humber Estuary Catchment. The NRA recognises the management of the two catchments is inextricably linked and the areas of overlap have been fully integrated in this plan.

GRAINGER DAVIES
REGIONAL GENERAL MANAGER

GRIMSBY CATCHMENT MANAGEMENT PLAN

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1. CONCEPT AND PROCESS

The water environment is increasingly becoming a focus for a range of passive and (inter) active uses and activities. The National Rivers Authority is the major environmental protection agency responsible for examining the interaction between such activities and uses, and the water and associated land environment, reconciling any conflicts that may arise, and generally protecting, and where possible improving, the water environment for the benefit of future generations.

The NRA's responsibilities are wide reaching and include:

- effective management of water resources;
- control of pollution and improving the quality of rivers, groundwaters and coastal waters;
- flood defence, including the protection of people and property;
- maintenance, improvement and development of fisheries;
- conservation and enhancement of the natural water environment;
- promotion of water-based recreation including navigation.

The NRA has developed the concept of Catchment Management Planning as an efficient and effective approach to the consideration of the full range of water management issues, which are considered within a geographical area which is relevant and meaningful.

Catchment Management Plans (CMPs) enable individual catchment needs to be taken into account in the management decisions which aim to make real improvements at local level that meet the community's needs. This process of integrated catchment management will enable resources to be targeted where they are most needed.

In managing catchments the NRA aims to:-

- manage water resources to achieve the right balance between the needs of the environment and those of the abstractors;
- control pollution, respond promptly to pollution incidents, and work with dischargers to achieve improvements;

- provide effective defence for people and property against flooding from rivers and the sea, including provision of flood warnings;

- develop fisheries, promote recreation and navigation and conserve and enhance wildlife;

- determine, police, enforce and review the conditions in water abstraction licences, discharge consents, and land drainage consents to achieve operational objectives;

- influence planning authorities to control development to meet NRA objectives.

The preparation of a CMP will require NRA to:-

- identify the catchment uses and physical attributes;

- set targets for a range of catchment uses;

- compare existing targets with the current status of the water environment to identify shortfalls;

- identify issues and options to address the shortfalls;

- undertake consultation on the uses, targets, issues and options;

- prepare an action plan to address the issues;

- implement the action plan and maintain on-going monitoring and review of the plan.

In producing the CMP the NRA recognises that to achieve its aims it must seek both to influence and work with central government, industry, commerce, local authorities, farming, conservation bodies and the general public. It must also take account of other ongoing initiatives such as the production of Development Plans, Water Level Management Plans etc. An important step in the CMP process is the public consultation on the NRA's draft plan.

Through detailed consultation with all interested organisations the NRA seeks to:

- confirm the range and extent of catchment uses and activities;
- obtain views on the issues facing the water environment identified in the Report;
- begin the process of identifying action plans;
- ensure decisions on the future management of the catchment are based on a wide range of views from interested parties.

The publication of this consultation report marks the start of a three month period of formal consultation. This will enable external organisations and the general public to work with the NRA in planning the future of the water environment in the Grimsby Catchment.

The Grimsby Catchment adjoins the Humber Estuary Catchment, the Management Plan for which has recently been published for consultation. The NRA recognises that there are clear links between a number of issues in both catchments. To ensure effective public consultation, all issues relevant to the Grimsby Catchment are included in this plan.

When commenting on this document the NRA requests that organisations and the general public will consider both points of detail and the following questions:

- have the issues been adequately assessed?
- what are the opinions of consultees on these issues and the options identified?
- are there any issues or options which have not been identified?
- how should the development of strategies and action plans be progressed?
- is the vision realistic, affordable and achievable?

The consultation period for the plan ends on Tuesday 28 February 1995. Those wishing to comment should write to the following address:

Catchment Planning Officer, National Rivers Authority, Northern Area, Aqua House, Harvey Street, Lincoln. LN1 1TF

To assist consultees in responding a consultation response document is included at the back of the report.

Following the consultation period the NRA will produce an Action Plan which will form the basis for the NRA's actions within the catchment. The NRA will seek the commitment to planned actions by others wherever necessary.

A summary of the CMP process and relevant timescales for the Grimsby CMP are shown in Table 1 (Page 6).

The Other Players

In addition to the NRA there are many other bodies and organisations which have a role to play in improving the water environment. The NRA also has a wide range of customers with whom it has contact or to whom it provides a service. These include the general public and many representative groups and businesses that form part of the community in the catchment. The following organisations have key responsibilities relevant to the protection of the water environment in the Grimsby catchment:

- Department of Environment (DoE) are sponsors of the NRA
- Ministry of Agriculture, Fisheries and Food (MAFF) are also sponsors of the NRA and with an important role in flood defence, fisheries and agricultural pollution. MAFF are responsible for administrating Nitrate Sensitive Areas and Nitrate Vulnerable Zones.
- English Nature (EN) are responsible for the protection and management of SSSIs.
- Countryside Commission are responsible for conservation of landscape.
- Anglian Water Services Ltd (AWSL) are responsible for water supply and sewage disposal.

- Local Planning Authorities (LPA's) are responsible for dealing with planning (including minerals), and waste disposal.
- Industrial and Trade Associations such as Confederation of British Industry (CBI) and National Farmers Union (NFU) etc. - have an important role, via their members, in the alleviation of pollution risks.
- Angling and Recreation Groups act as vital watchdogs.
- Her Majesty's Inspectorate of Pollution (HMIP) is responsible for authorising industrial processes under Integrated Pollution Control.
- Internal Drainage Boards (IDB) are responsible for supervision of land drainage within defined districts.
- Industry Companies and Agriculture are the principal water abstractors and effluent dischargers in the catchment.
- Associated British Ports (ABP) are responsible for operating port facilities.
- Land and Riparian Owners are responsible for aspects of land and river management/maintenance.
- The Media can readily influence public opinion.
- Pressure Groups can also influence public opinion on environmental matters.
- The Public are those who use, enjoy and have an interest in the water environment.
- Voluntary Conservation Bodies provide specialist advice to the other players.
- Local Authorities (LA's) have a role in environmental health (including Bathing Waters and some water supplies) and flood defence (including coastal protection and land drainage).

TABLE 1 - THE CATCHMENT PLANNING PROCESS
GRIMSBY CATCHMENT TIMETABLE

NRA CMP Team Formed	April 1994
NRA identify catchment uses, catchment current state, catchment targets and catchment shortfalls against targets	
NRA initial thoughts on catchment issues	
Pre-Consultation with: - Angling Interests - Conservation Interests - Planning Authorities - Navigation Interests - Water Companies - Industry - LLA, NFU etc - Catchment Panels	August/September 1994
< Feedback	
Completion and Launch of Draft Consultation Document	November 1994
Full Public Consultation	30 November '94 - 28 February '95
< Feedback	
NRA Produce Final Plan with 5 Year Horizon	May 1995
Annual Monitoring	Ongoing 1996 →
Review	2000

2. OVERVIEW

2.1 INTRODUCTION

The Grimsby Catchment is located in North Lincolnshire and South Humberside, it includes the area of the Chalk Wolds north of Caistor up to the Humber and the coastal plain running from Humberston to South Ferriby. The catchment is bounded to the north and east by the Humber, to the west by the edge of the Chalk Wolds and to the south by the catchment of the Waithe Beck.

Catchment Management Plans have already been produced for the area to the south of the catchment (Louth Coastal CMP) and for the area to the north and east (Humber Estuary CMP).

The Chalk Wolds are an area of outstanding beauty and dominate the western part of the catchment. They consist of rolling countryside with upland rivers, streams and springs. The area is predominantly agricultural. The eastern catchment is the coastal plain bounded by the sea defences and includes the urban areas of Grimsby, Cleethorpes and Immingham and the industrial areas associated with the Grimsby/Immingham area and the Humber Bank.

It is principally the issues relating to water resource management, groundwater protection, tidal defence, conservation enhancement and the discharge of effluents to the Humber Estuary, which are the key features of this plan.

The area covered by the Grimsby Catchment Management Plan is shown on Map 1.

2.2 HYDROLOGY, HYDROGEOLOGY AND WATER RESOURCES

2.2.1 Hydrology

The catchment covers an area of 481 square kilometres. The surface water hydrology is controlled by the topography and surface geology. In the western part of the catchment are the Chalk Wolds which form the permeable re-charge area for the Chalk aquifer. On the eastern edge of the Wolds a major springline running roughly north westwards from Laceby through Keelby to Ulceby, Barrow and Barton, gives rise to a number of springfed Chalk streams which flow north eastwards across the coastal plain to discharge to the Humber. These streams are substantially groundwater fed, with small catchments and limited land drainage inputs. They are consequently small in size.

The coastal plain is extensive and much of it lies below sea level. This area is drained by a combination of highland carriers and pumped drainage systems.

Annual average rainfall on the catchment is around 625mm of which around 450mm is lost as evaporation and transpiration.

2.2.2 Hydrogeology

The principal aquifer is the Chalk which outcrops over much of the western part of the catchment. From its outcrop the Chalk dips gently eastwards. In the eastern part of the catchment it is covered by glacial boulder clay and alluvium.

From its outcrop rainfall replenishing the Chalk percolates to the water table and moves eastwards where it either discharges as springflows (including some local features called blow-wells) or is drawn towards abstractions in the coastal plain area. In the Grimsby area quantities of sea/estuary water are drawn into the aquifer.

In the western part of the catchment groundwater levels in the Chalk are generally well below ground level whereas in the east, water levels are close to ground level and may in places be artesian. Some minor Sandstones are present below the Chalk (Carstone, Elsham Sandstone, Spilsby Sandstone) but these are generally of little water resource importance in this catchment.

Hydrometric Network

The NRA operates a network of hydrometric stations in the catchment measuring rainfall, river flows, groundwater levels and tide levels.

For flood warning and forecasting purposes a number of rainfall, river flow and tide level sites are connected to the Authority's telemetry system.

2.2.3 Water Resources

The major water resource in the catchment is the Chalk aquifer which is a regionally important aquifer for both public water supply and industrial uses. Demands for water in the catchment are met from the Chalk and also from water imported to the catchment by Anglian Water Services Ltd from two surface water sources, ie the Louth Canal (via Covenham Reservoir) and the River Ancholme (via Cadney Reservoir). The industrial demand in the catchment is substantial, both from direct abstraction and from public supplies.

The Chalk aquifer is heavily abstracted and there are concerns over impacts on fishery and conservation interests which rely upon Chalk springflows, and on the drawing of saline water into the aquifer in the Grimsby area. These concerns are greatest during dry/drought periods such as that recently experienced in the period 1988 - 1992.

All water abstractions are controlled by abstraction licences issued by the NRA under the Water Resources Act 1991 (previously the Water Resources Act 1963). Groundwater sources developed before 1963 were granted licences of right under the Water Resources Act 1963. Abstraction licences granted since 1963 are only issued if there is sufficient water available, the need for the water is justified, all rights of existing uses are protected and the water environment, eg rivers, springs and wetland sites, will not be unacceptably affected. Abstractions for domestic use do not require a licence.

Key Water Resources features are shown on Map 2.

2.3 WATER QUALITY

2.3.1 Surface Water

Surface water quality varies in the catchment from the generally good quality associated with groundwater fed rivers and streams in the Wolds, to locally poorer quality waters in the industrialised coastal plain where water quality may be adversely affected by saline intrusion and by run-off from industrial areas.

The Humber Bank from Grimsby to Immingham is a highly industrialised area. Effluent discharges from this area, along with sewage effluent discharges from urban areas, form the principal discharges in the catchment. These effluents are discharged to the Humber Estuary. Monitoring of the Estuary is carried out by both the NRA and the dischargers. At Cleethorpes compliance monitoring in relation to the EC Bathing Water Directive is carried out by the NRA. Programmes of investment in treatment plants are ongoing to ensure Estuary water quality is improved and protected. Future effluent treatment improvements to meet the EC Urban Waste Water Treatment Directive may be required.

2.3.2 Groundwater

The catchment includes the Chalk aquifer which is extensively developed for public water supply and high quality industrial uses. It is important that groundwater quality in the catchment is protected from pollution from all sources.

Groundwaters in parts of the Chalk Wolds are affected by high nitrate concentrations and some areas are being designated as Nitrate Sensitive Areas and Nitrate Vulnerable Zones. Nitrate removal plants have been established to protect public water supplies.

Landfill, contaminated land reclamation schemes and storage and transport of hazardous materials pose risks to groundwater quality, particularly in the catchment areas contributing to potable groundwater sources. Under the NRA's Groundwater Protection Policy the most vulnerable areas are being identified and protection zones established.

In the Grimsby area, connection between the Chalk groundwater and the Estuary results in saline water intrusion to the Chalk. The degree of contamination is affected by abstraction and dry/drought periods.

Key Water Quality features are shown on Map 3.

2.4 FLOOD DEFENCE

2.4.1 Tidal Defences

The catchment has a substantial length of tidal defences which protect extensive areas of industrial urban and agricultural land. Maintaining the integrity of the flood defence is of vital importance for the protection of both land and people. Whilst the defences were substantially upgraded following serious flooding in 1953, all man-made structures need both maintenance and renewal. This is of particular importance in such a hostile environment as the Humber Estuary.

Strategies are necessary to address maintenance and replacement of the defences which will also account for the effects of rising sea levels and the gradual loss of foreshore.

Tidal flood defence strategies need to be consistent throughout the Humber Estuary area.

2.4.2 Fluvial Defences

The catchment does not include any major rivers. Much of the western part of the catchment consists of permeable Chalk where there are few drainage problems.

In the coastal plain, the large area of low lying land is drained by a combination of riparian drains, highland carriers (designated as main river) and pumped drainage systems (operated by North East Lindsey and Louth IDB's). Land drainage water is discharged to the Estuary through a number of outfall channels. These outfalls also require maintenance to be effective.
There are a small number of local issues relating to standards of fluvial flood defence.

2.4.3 Flood Warning

The catchment includes some areas which, in severe flood events, are at risk of tidal or fluvial inundation. The NRA operates a flood warning service whereby the police and other organisations are advised of areas likely to be affected by flooding.

Key Flood Defence features are shown on Map 4.

2.5 FISHERIES, RECREATION, CONSERVATION AND NAVIGATION

2.5.1 Fisheries

The catchment is characterised by small groundwater fed rivers and drains. The Laceby Beck/River Freshney is the largest watercourse and is the only system subject to regular surveys. In terms of fisheries, it is likely to be typical of the catchment comprising of a mix of salmonid species in the upper catchment progressing downstream to more common coarse species such as roach, common bream, perch and pike. In the past the river has supported a breeding trout population.

The catchment in general is characterised by a number of constraints to fishery development associated with the periodic occurrence of low or zero riverflows, which also impact on associated lakes.

During low flow conditions the NRA has sealed several outfalls to conserve freshwater, this exerts an influence on migratory species, in particular on eels.

2.5.2 Recreation and Amenity

The principal focus for water based recreation within the catchment is associated with the coastal plain. The Humber Bank Path largely follows the coastal plain and a number of lakes and marinas behind the sea defences provide facilities for most forms of water based recreation.

The catchment adjoins the Humber Estuary which also has water based recreational activities.

Inland there are other minor riverbank footpaths as well as the Viking Way which "starts" at Barton Haven and skirts along the western edge of the catchment. Additionally there are a number of recreational fishing lakes, and the Freshney Parkway recreation/conservation area extending along the River Freshney from Grimsby.

2.5.3 Conservation

In the upper catchment "in-stream" and river corridor bio-diversity is poor. There are few wetland areas and the rivers are impacted by regularly occurring and often extended periods of low flows and levels.

The development of urban and industrial areas in the lower part of the catchment, along with an intensification of farming practices have resulted in a much modified drainage system. This has impacted on habitat development and the degree of bio-diversity of flora and fauna along rivers and river corridors.

In both the upper and lower catchments the frequency of occurrence of low flow conditions, possibly influenced by water abstractions, exert further constraints on the bio-diversity conditions.

The Humber Estuary and parts of the immediately adjacent coastal plain, contain a number of conservation areas of national (SSSI's) and international (RAMSAR) importance. These areas are wetland sites associated with Chalk blow-wells, abandoned clay pits, mudflats and reedbeds. Ongoing management of these sites is required to sustain and protect their conservation importance.

As part of a new MAFF initiative, and in order to give important water dependant SSSI's due consideration for their future well-being; interested parties, including English Nature and those drainage authorities operating in areas where SSSI's exist, have been tasked to produce Water Level Management Plans (WLMP's) for

identified sites. Four WLMP's have been scheduled for this catchment for completion by 1995, they are for the Barrow and Barton Clay Pits, The Grues, The Humber Flats and Marshes and the North Killingholme Pits.

2.5.4 Navigation

The catchment has no navigable watercourses. However, there are extensive dock areas in the Immingham/Grimsby area associated with the Humber Estuary which is a major navigable channel.

Key Fisheries, Recreation and Conservation features are shown on Maps 5 and 6.

2.6 LAND USE/DEVELOPMENT

A key feature of the catchment is the high levels of development that have occurred over the last 25 years. In particular there has been significant growth and change of land use in the Humber Bank industries.

Although there are significant areas of urban and industrial development associated with the coastal plain, notably in the Cleethorpes, Grimsby and Immingham areas, the majority of the catchment is agricultural (around 83%).

Both agricultural and urban/industrial development has impacted on the ground and surface water environments in the catchment and addressing these impacts and protection from future impacts, form the basis of many of the issues in this Catchment Management Plan.

The local government bodies within the catchment include 2 County Councils, 3 Borough Councils and 2 District Councils. The County Structure Plans have identified substantial areas (around 1,400 hectares) for estuary area development. These associated developments and re-developments will create additional pressures on the water environment. To ensure the water environment is adequately protected will require close co-operation between the NRA, planners and developers. In particular the development of a strategic approach to infrastructure planning and development and the adoption of NRA policies would assist substantially in ensuring appropriate development.

Key Development features in the catchment are shown on Map 7.

3. CURRENT STATUS

3.1 WATER RESOURCES

General

This section summarises the total licensed and actual abstractions of water within the catchment compared with the available resource. Future demands for water are also considered. The purpose of this comparison is to illustrate the level of commitment of water resources in the catchment, to establish the need for resources to meet any future increase in demand and to establish the availability of water to meet environmental needs.

The principal water resource within the catchment is groundwater abstracted from the Chalk. Surface water resources within the catchment are limited. Springs which are fed from the Chalk are dependant upon the availability of groundwater resources.

To illustrate the current level of development of the groundwater resources, the current (1993) abstraction and total licensed abstraction is compared with resource availability in dry, average and wet years. This analysis demonstrates that licensed abstraction is close to or exceeds available resources in all but above average resource availability years. In dry years limited groundwater resources are available to meet springflows.

The groundwater resources of the catchment can be supported from surface water resources from adjacent catchments. Future public water supply and industrial demands can be met from this combined resource system.

Map 8 shows the Water Resources current status.

Local Perspective

Groundwater resource balance:

The Chalk aquifer is developed for abstraction predominantly for public water supply and industrial use. Rainfall over the Chalk Wolds recharges the aquifer. In general the balance of recharge minus abstraction forms the residual resource available to meet springflows and blow-well discharges.

Table 2 illustrates the resource balance for the Chalk. The Chalk aquifer in the catchment is part of a larger groundwater resource extending southwards into the Louth catchment. Table 2 shows the balance based on both total licensed abstraction and actual 1993 abstraction (approximately 70% of licensed) for dry, average and wet year recharge levels.

CHALK AQUIFER

TABLE 2 - WATER RESOURCES BALANCE

Aquifer inputs(I)/outputs(O) in tcmd	Dry/Drought	Average	Wet
Recharge Available (I)	130	231	272.2
Licensed Abstraction (O)	211.5	211.5	211.5
Saline intrusion (I)	2.5	1.5	0.75
Total flow to Springs (O)	(-79)	21	61.5
Current (1993) Abstraction (O)	148	148	148
Saline Intrusion (I)	1.2	0.9	0.2
Total flow to springs (O)	(-16.8)	83.9	124.4

Note:
- tcmd means; thousand cubic metres per day.
- Recharge and abstraction figures relate to the Chalk aquifer within Grimsby and Louth CMP areas.
- Effective resource available (from recharge) and salinity figures are derived from the chalk distributed groundwater model.
- Saline intrusion greater than 1 tcmd places the aquifer at risk of serious pollution.
- Total estimated natural 95 percentile flow for all major springs is 21 tcmd.

The Table shows that:

i) for the licensed abstraction level:

- abstraction is close to or exceeds available resources in all but above average recharge years;
- flows to springs are at or below 95 percentile flows in all but above average recharge years.

The 95 percentile flow is taken generally to represent the flow required to protect the water environment.

- in dry years no resource is available to support springflows;
- saline intrusion exceeds 1 tcmd in all but above average recharge years.

Saline intrusion greater than 1 tcmd places the aquifer at risk of serious pollution.

ii) for the actual 1993 abstraction rate:

- resources are available to meet abstraction, flows to springs and to limit saline intrusion in all but dry years;
- in dry years no water is available to meet springflows and saline intrusion exceeds 1 tcmd.

The above balance demonstrates that abstraction at the licensed rate is essentially unsustainable. In dry periods severe restrictions in abstraction are necessary to secure 95 percentile springflows and protect the aquifer from pollution from saline intrusion.

In the recent drought (1988-92) abstraction for public water supply and industry was reduced to protect groundwater quality. However there were still extended periods of low or zero flows in springfed watercourses such as the River Freshney.

The figures used in Table 2 are based upon consideration of the gross recharge available for abstraction. In its Regional Water Resources Strategy the NRA has proposed that the gross recharge available for abstraction should be reduced by 20% to reflect the inadequacy of aquifer storage to fully even out year to year variations in recharge. If based upon this "effective resource", and allowing a reservation to protect river flows, then even greater restrictions on abstraction would be necessary.

Saline Intrusion:

It is the connection between the Chalk aquifer and the Humber Estuary in the Grimsby area that results in saline water being drawn into the aquifer. A number of industrial water sources have been affected by saline water contamination and

there is a real risk of public supply and other industrial sources becoming affected if abstraction exceeds available resources for extended periods.

A mathematical model has been developed by the NRA to simulate the behaviour of groundwater levels, saline intrusion and springflows given different levels of recharge to the aquifer and different levels of abstraction. The model is used operationally as a tool in the management of aquifer abstraction, and was used during the recent drought.

Environmental impacts:

The actual and potential hydrological impacts of the groundwater resource balance on springfed watercourses and blow-wells, have implications for water quality, fisheries, conservation and amenity interests, for example:

i) extended periods and sections of dry watercourses, lakes and blow-wells;

ii) salinity in the lower stretches of watercourses;

iii) reduced effluent dilution;

iv) poor conditions for fishery development;

v) impacts at water related SSSI's (eg. blow-wells).

However, the long term ecological implications of the hydrological conditions are not clear due to:

i) a lack of local data on the ecological impacts;

ii) a general lack of understanding as to the relationships between flow, ecological health and river channel physical characteristics.

There is however, serious concern that the current resource balance, in years when recharge is average and below, is having an unacceptable effect on the water environment. It is not currently possible to objectively define an acceptable balance between abstraction and the needs of the environment.

The NRA has embarked upon research and development work to establish methodologies to assist in setting minimum residual flows/"hands-off" flows to take account of all water related uses. Currently the 95 percentile flow is taken generally to represent flows required to protect the water environment.

Water Demands:

Water demands for Public Water Supply and Industry in the catchment are met partly from abstraction from the Chalk and partly from two major surface water resource developments which import water into the catchment. Most of the surface water, and in the region of 20% of groundwater, is used for industrial purposes. These surface water developments are:

i) Covenham reservoir fed from the River Lud and Great/Long Eau in the Louth Catchment to the south;
ii) Cadney reservoir fed from the Trent Witham Ancholme water transfer scheme feeding water from the Ancholme Catchment to the west.

Most of the surface water and around 20% of groundwater is used for industrial purposes.

Water demands in the catchment are summarised in Table 3.

TABLE 3 - GRIMSBY CATCHMENT WATER DEMANDS

	1980	1990	1993	Forecast 2000		Forecast 2015	
				L	Z	L	Z
Met from Chalk groundwater	160	137	142	146*	142	161*	142
Met from surface water	70	99	68	63*	68	74*	68
Total Demand	230	236	210	209	210	235	210

Note: L: NRA Low Growth Scenario Z: Water Company Zero Growth Scenario

(all figures in tcmd average).

* Future growth in demand for water to be met from surface water sources and in any one year the balance of abstraction between surface and groundwater will depend upon aquifer conditions.

In dry periods such as 1990, abstraction from the Chalk decreases and additional import of surface water takes place to meet demand.

Forecast demands for both industrial and domestic use are difficult to assess. The current forecast is for general industrial demand to reduce by 1% per annum until 2001 thereafter returning to growth of 1% per annum to 2015. With regard to public water supplies, the NRA's "low" growth forecast is for the increase in demand to be less than 1% per annum. However, with the introduction of a number of demand management initiatives (eg. retain good leakage reduction) the latest water company forecasts are for no growth at all over the next 20 years.

The combination of the catchment's groundwater resources and surface water resources from outside the catchment are adequate to meet both current demand and future demand based on either of the demand scenarios in Table 3. This can be achieved within the existing capacities of the surface water schemes.

Under the Regional Water Resources Strategy no additional resources within the catchment are available for abstraction. Additional Public Water Supply and Industrial demand is to be met from the imported surface waters. Any additional agricultural demand for spray irrigation, or improvements in the reliability of existing irrigation demand must be derived from the limited availability of surplus winter water via storage.

3.2 WATER QUALITY

General

This section considers the status of the catchment with respect to the quality of rivers, estuaries, coastal and ground waters. Water quality protection is effected in a number of ways:

i) Through the issue of discharge consents - consents are issued to those persons and organisations who discharge effluents. Consents specify the quality of effluent and conditions under which they are permitted to be discharged.

ii) By the regular monitoring of water and effluent quality - the NRA undertakes both biological and chemical monitoring to ensure consents are complied with and to identify any change in water quality.

iii) By influencing development proposals through the planning process

iv) By liaison with HMIP in respect of authorisation of prescribed processes under the Environmental Protection Act and with the Waste Regulatory Authority regarding Waste MAnagement Licences.

The main users of water for effluent disposal in the Grimsby Catchment are Anglian Water Services Ltd and major industries along the Humber Bank. Effluents are discharged principally to the Humber Estuary and improvements in the long term water quality of the Estuary is a particularly important issue in the catchment.

Other influences on water quality include agricultural activities, surface water run-off from industrial areas and saline intrusion of both ground and surface waters in dry/drought periods.

Widespread abstraction from the Chalk aquifer, for potable and other high quality uses, makes the standard of groundwater quality a particularly important issue in this catchment.

Local Perspective

Surface Water:

The water quality of the principal watercourses has been classified according to river uses. These River Ecosystem Classes are part of the development of Water Quality Objectives (WQO's) and Statutory Water Quality Objectives (SWQO's). **Map 9 shows the River Ecosystem Classes for the Grimsby Catchment** (based on data for 1991, 1992 and 1993). The map shows that surface water quality in the catchment is generally fair, with only two short stretches falling into the poor category. These poor quality stretches are:

i) The stretch of the New Cut Drain in Grimsby between the Railway Bridge and its outfall. The quality here is influenced by trade effluent discharges. A new foul sewer is currently under construction in this area which will improve river quality.

ii) The River Freshney downstream of Laceby Sewage Treatment Works, where ammonia concentrations are elevated during periods of low riverflow which inhibits fishery development.

In addition to the above, biological monitoring by the NRA has identified both the North and South Killingholme Drains as having poor biological quality due to effluent discharges from adjacent oil refineries. These dischargers have invested or are investing in treatment plants to improve their effluent quality and some improvement has been provided recently in the North Killingholme Drain.

The biological quality of the rivers in the rest of the Catchment is fair.

The principal effluent discharges from the catchment, for both industry and sewage treatment works, are to the Humber Estuary (which is generally of good quality and is biologically healthy). The quality of many of these discharges is being improved by significant investment in effluent treatment plants:

i) Increasing concern over the long-term well being of the North Sea has led the government to require that the amounts of Dangerous Substances discharged to the North Sea be reduced by 50% of their 1985 values by 1995. Several effluent treatment plants have been commissioned or are currently under construction to achieve this objective. Initial indications are that the required reduction will be achieved.

ii) The NRA are seeking reductions in the discharge of other substances to the Estuary. Changes to standards required by discharge consents and improvement programmes associated with authorisations under Integrated Pollution Control (IPC) are being required by NRA and HMIP. Construction of new treatment plants for nearly all the major dischargers is either complete or will be complete within the next 5 years.

iii) Microbiological quality of the Bathing Water at Cleethorpes does not meet the requirements of the EC Bathing Water Directive due to the influence of sewage effluent discharges from Cleethorpes southern outfall. Planned improvements in effluent quality are programmed for completion by 1995.

During periods of low river flows, the water quality in the lower stretches of a number of rivers is adversely affected by saline water ingress through outfall structures. During these periods, the River Ecosystem Class may temporarily fall to or below Class 5. The River Freshney in Grimsby has been the only significantly affected watercourse and poor water quality has affected fishery, conservation and recreation uses. Recent construction of a tilting weir on the river has eliminated the saline water intrusion problem but there may be periodic residual water quality deterioration upstream related to low flows (elevated water temperatures and low dissolved oxygen).

There are a number of dock and marine areas associated with commercial and recreational activity on the Humber. Water Quality in these areas is adversely affected by discharges from vessels by pumping out of oil contaminated bilge water. Better control of these discharges is available under legislation administered by the Port Authority.

The use of watercourses as dumping grounds for litter is a particular problem in the Grimsby and Immingham areas. The visual impact in these areas is not acceptable. Responsibility for addressing these problems is not clear and may require a number of bodies to work together towards a solution to the problem.

Concentrated industrial development in parts of the catchment poses increased risk of pollution of the water environment. In a number of areas including Killingholme Airfield and industrial estates at Elsham Wold, Wilton Road (Humberston), Manby Road (Immingham) and Kiln Lane (Stallingborough) it has led to significant pollution incidents. Such incidents are often avoidable and are contributed to by both piecemeal infrastructure development and by poor pollution prevention measures.

Groundwater:

The predominantly agricultural nature of the Wolds area, which forms the principal recharge area for the Chalk aquifer, has led to the presence of high nitrate levels in Chalk groundwaters in parts of the catchment. In places, these concentrations exceed 50mg/litre which is a standard set in the EC Drinking Water Directive. In response to this two types of nitrate protection zones are being established:

i) Nitrate Sensitive Areas (NSA's) have been established under the Water Resources Act 1991.

ii) Nitrate Vulnerable Zones (NVZ's) have been established under the EC Nitrate Directive.

These areas are shown on Map 10.

The zones have been established to reduce the long-term impact of nitrates from agricultural activities. The NSA and NVZ schemes are managed by MAFF.

There is also growing concern over the levels of pesticides being detected in some Chalk groundwaters. Currently potable waters are treated to remove nitrate and pesticides to set quality standards.

In the Grimsby area direct contact between the Chalk aquifer and the water in the Estuary has led to the movement of saline water into the Chalk within 1-2km of the coast (see Map 3). This affects a number of water abstractions and poses a risk to others. The extent of the saline groundwater area is related to the balance between groundwater recharge and groundwater abstraction. The degree of contamination and the potential for deterioration is greatest in dry/drought periods. If industrial and public supply abstractions increased to licensed limits, the integrity of the long term aquifer would be at risk.

In addition to nitrates, pesticides and saline water, there are other potential risks to groundwater quality especially in the area of the Wolds and adjacent areas. These risks include the storage and transportation of hazardous materials (by roads, rail, pipelines), landfill sites and areas of contaminated land. Since 1992 the NRA has been implementing it's Groundwater Protection Policy by which it seeks to discourage inappropriate developments in those parts of the catchment where groundwater is most vulnerable to pollution.

Under this policy, Source Protection Zones (SPZ's) have been established. These zones represent the vulnerable catchment zones which feed potable groundwater sources. **These zones are shown on Map 10.**

The principal area of contaminated land is a former pesticide formulation plant complex at Barton on Humber (see Map 3). This site is a risk to both ground and surface water quality in the area, it will be redeveloped in a manner which minimises risks to the water environment.

3.3 FLOOD DEFENCE

Background

This catchment can be sub-divided into two distinct drainage areas:

i) The Lincolnshire Wolds: to the south and west where a number of small, largely groundwater fed rivers, drain eastwards.

ii) The coastal plain and associated tidal defences in the east.

General land levels along the coastal plain are below normal high tide levels. This area is protected against flooding by extensive tidal defences. Drainage of areas of the low lying coastal plain is carried out by the Internal Drainage Boards.

The NRA has a general supervisory role relating to all flood defence matters and has a duty to carry out surveys to define flood defence needs. It has permissive powers to maintain and improve existing defences and construct new defences on designated main rivers.

The catchment includes lengths of defence which are the responsibility of the District/Borough Councils and Associated British Ports, not just the NRA.

Local Perspective

Fluvial Defences:

The general drainage system consists of a number of natural watercourses (highland carriers) carrying drainage waters from the Wolds across the low lying coastal plain before discharging to the Humber Estuary. Drainage within the coastal plain is provided by a network of largely artificial drainage channels, administered and maintained by the North East Lindsey and Louth Internal Drainage Boards. Due to the low lying nature of the land numerous pumping stations are operated by both the NRA and IDB's to discharge fluvial waters to the Estuary.

A number of these highland carriers rely on raised embankments to contain rivers. These embankments become particularly important in periods of tide-lock (when drainage waters cannot be discharged due to tide levels) when they provide storage for surface waters. The condition of these raised banks is generally acceptable.

Current standards of flood protection are provided in accordance with guidelines set by MAFF. **Existing standards of flood protection are shown on Map 11.** Generally the current standard of defence is considered to be adequate for the land use protected, an exception being the River Freshney in Grimsby where the standard is less than 1 in 20.

The NRA uses its powers to alleviate flood risk for designated main river stretches only. There are locations within the catchment such as at Goxhill, Habrough and Barrow which suffer from, or are at risk of, flooding from non-main rivers. This risk arises because drainage systems have been inadequately maintained or may have been the subject of indiscriminate and uncontrolled culverting. In these areas the responsibility for maintenance rests with riparian owners. County, District and Borough Councils have permissive powers to alleviate flood risks on non-main rivers outside IDB areas.

There are a number of river outfalls discharging water to the Estuary. The correct functioning of these outfalls is essential to flood defence. A recurring problem in the catchment is the intermittent blocking of the outfalls by silt associated with extended periods of low natural river flows. The outfalls at Barrow and East Halton were affected during the recent drought. Intermittent flooding of agricultural land along the East Halton Beck was aggravated by this situation.

The NRA is currently carrying out surveys of flood defence needs. These surveys will be completed in 1996 and will be used to identify future flood alleviation schemes and assist with development control.

Tidal Defences:

The existing tidal defences along the coastline vary in their type and size. They range from earth and clay banks, such as those at Goxhill, to armoured banks with wave walls, such as those at Stallingborough. Much of the existing defence is fronted by mudflats and saltmarsh which in addition to their conservation significance, also play an important role for flood defence by reducing wave damage to the defences.

Existing standards of protection against tidal flooding are shown on Map 11.

The tidal defence standards shown indicate the frequency with which occasional wave action is likely to over-top the defence. Over-topping much greater than this could lead to failure of the defence and consequential flooding. Map 11 indicates that the current level of protection varies from less than 1 in 5 to around 1 in 200.

There is a risk of inconsistency in the standards of tidal defences because three different organisations have responsibility for their construction and maintenance (District/Borough Councils, Associated British Ports and NRA).

The defences are regularly inspected and maintained by the NRA. However, many are now reaching the end of their effective life and will require increased levels of maintenance and eventual replacement. In addition to these effects the standard of future protection is also significantly influenced by:

i) Sea level change: it has been estimated that there has been a rise in sea level, relative to land levels, of 215mm over the last 60 years in the Estuary. This sinking of land is anticipated to continue and there will be a further rise in sea levels as a result of global warming. Their combined effects are predicted to give a 6mm rise per annum in relative sea level to the year 2030. This may reduce the area of inter-tidal mudflats and marshes.

ii) Changes in Sedimentary Processes: sedimentary drift from the Holderness coast may be affected by future coast protection works to the north of the Humber and this may have an adverse impact upon foreshore levels in the Estuary.

To accommodate these changes and the increased flooding risk, the NRA is developing a Humber Estuary Flood Defence Strategy. This will identify works necessary to the year 2030 using current predictions on global warming and sea level rise. In forming this strategy consultation with all interested parties will take place in order that the right balance is struck between the competing needs of the Estuary and adjacent catchments.

By 2030 it is envisaged the minimum level of protection afforded will be in accordance with MAFF indicative standards providing the necessary cost benefit criteria are met.

In the longer term the NRA will monitor sea level rise in order to ensure any works past 2030 are implemented. Ahead of this strategy being produced, works of a more immediate nature are being undertaken to lessen the risk of flooding to people and property such as the emergency repairs undertaken south of the East Halton Skitter outfall during the winter of 1993/94.

The combination of all these effects will be to increase tidal flood risks and will require investigations and strategies to ensure adequate protection is maintained.

Studies are being carried out which will help the NRA form a strategy for the renewal of defences in the catchment. These studies are considering the defences of the whole Humber Estuary.

Flood Warning:

These warnings are phased and colour coded (Yellow, Amber, Red) to indicate the anticipated severity of an event and its impact on land and property.

To be effective, warnings need to be timely and accurate. Warnings are based on forecasts based on data obtained from rainfall, river level, river flow and tide level monitoring sites which are connected to the NRA's telemetry system.

In respect of tidal events the standard of warning does meet the general criteria. However, fluvial forecasting is restricted by the current number and location of monitoring stations.

3.4 FISHERIES, RECREATION, CONSERVATION AND NAVIGATION

General

The Grimsby Catchment can be divided into three distinct areas in relation to fisheries and conservation:

i) The Chalk Wolds: rolling Chalk countryside dominates, tree cover along rivers is relatively sparse and the area is developed for intensive arable farming. The permeable geology creates the typical dry valleys. A number of ephemeral streams run off the high ground, and other, more perennial watercourses originate along the springline on the eastern edge of the Wolds. Flows may be "fast" supporting gravel beds with pool and riffle sequences.

ii) The Coastal Plain: an area characterised by a combination of intensive arable farming, urban development and industrial complexes. Flows in the watercourses are "moderate" to "sluggish" and lead to the formation of silt beds. These watercourses have been modified for land drainage purposes, some have been embanked.

iii) The Mudflats and Saltmarshes: these areas have been much reduced in size following extensive reclamation and the construction of tidal defences.

Local Perspective

Fish population surveys are normally undertaken on a 3 year rolling programme. In this catchment, survey data is only available for the River Freshney/Laceby Beck for 1986 and 1992. **Available data is summarised on Maps 12 and 13.** These maps indicate a poor (Class C/D) fish population, which is likely to be a reflection of low river flow conditions and the extended drought (1988-92) and may be indicative of conditions elsewhere in the catchment. In addition to low river flows and levels, the presence of tidal structures at the lower ends of watercourses are likely to restrict the movement of migratory fish species, particularly eels.

River Corridor Surveys were carried out in 1990 and 1993 to establish the extent of plant, animal and habitat diversity. These features are indicative of the overall health of the water environment. **Data from the most recent survey is shown on Maps 14 and 15 for river channel aquatic plant diversity and river corridor/tidal defences respectively.** The general diversity of river channel

habitat and aquatic plant diversity is low, with almost 90% of the catchment having less than 10 species per 500 metres. Low river flows and levels, eutrophication, and the impacts of saline intrusion are considered to be the principal constraints. River corridor bio-diversity is average. Some river banks are dominated by plants most often associated with disturbed ground such as nettle, thistle and rough grasses.

Species diversity on the Humber Bank defences is average. This probably relates to the physical design of the banks as well as the mowing regimes which leave cuttings to choke less vigorous plants. In the saltmarshes, high species diversity is recorded.

The extent of urban, industrial and agricultural development in the catchment has the potential to degrade species diversity but new or re-development offers opportunities for improvement.

The coastal plain has gone through a major transition over the last century. With the embankment of the Humber, and the installation of effective drainage regimes, many wetland habitats have been lost. Nevertheless the catchment does have a number of wetland sites of national and international importance (see Map 6):

i) The recently designated Humber Flats and Marshes, RAMSAR/SPA sites are rich in invertebrates and support waders and wildfowl on an internationally important scale.

ii) A number of flooded and abandoned clay pits on the landward side of the Humber Bank from North Killingholme to South Ferriby, including Barton/Barrow Clay Pits, currently support large stands of reedbeds and associated Wainscot moths, and a wintering Bittern population. A number of these wetlands are at an advanced stage of degradation due to natural successional changes.

In the catchment there are 7 distinct SSSI's, 10 Nature Reserves, 10 Sites of Nature Conservation Importance and 15 Scheduled Ancient Monuments.

English Nature are currently developing a Humber Estuary Management Strategy, in collaboration with other key organisations including the NRA, to pursue the environmental interests of the Estuary. Any recommendations made in that strategy, relevant to this catchment, are likely to be facilitated by the NRA in it's management of the catchment.

Water based recreational activities in the catchment are focused along the Humber Bank where a wide range of facilities are available including footpaths and marinas, and at other watersports areas eg. Barton Clay Pits. There is potential for further enhancement of recreation associated with the Humber.

The catchment has a number of recreational fishing lakes principally associated with the Laceby Beck/River Freshney. In dry/drought periods these facilities are unusable due to low water levels.

3.5 LAND USE/DEVELOPMENT

General

Changes in land use and development have a potentially adverse impact upon the water environment.

They can result in:

i) An increased risk/occurrence of flooding as a consequence of changes to surface water drainage;

ii) An increased risk to water quality eg:

   a) from effluent discharges to surface water and groundwaters;
   b) from agriculture;
   c) from increased pressure upon the sewerage infrastructure;

iii) An increased demand for water for industrial/agricultural use, and for public water supply;

iv) A risk to flora, fauna and habitats as a consequence, directly or indirectly, of remedial flood defence works and/or water quality problems.

Through its involvements in the Town and Country Planning process, the NRA seeks to influence the development and land use change process in order to protect the water environment from these possible impacts. The final decision on planning matters rests with the Local Planning Authorities (LPA's).

The NRA's participation in this process is essentially at two levels:

i) In the short term the NRA acts as a Consultee in certain types of application under the Town and Country Planning General Development Order. It liaises and advises on proposals which may impact on matters relevant to the NRA.

ii) In the long term, policy and strategy for change in land use is contained in the Development Plans prepared by LPA's.

The NRA has undertaken to provide LPA's with Section 105 plans which will show areas at risk of flooding from both fluvial and tidal sources. The production of these plans will start in 1995/6 and will assist the LPA's in the planning process and minimise the risk of flooding as a consequence of development.

Any development upon which the NRA is consulted whether through the formal planning process or otherwise provides an opportunity for the NRA to enhance the interests of the water environment.

Local Perspective

The catchment is situated within the administrative boundaries of Humberside and Lincolnshire County Councils, Cleethorpes, Great Grimsby and Glanford Borough Councils and West and East Lindsey District Councils.

The County Structure Plans for the catchment identify levels of land allocation for residential, commercial, industrial and associated social development uses to meet predicted needs up to the year 2011.

An area of some 1,400 hectares has been identified in the Structure Plan for this catchment for Estuary Area Development. Statistics from Humberside County Council's Structure Plan indicate that the population of Cleethorpes and Grimsby Borough Councils is likely to grow by approx. 1.6% by the year 2011.

Each of the Local Planning Authorities within the catchment have produced development plans on which the NRA have been consulted. The current state of these plans is shown in Table 4.

TABLE 4 - COUNTY AND LOCAL PLANS

PLANNING AUTHORITY	DEVELOPMENT PLAN TITLE	STATUS AND CONSULTATION DATE
Humberside County Council	Humberside Structure Plan (Revision)	Consultation 2nd Draft, Jan 1994
Cleethorpes Borough Council	Cleethorpes Borough Development Plan	Consultation Draft September 1994
Glanford Borough Council	Glanford Local Plan	Consultation Draft expected October 1994
Grimsby Borough Council	Grimsby Local Plan	Deposit Draft expected October 1994
Lincolnshire County Council	Lincolnshire Structure Plan (Alteration 3)	Deposit Draft October 1993
West Lindsey District Council	West Lindsey Local Plan	Deposit Draft March 1994
East Lindsey District Council	East Lindsey Local Plan	Adoption anticipated October 1994

A feature of this catchment is the high growth that has occurred in the past 25 years, particularly the development of Humber Bank Industries, such as petro-chemical, chemical and power operation and the expansion of ports and wharfs at Killingholme and Immingham. These and associated developments involve the storage of large volumes of hazardous materials.

The allocation of land in the coastal flood plain for industrial use has ongoing implications for the level of flood protection to be provided.

To enable the LPA's to fulfil their obligation with regard to the concept of sustainability, and in order to meet the NRA's duty to protect the water environment, the NRA has produced and distributed to all Planning Authorities its "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans".

The assimilation of these policies into Development Plans has been achieved with a variable degree of success, limited in part by the timing and ongoing Development Plan process by individual LPA's. The NRA recognises the need for improvement in liaison with LPA's.

A planning related characteristic of the catchment is the actual and potential piecemeal development of land. The cumulative effect of piecemeal development, such as that which has occurred within the lower New Cut Drain sub-catchment and at North Killingholme Airfield, results in risks to ground and surface water quality, flood defence and conservation interests. The implementation of strategic planning and holistic infrastructure development could reduce overall infrastructure costs and ensure protection of the water environment.

4. CATCHMENT TARGETS

4.1 INTRODUCTION

This section identifies the NRA's broad strategy and principal aims in relation to it's main responsibilities of water resources and water quality management, flood defence, fisheries, recreation, conservation and navigation. In addition, the local perspective identifies the specific application of those objectives to the Grimsby Catchment. These objectives require an efficient balancing of costs and benefits within the integrated system of catchment management, taking the needs of all users and NRA functions into account.

4.2 WATER RESOURCES

Broad Strategy

The NRA's principal aim in relation to water resources is to:

- manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.

To achieve this aim, the NRA seeks to:

- plan for the sustainable development of water resources, developing criteria to assess reasonable needs of abstractors and of the environment;
- collect, validate, store and provide hydrometric data and environmental data in order to assess water resources;
- apply a consistent approach to abstraction licensing;
- implement a consistent approach to the resolution of inherited problems caused by authorised over-abstraction;
- work with other functions and external bodies to protect the quality of our water resources.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to protect the Chalk aquifer and surface waters from over-commitment and ensure that abstraction does not have an unacceptable effect on existing abstractors and environmental waters;

- to set MRF's and MCL's to protect environmental river needs and to ensure their compliance;

- to augment and/or redistribute water resources, where appropriate, to meet existing catchment water demands to the following standards of reliability:

  - Public Water Supply — a hosepipe ban not more than once in every 10 years on average.

    voluntary restrictions required not more than once in every 20 years on average.

    rota cuts or standpipe required not more than once in every 100 years on average.

  - Spray Irrigation — shortages not more than once in every 12 years on average.

  - Other Agricultural, Environmental and Industrial. — no specific target level of reliability.

- to apply the principle of sustainability of water resources and where the impact of abstraction is uncertain, take a precautionary approach;

- to ensure all water abstraction demands are fully justified and to require environmental reports to accompany licence applications where appropriate;

- to encourage efficient water uses, re-use of water where appropriate and effective leakage control;

- to seek to maximise use of effluents;
- to encourage the development of winter storage reservoirs to meet irrigation demand and to discourage summer surface water abstraction;
- to identify environmental water needs and balance the interests of the abstraction with those of the environment;
- to protect water related conservation sites and environmental flows from over-commitment of resources and set minimum flows and minimum levels wherever necessary and ensure their compliance;
- to revoke licences or reduce authorised quantities where there is no need for the original licensed quantities;
- to review levels of abstraction in terms of sustainability and proper use;
- to develop a policy for the identification of groundwater protection zones;
- to ensure the best utilisation of water resources in the catchment.

4.3 WATER QUALITY

Broad Strategy

The NRA's principal aims in relation to water quality are to:

- achieve a continuing overall improvement in the quality of rivers, estuaries, ground and coastal waters through the control of pollution;
- ensure that dischargers pay the costs of the consequences of the discharges.

To achieve these aims the NRA seeks to:

- maintain waters that are already of high quality;
- improve waters of poorer quality;
- ensure all waters are of an appropriate quality for their agreed uses;

- prosecute polluters and recover the costs of restoration from them;

- devise charging schemes that allocate the costs of maintaining and improving water quality fairly and provide incentive to reduce pollution;

- provide advice to individuals and developers on measures to be taken to reduce the risk of pollution at their sites.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to ensure that water quality is maintained and where necessary improved to meet EC Directives, and River Ecosystem Classes as part of Water Quality Objectives. **The NRA's proposed River Ecosystem Classes are shown on Map 9;**

- to ensure that discharge consents adequately safeguard water quality and prevent exceedence of EC Directives and Water Quality Objectives;

- to ensure, through an effective system of monitoring (by NRA and/or others) compliance of waters with EC standards, compliance of effluents with consents, compliance with EC Directives on substances discharged to groundwaters and compliance with landfill site licences;

- to ensure landfill activity does not compromise water quality and that the restoration of all sites is to an acceptable environmental standard;

- to implement and enforce groundwater protection zones and the NRA's Groundwater Protection Policy to protect aquifers and water sources from contamination, and the effects of development including mineral extraction;

- to ensure that point source and diffuse pollution of ground water and surface waters is prevented and/or controlled wherever possible by liaison with potential polluters

- to implement effective pollution alleviation and prevention measures to reduce the incidence and impact of pollutions;;

- to maintain links with planning authorities, local groups and national bodies to ensure watercourses are cleared of litter and then kept clean;

- to maintain strong links with government regulators, planning authorities and developers to ensure potentially polluting activities are controlled wherever possible;

- to seek to prevent potential pollution from the redevelopment of contaminated land;

- to maintain strong links with MAFF on the implementation of Nitrate Sensitive Areas and Nitrate Vulnerable Zones;

- to protect the Chalk aquifer from long term damage by saline intrusion.

4.4 FLOOD DEFENCE

Broad Strategy

The NRA's principal aims in relation to flood defence are to:

- provide effective defence for people and property against flooding from rivers and from the sea appropriate to land use;

- provide adequate arrangements for flood forecasting and warning.

To achieve these aims the NRA seeks to:

- maintain fluvial and tidal defences and structures to appropriate standards;

- develop and implement the flood defences strategy through a systematic approach for assessing capital and maintenance requirements and develop medium and long-term plans for those defences owned and maintained by the NRA;

- encourage development of information technology and extension of facilities which will further improve the procedure for warning of, and responding to, emergencies;

- support Research & Development which will assist in identifying future flood defence needs;

- review best practices for all operational methods and the identification and justification of work, thus increasing efficiency and enhancing value for money;

- heighten general awareness of the need to control development in flood plains;

- identify opportunities for the enhancement of environmental, recreational and amenity facilities when undertaking flood defence works.

Target Standards of Defence

Notional target standards of protection from tidal and fluvial defences are provided by MAFF guidance notes of indicative standards of protection for different types of land use. These notes also give guidance on economic justification.

The 5 bands of land use are shown in Table 5.

Land Use Classification is shown on Map 16.

TABLE 5 - INDICATIVE STANDARDS OF FLOOD DEFENCE

Land Use	Indicative Standard of Protection (Return period in Years)	
	Tidal	Fluvial
High density urban containing significant amount of both residential and non-residential property	200	100
Medium density urban. Lower density than above, may also include some agricultural land	150	75
Low density or rural communities with limited number of properties at risk. Highly productive agricultural land	50	25
General arable farming with isolated properties. Medium productivity agricultural land	20	10
Predominantly extensive grass with very few properties at risk. Low productivity agricultural land	5	2

It should be noted that these standards are indicative only and do not represent an entitlement to protection. They are a starting point on which the NRA assesses the economics of providing defences, depending on the land use it will protect.

Once it is decided a flood defence improvement scheme is required for a given location, a range of options will be considered by the NRA. Each of these options has to be evaluated. The capital, maintenance and environmental costs of any works to the defences must be contrasted with the benefits of providing the level of protection. Options may also be considered for different levels of protection. Usually the most economic option which yields the desired level of protection would be chosen, although a lesser level of defence may be accepted if the indicative standard cannot be justified when comparing costs against benefits. The consequence of this is that a level of protection ultimately chosen ie. the design standard, may not always be consistent with the indicative standard.

In addition to this methodology the NRA is currently developing a Standards of Service approach to assist with definition of length of defence which requires improvement. This methodology will score each length of defence in "House Equivalents". This will afford the NRA a more consistent approach and enable resources to be better focused on defences where the shortfall is more pronounced.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to maintain and improve the standards of tidal defence to accommodate future changes in sea level rise;
- to operate and maintain river systems and associated structures to achieve effective and efficient land drainage;
- to operate an effective flood warning service and pass warning messages to the police;
- to seek to ensure that new development does not increase flood risk in the catchment;

- ensure opportunities for conservation, recreation and enhancement of the environment are identified and implemented where justified.

4.5 FISHERIES, RECREATION, CONSERVATION AND NAVIGATION

4.5.1 Fisheries

Broad Strategy

The NRA's principal aim in relation to fisheries is to:

- maintain, improve and develop fisheries.

To achieve this aim the NRA seeks to:

- protect and conserve salmon, trout, freshwater, eel and, where appropriate, coastal fisheries;
- regulate fisheries through the enforcement of a consistent service of licences, orders, byelaws and consents;
- monitor the fisheries status of rivers and inland, estuary and, where appropriate, coastal waters;
- formulate policies to maintain, improve and develop fisheries and restore and rehabilitate damaged fisheries;
- provide an efficient and effective fisheries service which is responsive to the needs of its customers and which is based on a sound charging system.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to sustain a natural fish population appropriate to the catchment and achieve Class A in terms of both biomass and species richness;
- to maintain regular monitoring and re-appraisal of the fisheries resource;

- to ensure that fisheries are not adversely affected by water resources, flood defence and other developments and ensure active involvement in determining the requirements of Environmental Impact Assessments and the auditing of Environmental Statements;

- to ensure there is a variety of habitat, including pool/riffle sequences and reedbeds for feeding, spawning etc. and to ensure the presence of bankside vegetation to provide adequate shade and cover;

- to maintain where practicable, a variable flow regime where the monthly average reflects the natural flow conditions in the river and flows do not decline below the historic monthly 95 percentile flows, except during extreme drought conditions;

- to respond efficiently to emergency incidents involving issues to fish, seeking to prevent or limit fish losses;

- to minimise the deleterious impact of river maintenance operations on habitat diversity.

4.5.2 Recreation

Broad Strategy

The NRA's principal aim in relation to recreation is to:

- develop the amenity and recreational potential of inland and coastal waters and associated lands.

To achieve this aim the NRA seeks to:

- maintain, develop and improve recreational use of NRA sites;

- take account of recreation in proposals relating to any NRA functions;

- promote the use of water and associated land for recreation purposes.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to maintain and improve water quality in order that the amenity value of the watercourses may be enhanced and protected;
- to maximise public access to flood embankments, coastal defences in NRA ownership (subject to consideration of constraints), places of natural beauty and to buildings, sites of archaeological, architectural and historic interest;
- to promote the use of river corridors as a recreational facility without compromising other uses;
- to safeguard existing recreational uses and, where practicable, incorporate recreational facilities into schemes being designed for other reasons.

In pursuance of these aims the NRA seeks to:

- take into account the needs of persons who are sick or disabled;
- maintain and enhance the diversity of natural river features and other riverine habitats;
- maintain and enhance the diversity of aquatic vegetation and of the river corridor in general;
- take account of recreational use when setting water quality objectives, and minimum flows/levels and when determining planning applications and applications for effluent discharge or abstraction;
- provide suitable and safe access for angling and encourage the development of new fisheries;
- protect and enhance fish status.

4.5.3 Conservation

Broad Strategy

The NRA's principal aim in relation to conservation is:

- to conserve and enhance wildlife, landscape and archaeological features associated with inland and coastal waters.

To achieve this aim the NRA seeks to:

- assess and monitor the conservation interest of inland and coastal waters and associated lands;
- ensure that the NRA's regulatory, operational and advisory activities take full account of the need to sustain and further conservation;
- promote conservation to enhance the quality of the aquatic and related environment for the benefit of wildlife and people.

Specific Targets

In implementing the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to monitor habitats and associated flora and fauna of inland waters and associated lands, together with landscape and archaeological features;
- to assess the conservation interests of inland and coastal waters, and their potential, and work closely with others to target resources to protect the sites of the highest conservation interest and, wherever possible, rehabilitate degraded rivers and wetlands;
- to evaluate the impacts of applications for abstraction licences and discharge, land drainage and fisheries consents and ensure that conservation and archaeological interests are protected;
- to minimise the impact of the NRA's operational and regulatory activities and implement enhancement measures wherever possible;

- to maintain a variable flow regime in an appropriate channel cross section where the monthly average flow reflects the natural flow conditions in the river and flows do not decline below the historic monthly 95 percentile flows, except during extreme drought conditions;

- to maintain ground and surface water quality and level so that sensitive wetland ecosystems are protected;

- to maintain and enhance the diversity of aquatic vegetation, natural river features and other riverine habitats and the river corridor in general;

- to ensure the free passage of fish upstream and downstream of physical barriers;

- to require internal and external development proposals to be subject to Environmental Assessment;

- to work with planners and developers to ensure that conservation interests are taken fully into account.

4.5.4 Navigation

Broad Strategy

The NRA's principal aim in relation to navigation is to:

- improve and maintain inland waters and their facilities for use by the public where the NRA is the navigation authority.

To achieve this aim the NRA seeks to:

- contribute to the development of an overall navigation strategy for England and Wales;

- regulate NRA navigations through the enforcement of a consistent series of licences, orders, byelaws and statutes;

- maintain and improve the NRA navigation fairway, facilities and standards;

- recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

Specific Targets

There are no navigable waterways within the Grimsby Catchment. The Humber Estuary is however, a major navigation and relevant aspects are considered in the Humber Estuary Catchment Management Plan.

4.6 LAND USE/DEVELOPMENT

Broad Strategy

The NRA's principal aim in relation to development control is:

- to seek and develop understanding and professional working relationships with Local Planning Authorities and developers to protect the water environment.

To achieve this aim the NRA seeks to:

- maintain effective links with Local Planning Authorities to ensure an NRA input into planning applications and development plans;
- prevent pollution and land drainage problems caused by development; by active involvement in determining the requirements of Environmental Impact Assessments;
- to develop procedures and techniques to assess the implications of major developments and to allow audit of Environmental Statements.

Specific Targets

In seeking to implement the broad strategy in the Grimsby Catchment a number of specific targets are relevant:

- to promote the adoption of the NRA's "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans";
- to promote a strategic approach to infrastructure development.

5. SHORTFALLS AGAINST TARGETS

5.1 WATER RESOURCES

The amount of water licensed for abstraction from the Chalk aquifer exceeds the average resource available. Over abstraction of water resources has given rise to two problems:

i) saline intrusion to the Chalk aquifer in the Grimsby area from sea water;

ii) concern over unacceptable effects on the water environment notably the Laceby Beck/River Freshney and the Barrow and Barton Blow-wells.

This situation reflects a shortfall against NRA targets to:

- manage water resources to achieve the right balance between the needs of the environment and those of the abstractors;
- protect the Chalk aquifer from over-commitment;
- apply the principal of sustainability;
- protect water related conservation sites and environmental flow from over-commitment.

It also reflects the need the NRA has to develop a consistent and objective methodology to set Minimum Residual Flows and Minimum Control Levels so the NRA can achieve the right balance between abstraction and the needs of the environment when it determines abstraction licences.

Water Resources Shortfalls are shown on Map 17.

5.2 WATER QUALITY

There is a risk of groundwater and surface water pollution caused by development involving the storage and transportation of hazardous materials within the catchment.

Re-development of contaminated land threatens ground and surface water quality.

High concentrations of nitrate occurs in Chalk groundwaters in parts of the catchment and measures are required to protect the aquifer from further contamination.

The aesthetic quality of the water environment is impaired by general litter and refuse discarded to watercourses in urban areas.

Cleethorpes Bathing Beach fails the EC Bathing Water Directive. The microbiological standards of Bathing Water is adversely influenced by sewage effluent discharged from Cleethorpes southern outfall.

Effluents contribute to the pollution of the North Sea by Dangerous Substances.

The incidence of avoidable pollution, notably in the concentrated industrial parts of the catchment, is significant. The incidents are caused by a range of factors such as a lack of awareness of potential risks to the environment of pollutants eg. oils, chemicals etc.

The New Cut Drain fails to achieve its proposed Water Quality Objective as a consequence of untreated effluent discharges.

The Laceby Beck from Laceby to the Golf Course fails to achieve the standard set by the E C Fisheries Directive due to the combined influence of low flows and Sewage Treatment Works effluent discharge.

Water quality in dock and marina areas is adversely affected by oil discharges from vessels pumping contaminated water from their bilges.

The stretch of the River Freshney between Littlecoates Bridge and Alexandra Road fails to achieve River Ecosystem Class 4 target due to a combination of eutrophication and saline intrusion. Operation of a recently installed "tilting gate" weir should enable the target class to be achieved.

Aquatic life in the North and South Killingholme Main Drain is inhibited by trade effluent discharges from nearby oil refineries.

Water Quality Shortfalls are shown on Map 18.

5.3 FLOOD DEFENCE

Localised flooding occurs along the East Halton Beck and can be aggravated as a consequence of siltation of the East Halton Beck outfall which can prevent effective land draining during periods of high flow. The watercourse fails to provide indicative standards of protection of 1:10 year.

The current standard of protection in Grimsby along the River Freshney is below the indicative standard of protection of 1:100 years. Its current standard is assessed as <1:20 years.

As land continues to be developed behind sea defences, the value of the assets being protected by tidal defences increases. This may lead to a situation where the standard of protection deemed appropriate for the new improved land use is inconsistent with the current level of protection afforded, thus putting the responsible authority under pressure to invest in improved tidal defences.

There is currently a shortfall in our knowledge of the relationship between sedimentary processes, freshwater flows, rising sea levels and estuary boundaries however, this is being addressed by a number of initiatives such as the Humber Estuary Study. The NRA requires this information to assist in developing appropriate flood defence strategies for this catchment's coastline, the Humber Estuary as a whole and all remaining lengths of the Anglian coastline.

Standards of flood protection are being reduced by the erosion of foreshore which fronts tidal defences. The lowering of the foreshore results in increased wave height and wave action upon defences, threatening their stability and increasing the risk of overtopping and breaching.

Standards of flood protection are eroded by rising sea levels. Over the past 60 years there has been an estimated rise in sea level of 215mm - this trend looks set to continue with a predicted rise in sea levels of 6mm p.a. to the year 2030, unless extensive improvement works are undertaken, the net effect of this will be a significantly reduced standard of flood protection along the entire coastline.

The vesting of responsibility for tidal defences with a range of "authorities" has resulted in inconsistencies in terms of the standard of protection provided against flooding for land behind those defences. This can result in abutting lengths of defence having markedly differing crest heights diminishing the value of the adjacent defence built to the higher level.

The effectiveness of fluvial flood forecasting and control is below the target standard for some areas in the catchment. A lack of telemetrical equipment and gauging stations precludes the NRA from effective monitoring of fluvial flooding events in areas such as Barrow and East Halton.

Avoidable flooding of riparian watercourses can occur as a consequence of their inadequate maintenance and indiscriminate culverting activity. Riparian owners may be unaware of their responsibilities or the consequences of their actions.

Flood Defence Shortfalls are shown on Map 19.

5.4 FISHERIES, RECREATION, CONSERVATION AND NAVIGATION

5.4.1 Fisheries

The 1992 fish survey identified the River Freshney and the Laceby Beck as having a low fish biomass (Grade C) and low species richness (Grade D). The target for both classifications is Grade A.

The NRA has a target to maintain regular monitoring and re-appraisal of the fisheries resource. This has not been achieved in this catchment with only the Freshney/Laceby Beck being regularly monitored.

The free passage of elvers and other species into the river system is constrained by sea doors which are sealed during periods of low flow to prevent the loss of water. These structures inhibit species diversity and biomass in the lower part of the catchment.

5.4.2 Recreation

The angling and amenity value of several lakes in this catchment are severely affected by low water levels during dry periods. The NRA has a duty to generally promote recreation on inland waters.

The Humber Estuary represents a significant asset to the catchment. Opportunities exist to develop the recreational potential of the Estuary. The NRA has a duty to generally promote recreation on coastal waters.

5.4.3 Conservation

River stretches have been identified that support a low plant species diversity. The situation is particularly poor for river channel aquatic plant species as the majority (95%) of main river in the catchment contained low (1-9 species) species diversity. In terms of the river corridor only 7% of main river contains a low species diversity (< 50 species).

The conservation value of the reedbeds in Barton and Barrow SSSI is falling due to natural succession ie. the natural development of such sites to dry land.
The embankment of the Humber Estuary has resulted in the loss of complex wetland habitats such as saltmarshes. Where such habitats exist plant species diversity is high.

The Humber Estuary offers unique opportunities to developers and consequently pressure to develop wetland sites or sites of archaeological importance could be high.

Fisheries and Conservation Shortfalls are shown on Map 20.

5.5 LAND USE/DEVELOPMENT

Water quality, flood defence and conservation interests are adversely affected by piecemeal development of land. The uncoordinated approach to piecemeal development increases the risk of flooding and pollution, and reduces the opportunity for environmental improvements.

The ability of the NRA to limit the adverse impact of changes in land use and development upon the water environment is at times constrained by our lack of influence in the planning process.

6. ISSUES & OPTIONS

6.1 INTRODUCTION

The catchment management planning process enables the differences between the current state of the catchment and the use related targets for the catchment to be identified. These differences termed shortfalls in the plan, are developed into issues, and a number of options to resolve the issue are developed. For each of the options the advantages/disadvantages are defined.

The purpose of the Consultation Document is to seek comments on these issues and the options identified to resolve them.

The options which are at this stage considered feasible will only be implemented following a full project appraisal including a thorough analysis of the costs, benefits and environmental impact. At this stage it is not practical to identify the costs associated with all the options.

The next stage in the catchment management process is for the NRA to produce an Action Plan which takes into account the comments received.

This Action Plan may include a combination of the options shown or further options identified during the consultation period. It will form the basis for the NRA's actions in the catchment. The NRA will seek the commitment of planned actions by others where necessary.

There are 34 issues identified in total in the plan covering the major areas of water resources, water quality, flood defence and fisheries, recreation and conservation. A number of the issues in the areas of water resource protection (quality and quantity) flood defence and conservation are inter-related and are further evidence of the need for an integrated approach to their resolution.

In the tables each issue is presented in the following manner:

i) A short description of the issues.

ii) An attempt to define the options to address the issue.

iii) An assessment of the advantages and disadvantages associated with a particular option.

ISSUE 1

LICENSED AND ACTUAL GROUNDWATER ABSTRACTION FROM THE CHALK AQUIFER EXCEEDS AVAILABLE RESOURCES.

ISSUE 1 - Sub Issue 1

GROUNDWATER ABSTRACTION POSES A SIGNIFICANT RISK TO GROUNDWATER QUALITY DUE TO SALINE INTRUSION IN THE GRIMSBY AREA.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Reduce groundwater abstraction to quantities consistent with available water resources using statutory powers.	NRA. Abstractors.	Eliminates over-commitment of resources. Protects aquifer.	Compensation may be payable to abstractors. Costs of importing surface waters.
Reduce groundwater abstraction to quantities consistent with available water resources through legal management agreement with principal abstractors.	NRA. Abstractors.	Eliminates over-commitment of resources. Protects aquifer.	Costs to Abstractors. May not be permanent solution. No track record of such agreements. Costs of importing surface waters.
Seek reductions in abstraction to quantities consistent with available water resources through informal agreement with principal abstractors.	NRA. Abstractors.	Some elimination of resource over-commitment.	Not permanent solution. No legal basis. Requires continual review. Costs of importing surface waters.

ISSUE 1 - Sub Issue 2

THERE IS CONCERN THAT GROUNDWATER ABSTRACTION HAS AN UNACCEPTABLE EFFECT ON THE WATER ENVIRONMENT PARTICULARLY THE LACEBY BECK/RIVER FRESHNEY AND BARROW/BARTON BLOW WELLS. THERE IS INSUFFICIENT INFORMATION AVAILABLE ON THE ENVIRONMENTAL IMPACT OF GROUNDWATER ABSTRACTION.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Carry out Environmental Assessments of potentially affected areas and implement defined remedial actions.	NRA.	Objective definition of environmental impacts and potential solutions. Logical approach. Environmental Protection.	Cost. Time to address.
Require abstractors to carry out Environmental Assessment of potentially affected areas and implement defined remedial works.	NRA. Abstractors.	Objective definition of environmental impacts and potential solutions. Logical approach. Uses developer pays principle. Environmental protection.	Cost. Only piecemeal unless wider agreements reached with abstractors.
Act now to reduce abstraction (voluntary or by using statutory powers).	NRA. Abstractors.	Some environmental protection.	Cost. No improved understanding. May not be most cost effective or environmentally sound option. Partial solution.
Act now to augment flows/levels at affected sites.	NRA.	Environmental protection.	Cost. No improved understanding. May not be the most cost effective or environmentally sound option.
Require abstractors to augment levels/flows as part of licence conditions.	NRA. Abstractors.	Alleviation of low flows/levels. Uses developer pays principle.	Cost. Only piecemeal unless wider agreements reached with abstractors. May not be most cost effective option.

ISSUE 2

ACHIEVING THE RIGHT BALANCE BETWEEN ABSTRACTION AND THE NEEDS OF THE ENVIRONMENT IS LIMITED BY A LACK OF A CONSISTENT AND OBJECTIVE METHODOLOGY TO SET MINIMUM RESIDUAL FLOWS/MINIMUM CONTROL LEVELS TO TAKE ACCOUNT OF ALL WATER USES.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
R&D to define methodology and NRA to develop a River Minimum Flow Objective policy.	NRA.	Methods established to enable MRF's to be set.	Potentially protracted process to develop and refine sustainable methods to ensure striking a balance of all interests, on all rivers. Costs.
Use existing methods.	NRA.	Methods available.	No objective NRA method. Not cost effective nationally. No consistent NRA approach.
National R&D just to develop broad framework/ concept. Regions implement within that framework.	NRA Regions.	Ability to adopt flexible approach to local circumstances, within broad framework concepts.	Time to develop framework.

ISSUE 3

DEMAND FOR WATER IN THE CATCHMENT EXCEEDS AVAILABLE RESOURCES.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Industry: Increases in demand can be met from water supplies made available through AWS's imported water within their existing licence entitlements.	NRA. AWS. Industry.	Demands could be met by AWS up to the current capacity of NRA's Trent Witham Ancholme River Transfers.	Industry has only one supplier of water.
Spray Irrigation: Meet demand from winter storage reservoirs for subsequent summer use.	NRA. Farmers.	Small demands can be met.	Not all demands could be met.
Public water supplies: Meet future demand by importing water into the catchment via NRA's Trent-Witham-Ancholme River Transfer and from AWS's Covenham Reservoir.	AWS. NRA.	Current forecast demands for water can be met.	Increased costs to AWS compared with the cost of groundwater.
Promote appropriate measures to reduce demand.	NRA. All water users.	Reduces the need for water abstraction. Environmental benefits. Follows a sustainable principle on the use of water. Reduced costs for all.	May be a partial solution.

ISSUE 4

THE NEW CUT DRAIN FAILS ITS PROPOSED WATER QUALITY OBJECTIVE TARGET OF RIVERS ECOSYSTEM CLASS 4.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
New foul sewer.	AWS.	Permanent solution could be achieved in short timescale. Improve quality to target. Development opportunity.	Cost.
Dischargers to provide treatment.	NRA. Dischargers.	Permanent Solution.	Impact on industry. Piecemeal approach.

ISSUE 5

EFFLUENT DISCHARGES INTO THE NORTH AND SOUTH KILLINGHOLME MAIN DRAINS INHIBIT THE DIVERSITY OF AQUATIC LIFE.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve quality of effluent discharges.	Dischargers.	Improve water quality and increase diversity.	Cost.

ISSUE 6

SIGNIFICANT NUMBERS OF POLLUTION INCIDENTS ORIGINATE FROM INDUSTRIAL ESTATES IN THE CATCHMENT.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Carry out proactive pollution prevention campaigns and identify potential sources of pollution and seek the co-operation and increased awareness of those responsible in reducing the pollution potential of their activity.	NRA. Dischargers. Developers.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	Cost of implementing pollution prevention measures.
Persuade local authorities to include measures when granting planning permission.	NRA. Local Authorities.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	Cost of implementing pollution prevention measures. Increased enforcement required.
Seek additional regulatory powers to require pollution prevention works.	NRA. DoE.	Reduced frequency of pollution incidents. Improved water quality. Cost savings on pollution incident investigations.	Cost of implementing pollution prevention measures. Increased enforcement required.
Provide foul sewer/drainage infrastructure.	Developers.	Reduced frequency of pollution incidents.	Cost.
Increase policing and prosecution.	NRA.	Some reduction in incident frequency. Some improvement in water quality. Follow "Polluter Pays" principal.	Reactive and piecemeal approach. May not be the most cost effective option. Difficulty in tracing the source of pollutions.

ISSUE 7

THE LACEBY BECK/RIVER FRESHNEY FAILS TO MEET THE EC FISHERIES DIRECTIVE STANDARD FOR AMMONIA IN YEARS WHEN RIVER FLOW IS LOW.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve effluent quality.	NRA. AWS.	Meets target. Permanent solution. Environmental benefits.	Cost.
Augment river flow to increase dilution.	AWS.	Meets target. Permanent solution. Environmental benefits.	Cost.

ISSUE 8

SURFACE WATERS IN DOCK AND MARINA AREAS ARE BEING POLLUTED BY OILY BILGE WATERS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Provide disposal facilities.	Dock Owners.	Reduce pollution improve visual appearance.	Cost.
Increase boat owners awareness.	NRA. Dock Owners.	Potentially some pollution reduction.	Likely only partial/short term solution. Cost to boat owners.

ISSUE 9

REDUCE THE DISCHARGE OF "DANGEROUS SUBSTANCES" TO THE NORTH SEA.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Reduce discharges of Dangerous Substances in effluents by application of: a) Best available techniques. b) Waste minimisation programmes. c) Integrated Pollution Control.	NRA. HMIP. Dischargers.	Reduce concentration in food chain. Reduce input to North Sea. Achieve Environmental Quality Standards. Reduce costs to industry.	Cost. Cost to industry increases as concentration decreases. Viability decreases as concentration decreases.
Do nothing.			UK fails to meet its commitment to the Ministerial declaration on the North Sea.

ISSUE 10

CLEETHORPES BATHING WATER FAILS THE EC BATHING WATER DIRECTIVE.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve sewerage and sewage treatment.	NRA. AWS.	Bathing Water complies with targets.	Cost.

ISSUE 11

LITTER ACCUMULATION IN MANY WATERCOURSES OCCURS CLOSE TO URBAN DEVELOPMENT.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Awareness campaigns.	NRA. Local Councils.	Low cost. Some improvements.	Limited effectiveness.
Litter removal.	NRA. Local Councils. Local Groups. Landowners etc.	Aesthetic improvement.	Cost.

ISSUE 12

NITRATE CONCENTRATIONS IN GROUND AND SURFACE WATERS EXCEED, OR ARE EXPECTED TO EXCEED 50mg/l.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Designate/implement nitrate protection zones (NSA's, NVZ's).	MAFF.	Reduce nitrate concentrations in surface and ground waters - limit need for water treatment.	Cost. Impact on agricultural activity.

ISSUE 13

DEVELOPMENT ON AREAS OF CONTAMINATED LAND HAS THE POTENTIAL TO POLLUTE, BUT PROVIDES OPPORTUNITY TO CLEAN UP EXISTING PROBLEMS.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Persuade Local Authorities not to allow building on contaminated land.	NRA. Local Planning Authorities. Government.	Risk of pollution not increased.	Does not permit land reclamation. Risk to environment by development elsewhere.
Ensure the pollutants within the site are effectively contained.	NRA. Local Planning Authorities. Developer.	Reduced risk of pollution.	Cost. Residual risk of pollution.
Ensure the pollutants within the site are effectively removed.	NRA. Local Planning Authorities. Developer.	Reduced risk of pollution. Cleans up existing problems.	Cost.
Ensure the site developer undertakes adequate measures of pollution prevention.	NRA. Local Planning Authorities. Developer.	Reduced risk of pollution.	Cost. Residual risk of pollution.
Seek legislative change.	NRA. Government.	Reduced risk of pollution.	Timescale of change for legislation.

ISSUE 14

DEVELOPMENT INVOLVING THE STORAGE AND TRANSPORTATION OF HAZARDOUS MATERIALS WITHIN THE CATCHMENT MAY CREATE A POLLUTION AND HEALTH AND SAFETY RISK.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Ensure appropriate pollution prevention measures are in place.	NRA. Local Planning Authorities. Developer/ Operator.	Reduced risk of pollution.	Cost.
Ensure high risk sites are situated in areas with appropriate aquifer and flood protection.	NRA. Local Planning Authorities. Developer.	Reduced risk of pollution.	Restriction of development.
Ensure adequate emergency procedures are in place and publicised.	NRA. Emergency Services. Local Authorities. Developer/Site Owner.	Effective response to emergency incidents.	Cost.

ISSUE 15

LOCALLY INADEQUATE RIPARIAN DRAINAGE SYSTEMS RESULT IN FLOODING PROBLEMS IN A NUMBER OF SMALL VILLAGES.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Enmain watercourses and improve management and maintenance.	NRA.	Reduces risk of flooding by better management.	Doesn't meet main river criteria. Cost. Environmental Impact.
Extend IDB area to cover management and maintenance.	IDB. NRA.	Reduces risk of flooding by better managment.	Lengthy process. Cost. Environmental Impact.
District Councils to use their land drainage powers to resolve drainage problems.	District Councils.	Reduces risk of flooding by better managmement.	District Councils unwilling to address. Cost. Environmental Impact.
Riparian owners to implement their maintenance responsibilities.	Riparian owners.	Reduces risk of flooding by better management.	Piecemeal approach. Environmental Impact.

ISSUE 16

THE LEVEL OF FLOOD PROTECTION TO PROPERTIES ON THE RIVER FRESHNEY IS INADEQUATE.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Carry out improvements to watercourses and structures.	NRA.	Reduced flood risk. Upholds land values.	Cost. Environmental Impact.
Provide upstream flood attenuation/ storage.	NRA.	Reduced flood risk. Opportunity for environmental enhancement. Upholds land values.	Cost. Loss of land. Environmental Impact.
Flood proof individual properties.	NRA. Local Authorities. Individual householders.	Some reduced flood risk. Relatively inexpensive. No environmental impact.	Piecemeal approach. Limited effectiveness.

ISSUE 17

THE EFFECTIVENESS OF FLUVIAL FLOOD FORECASTING AND CONTROL, FOR SOME FLOOD RISK AREAS IN THE CATCHMENT, IS BELOW THE TARGET STANDARD.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve riverflow/river level/rainfall network, and extend the telemetry system.	NRA.	Improved forecasting and more accurate measurement.	Cost.

ISSUE 18

DIFFERENT STANDARDS OF TIDAL FLOOD PROTECTION ARE ASCRIBED TO ADJACENT LENGTHS OF FLOOD DEFENCES BECAUSE THE RESPONSIBILITY FOR FLOOD DEFENCES RESTS WITH A NUMBER OF ORGANISATIONS.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN).

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Form a unitary authority to be responsible for all sea/tidal defences.	NRA. MAFF. Government. Riparian Owners.	Consistency of purpose and standards. One stop shop for customers.	Resource and set-up costs. Legislative change required.
Liaise with other bodies and try to mutually agree approach and standards.	NRA. Riparian owners. Local Authorities.	Consistency of purpose and standards. One stop shop for customers.	Limitations of existing legislation. Obtaining third party commitment to increased investment.
Do nothing.		No resource implications.	An uncoordinated and inconsistent approach toward determining standards and levels of defence will remain.
NRA adopts all tidal defences.	NRA. MAFF. Riparian Owners.	Consistency of purpose and standards. One stop shop for customers.	Costs. Legislation change required.

ISSUE 19

A) EXISTING SEA DEFENCES WILL NEED TO BE SUBSTANTIALLY IMPROVED IF THE NRA IS TO MAINTAIN STANDARDS TO ACCOMMODATE RISING SEA LEVELS

B) THE STRUCTURAL INTEGRITY OF THE SEA DEFENCES NEEDS IMPROVING TO LESSEN THE RISK OF FLOODING DUE TO THEIR FAILURE THROUGH REACHING THE END OF THEIR USEFUL LIFE

(THESE ISSUES ARE ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve existing defences to the justifiable design standard.	NRA. ABP. Industry. Crown Estates.	This will optimise the level of protection.	Cost. May have adverse effect on other coastal processes.
Accept the reduced standard of protection and maintain at the reduced standard.	NRA. ABP. Industry. Crown Estates.	Lower cost than above option in the short term.	Increased risk of overtopping. Increased likelihood of sudden failure with consequent risk to life and property. Effectiveness of flood warning will decrease.
Consider managed retreat.	NRA. ABP. Industry. Crown Estates.	Possible environmental gain.	Possible environmental loss. Detrimental to landowners and the community. Limited option, not always appropriate. Legal framework unclear. Effect on coastal processes is unknown.
Patch and repair defences/do little.	NRA. Others.	Maintains the status quo.	Possible environmental loss. Detrimental to landowners and community. Limited option, not always appropriate. Effect on coastal processes is unknown. Increased risk of flooding.

ISSUE 20

SEA DEFENCES NEED TO BE PROTECTED FROM INCREASED WAVE ATTACK BROUGHT ABOUT BY THE EROSION OF THE FORESHORE.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Improve existing defence.	NRA. Others.	Maintains existing level of protection.	Cost. May have an adverse effect on other coastal processes.
Undertake works to the foreshore.	NRA. Others.	Maintains existing level of protection. Maintains environmental benefits of foreshore.	Environmentally contentious.
Consider managed retreat.	NRA. Government. Others.	Possible environmental gain.	Possible environmental loss. Detrimental to landowners and the community. Limited option, not always appropriate. Legal framework unclear. Effect on coastal processes is unknown.
Do nothing.		Possible environmental gains.	As above. Reduced standard of protection.

ISSUE 21

INSUFFICIENT INFORMATION EXISTS ON THE RELATIONSHIP BETWEEN SEDIMENTARY PROCESSES, FRESHWATER FLOW, RISING SEA LEVELS AND ESTUARY BOUNDARIES.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Initiate a study to predict the impact on flood defences, navigable channels and estuarine habitats.	NRA. English Nature. ABP. Local Authorities. MAFF.	Improved knowledge of impact will aid the decision making of all parties. Could produce a coordinated approach by interested parties.	The long term cost/ benefit of any study is indeterminate. Lack of any suitable modelling techniques.
Wait and see.		There may be greater benefit to all parties by waiting for improved understanding of the processes involved. Provides time for a management framework for the estuary to be established.	May be long term cost disadvantages. Reduced level of protection. Reactive works may prove more expensive. Environmental Loss. Increased possibility of breaches with consequent risk to life and property.

ISSUE 22

DEVELOPMENT AND UPGRADING OF LAND BEHIND DEFENCES MAY BE INCONSISTENT WITH THE CURRENT LEVEL OF PROTECTION AFFORDED.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Liaise with Planning Authorities to ensure there is consistency between Structure Plans and Catchment Management Plans.	NRA. Planning Authorities.	Consistent approach.	
Encourage appropriate development in low risk areas.	Local Planning Authorities. NRA.	Environmental benefits. Reduced risk to new development.	
Improve the standards of the defence. a) Through Developer contributions b) Through Local Council funding c) Through NRA funding	NRA. Others.	 Developer pays. Co-ordinated approach can be most realistic and appropriate way of obtaining development funds.	 Cost to individual companies may be too high. Competing Local Authority priorities. Unrealistic.

ISSUE 23

FISH BIOMASS AND SPECIES RICHNESS FALL BELOW TARGET STANDARDS IN THE LACEBY BECK AND RIVER FRESHNEY FOLLOWING PERIODS OF LOW FLOWS AND RESULTING POOR WATER QUALITY.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Augment flows in the system.	NRA.	Maintain Flows. Improve water quality by dilution.	Solution only downstream of augmentation point.
Reduce abstraction from catchment to improve natural flows.	NRA. Abstractors.	Maintain flows. Improve water quality by dilution.	Cost. Limitation of available water resources to abstractors.
Increase instream habitat diversity.	NRA.	Increase water retention time in catchment. Improve riverine environment/ habitat for fish.	Cost. Partial solution only.
Improve quality of discharges.	AWS.	Improve water quality.	Partial solution only. Solution only downstream of major discharge points.
Periodic restocking.	NRA.	Simple solution.	Doesn't address cause. Long term costs. Partial solution. Target failure at times of low flow.

ISSUE 24

AREAS OF RIVER CHANNEL AND RIVER CORRIDOR HAVE BEEN IDENTIFIED AS HAVING LOW PLANT SPECIES DIVERSITY.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Restore and enhance during routine flood defence maintenance or Capital works without loss of channel capacity.	NRA. Landowners.	Increased habitat diversity. Increased bio-diversity. Increased amenity value.	Cost.
Encourage landowners to restore wetland and riparian habitats (Countryside Stewardship, Set Aside schemes etc.)	Landowners. NRA. Countryside Commission. Wildlife Trust.	Increase habitat diversity. Increased bio-diversity. Increased retention time of water in catchment. Increased amenity value.	Cost.

ISSUE 25

RECREATIONAL USE OF LAKES AND RIVERS IS SEVERELY IMPACTED IN DRY PERIODS BY INADEQUATE FLOWS/LEVELS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Reduce abstraction from Catchment to improve natural flows.	NRA. Abstractors.	Maintain improved flows and groundwater levels.	Cost. Limitation of resource to abstractors. Partial solution.
Augment flows in the system.	NRA. Abstractors.	Maintain flows in river system and provide source of water for neighbouring lakes.	Partial solution, only beneficial downstream of augmentation point and to neighbouring lakes.
Discourage lake construction in inappropriate locations.	NRA. Planning Authorities.	Minimises the number of lakes affected by drought conditions.	Reduced recreation/ conservation resource in some areas.
Accept poor reliability in dry periods.	Owners.	Minimal action.	Poor quality of use in dry periods. Public reaction. Cost of recreational loss eg. fish mortalities.

ISSUE 26

THE FREE PASSAGE OF EELS AND OTHER FISH IS LIMITED BY PHYSICAL BARRIERS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Install eels and/or fish passes at appropriate locations.	NRA.	Permit fish to move throughout river systems. Permit fish to complete life cycle.	Cost. Water resource requirement.
Reconstruct restricting structures.	NRA.	Permit fish to move throughout river systems. Permit fish to complete life cycle.	Costs would be excessive. Water resource demand.

ISSUE 27

THE MAINTENANCE, IMPROVEMENT AND DEVELOPMENT OF FISHERIES IN THIS CATCHMENT IS RESTRICTED BY INSUFFICIENT SURVEY DATA.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Incorporate Barrow Beck, East Halton Beck, Stalling-borough Beck, Oldfleet Drain and Buck Beck into the routine 3-year fisheries rolling programme.	NRA.	Considerable increase of fisheries knowledge in catchment.	Increased effort and cost on data collection.

ISSUE 28

THE CONSERVATION VALUE OF BARTON AND BARROW WETLAND SSSI'S IS AT RISK OF SERIOUS DEGRADATION DUE TO NATURAL SUCCESSION.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Undertake works identified by Humber Bank Reedbed Management Project.	English Nature. Landowners. Barton Clay Pits Group. Countryside Commission. RSPB. NRA.	Restore aquatic conservation value of SSSI.	Cost.

ISSUE 29

OPPORTUNITIES EXIST TO IMPROVE THE CONSERVATION VALUE OF THE ESTUARY.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN).

ISSUE 29 - Sub Issue 1

EMBANKMENT OF THE ESTUARY HAS LEAD TO THE LOSS OF COMPLEX WETLAND HABITATS SUCH AS SALTMARSHES.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Managed retreat to natural profile or new line of defence.	Landowner. NRA. MAFF. Countryside Commission. Government.	Restoration of wetland habitats. Full integration of salt to freshwater flora and fauna.	Cost. Limited number of viable sites. Full impact unknown. Effects on rural economy.
Managed creation of new habitats on landward side of bank on the back of capital and maintenance schemes eg. borrow pits, tidal storage/flushing reservoirs.	NRA. Landowner. MAFF. Countryside Commission.	Restoration of freshwater habitats. Increased integration of bird fauna.	Cost. Partial solution.
Maximisation of existing wetland habitats through joint projects eg. Barton Claypits.	NRA. English Nature. Landowners. County Trust. Local Authorities. Countryside Commission. RSPB.	Maintenance/enhancement of target species eg. bittern, bearded tit, etc. Development of management expertise.	Cost. Partial solution.
Encourage landowners to restore/create wetlands and grazing marshes on either side of embankments.	Landowners. NRA. MAFF. Countryside Commission.	Restoration of wetland habitats. Increased integration of bird fauna.	Cost. Partial solution.

ISSUE 29 - Sub Issue 2

OPPORTUNITIES EXIST TO IMPROVE THE HABITAT DIVERSITY OF COASTAL CORRIDORS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
New embankments or repair to existing structures to be a varying profile with less steep slopes.	NRA. Riparian Owners. District Councils. Crown Estates. MAFF.	Suitable for hay cropping. Increased environmental asset.	Cost.
Review the design and management of NRA banks.	NRA. MAFF.	Identify conservation improvements.	Cost.
Restore and enhance during maintenance or capital works.	NRA.	Increased environmental asset.	Cost.

ISSUE 30

SILT BUILD-UP IN HAVENS IN LOW FLOW PERIODS RESTRICTS ACCESS TO RECREATIONAL CRAFT AND INHIBITS LAND DRAINAGE AT EAST HALTON AND BARROW HAVENS.

(PART OF THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN).

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Creation of tidal storage/flushing lagoons to prevent silt build-up.	NRA. Recreational Interests. IDB's.	Increased salt/brackish wetland habitats. Maintenance/enhancement of target (rare) brackish species. Increased integration of bird, fish fauna between fresh and saltwater. Maintain natural estuarine channels. Improves recreational access.	Cost. Saline intrusion in present freshwater habitats. Potential saline intrusion into aquifer. On-going maintenance.
Dredging tidal channels.	NRA. ABP.	Short-term cost. Improves recreational access. Improved drainage.	Temporary solution. Access problems. Loss/disturbance to environment/habitat.
Re-align tidal channels with training walls.	NRA.	Speed flows to maintain silt free channel. Improved access for future dredging. Improved recreational access.	Cost. Loss/disturbance to environment/habitat. Will not maintain silt free channel in low flow conditions.
Pumped freshwater outfall to tide.	NRA.	Maintain adequate outfall. Improved recreational access.	Cost. Long term effects on Haven morphology and does not solve access for craft.
Relocate outfalls.	NRA.	Meets target.	Cost.
Increase flows by augmentation.	NRA.	Meets target.	Cost.
Reduce abstraction to increase flows.	NRA. Abstractors.	Meets target.	Impact on abstraction. Cost.

ISSUE 31

THE RECREATIONAL POTENTIAL OF THE ESTUARY IS NOT FULLY DEVELOPED.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN)

ISSUE 31 - Sub Issue 1

A CO-ORDINATED STRATEGY FOR THE DEVELOPMENT OF RECREATIONAL USES OF THE ESTUARY IS REQUIRED.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Study present and potential uses.	NRA. Local Authorities. Sports Council. English Nature.	Better understanding of present and future requirements.	Cost.

ISSUE 31 - Sub Issue 2

FOOTPATH ACCESS IS RESTRICTED ON SOME EMBANKMENTS PARTICULARLY TO DISABLED PERSONS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Provide better footpaths using small stone material.	NRA. Local Authorities. Sports Council.	Provide better access to all users.	Cost. May provide access for inappropriate users or to inappropriate places.
Provide better gate access.	NRA. Local Authorities. Sports Council.	Provide better access to all users.	Cost.
Provide car parks.	NRA. Local Authorities.	Provide better access to all users.	Cost.

ISSUE 31 - Sub Issue 3

POTENTIAL CONFLICTS EXIST BETWEEN RECREATIONAL ACTIVITIES AND OTHER USERS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Work with other interested parties to develop management strategies.	County Councils. Local Councils. NRA. Recreational organisations. English Nature.	Strategic approach. Reduce conflicts. Protect sensitive areas.	

ISSUE 32

INDUSTRIAL, URBAN AND AGRICULTURAL DEVELOPMENT MAY HAVE AN ADVERSE EFFECT ON THE WATER ENVIRONMENT FOR EXAMPLE, LOSS OF HUMBER WETLANDS AND SITES OF ARCHAEOLOGICAL IMPORTANCE.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN).

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
Work with other interested parties to create a co-ordinated land-use strategy.	Local Authorities. NRA. English Nature, etc. Landowners. Lincs Trust for Nature Conservation.	Maintain/enhance the water environment. Maintain bio-diversity. Protect important archaeological sites.	Cost/time.
Develop zonal restrictions.	NRA. Local Authorities. Landowners. Developers.	Strategic approach. Conserve and create wetlands. Conserve important archaeological site.	Restriction to some development.
Encourage landowners to create sanctuary areas eg. through Countryside Stewardship.	Landowners. NRA. English Nature. Countryside Commission. Local Authorities.	Reduced disturbance. Benefits to other flora and fauna.	Cost. Limitation on development.

ISSUE 33

THERE IS A NEED TO IMPROVE LIAISON WITH LOCAL PLANNING AUTHORITIES IN ORDER THAT NRA RECOMMENDATIONS ARE ADEQUATELY CONSIDERED IN THE PLANNING PROCESS.

(THIS ISSUE IS ALSO IDENTIFIED IN THE HUMBER ESTUARY PLAN).

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
To increase NRA influences in the planning process: a) by contributing to the formulation of National Planning Policy b) by seeking the inclusion of NRA policies into development plans c) by agreeing the inclusion of NRA comments in planning application decisions.	DoE. NRA. Local Planning Authorities.	Reduced planning and operational costs. Clear guidance for landowners and developers on acceptable uses of land. New development/ redevelopment would have regard to constraints aimed at conserving the water environment. Reduces chance of inappropriate use of land. New development/ redevelopment would have regard to constraints aimed at conserving the water environment. Reduces chance of inappropriate use of land.	
Encourage environmental enhancements as part of development/ redevelopment.	NRA. Developers.	New development/ re-development would have regard to constraints aimed at conserving the water environment.	

ISSUE 34

THE CUMULATIVE EFFECT OF PIECEMEAL DEVELOPMENT HAS AN ADVERSE EFFECT ON FLOOD DEFENCE, WATER QUALITY AND CONSERVATION INTERESTS.

OPTIONS	RESPONSIBILITY	ADVANTAGES	DISADVANTAGES
NRA to encourage local planning authorities to adopt strategic approach and fund infrastructure costs.	NRA. Local Planning Authority.	Strategic approach. Reduced risk to water environment. Lower overall infrastructure costs.	Cost to Local Planning Authority.
NRA to encourage local planning authorities to adopt strategic approach and require developers to fund infrastructure costs.	NRA. Local Planning Authority. Developers.	Strategic approach. Reduced risk to water environment. Lower overall infrastructure costs.	Cost to developers. Difficult to control funding/timing.
Allow piecemeal development to continue.	Local Planning Authority.		Adverse impacts.

7. GLOSSARY

Abstraction
Removing water from the ground or river usually by pumping.

Aquifer
Water bearing rock below ground level.

Armoured Bank
Flood defence constructed of earth/clay but strengthened with material such as stone, rock or cladding.

Artesian
Groundwater which reaches the surface under it's own pressure.

Attenuation
Method by which additional surface water run-off caused by development is constrained to a run-off equivalent to its previous rate.

Bilge
The bottom of a ship where dirty water collects.

Bio-diversity
Diversity of biological life.

Blow-Well
Pond/lake formed by artesian waters bubbling to the surface.

Borehole
Well sunk into a water bearing rock from which water will be pumped.

Breach
A failure of a sea or fluvial defence.

Controlled Waters
All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three miles from the shore.

Diffuse Pollution
Pollution from widespread activities with no one discrete source.

Ecology
The study of relationships between an organism and its environment.

Ecosystem
A system involving the interaction between a community and its environment.

Effluent
Liquid discharges from sewage treatment works/industry.

Enmain
Procedure in which the NRA assumes powers to maintain a watercourse.

Ephemeral
Seasonal, short lived.

Eutrophication
The process by which water becomes eutrophic ie. rich in nutrients, leading to algal blooms and oxygen imbalance.

Fauna
Animal Life.

Fish Biomass
A measure of the quality of a fishery as found in terms of surveys, weight by area ie. g/m^2.

Flora
Plant Life.

Fluvial
Relating to the river.

Foreshore
The part of the shore that lies between the limists of high and low tides.

Groundwater
Water which saturates a porous soil or rock substratum (or aquifer).

Highland Carrier
A watercourse carrying waters, which originate in upland areas, across low lying land before discharging to the sea, often embanked.

Holistic
Taking into account the whole rather than looking at individual parts.

House Equivalents
System by which areas of land and property are allocated a value in terms of number of houses.

Hydrogeology
The study of groundwater.

Hydrology
The study of water.

Hydrometric
The measurement of water.

Minimum Acceptable Flow (MAF)
These flows have a legal status as referred to in Sections 21 and 22 of the Water Resources Act 1991. (No Minimum Acceptable Flows have been set in this country).

Minimum Residual Flow (MRF)/Minimum Control Level (MCL)
This flow is similar in concept to Minimum Acceptable Flow but does not have the legal status. These flows are often used as control flows attached to conditions in abstraction licences. Minimum Control Levels are also used in abstraction licences.

Morphology
The form of the structure of plants and animals.

Nitrate Sensitive Area (NSA)
An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding, the limit of 50mg/l laid down in the 1980 EC Drinking Water Directive and where voluntary, compensated agricultural measures have been introduced as a means of reducing those levels.

Nitrate Vulnerable Zone (NVZ)
An area where nitrate levels exceed, or are likely to exceed, the EC limit of 50mg/l must be designated as an NVZ and made subject to mandatory measures.

Outfall
The point at which a river discharges to the sea/estuary, it may also include an outfall structure to prevent sea waters backing up the system.

Perennial Stream
A stream which lasts through the year.

Permeable
That which water can pass through.

Permissive Power
Power to undertake works where there is no obligation to do such.

Potable
Water of suitable quality for drinking.

Public Water Supply (PWS)
Water supplied by the water undertaker (Anglian Water Services for this catchment).

Q95
The 95 percentile riverflow, a very low river flow; ie. that flow that is exceeded 95% of the time.

RAMSAR - Wetland Site of International Importance

Recharge
Water which percolates downward from the surface into groundwater.

Return Period
Refers to the return period of a flood. Flood events are described in terms of the frequency at which, on average, a certain severity of flood is exceeded. This frequency is usually expressed as a return period in years eg. 1 in 50 years.

River Corridor
Area of land adjacent to the river channel and within the flood plain.

River Flow Objective (RFO)
This is a concept being developed for flows based on in river needs and seeks to define minimum acceptable flow regimes. It aims to get away from the single minimum flow concept and move to a target flow regime (or RFO) (ie. specifying targets for the frequency with which each threshold flow should occur). Work is in the initial stages of research and development and the NRA intends to move towards policy formulation in this area.

Riparian Owner
A person/organisation with property rights on a river bank or sea defence.

Saline water
Water containing salts.

Salmonid
Game fish, eg. trout and salmon.

Saltmarsh
An area of marsh which is intermittently inundated with salt water.

Site of Special Scientific Interest (SSSI)

Source Protection Zones (SPZs)
Source Protection Zones are designed to protect potable water supplies against the effects of human activity.

Surface water
Water collecting on an running off the surface of the ground (rivers and lakes).

Sustainable Development
"That which meets the needs of the present without compromising the ability of future generations to meet their own needs".

Telemetry
The telephone system which allows the collating of rainfall, riverflow and tidal data from outstations at a central point.

Thousand Cubic Metres Per Annum (TCMA)

Thousand Cubic Metres Per Day (TCMD)

Water Resources
Water available in aquifers and rivers/streams which could be abstracted for use by others.

Water Transfer Scheme
An infrastructure provided to transfer water from one river system to another.

Weir
A dam built across a river to raise upstream levels.

Wetland
An area of swampy or marshy land considered as part of an ecological system.

Winter Storage Reservoir
Reservoirs built by farmers to store water during the winter months when it is "plentiful" for re-use during the summer.

50mg/l (Milligrams per litre)

8.0 APPENDIX 1 - CATCHMENT USES

8.1 WATER RESOURCES

8.1.1 Potable Water Supply - Surface Water

General

Water may be abstracted for use from surface water sources, ie rivers and springs, for domestic water supply purposes (ie drinking, washing etc). Surface water is a key source of water for public water supplies and industry in general.

Local Perspective

There are no surface water abstractions for public water supply **within** the catchment, but water supplied for domestic and industrial use which is derived from surface waters, is a significant use within the catchment.

Water is imported from two surface water sources outside of the catchment:

i) surface water abstracted from the Louth Canal and stored in Covenham reservoir;
ii) surface water abstracted from the River Ancholme at Cadney. The River Ancholme is a river supported by river water transfers via the NRA's Trent-Witham-Ancholme transfer scheme.

The water supply system operated by Anglian Water Services Ltd can be flexibly operated to vary the quantities of surface water put into supply from the external surface waters and the groundwaters from within the catchment.

The approximate locations of the two surface water imports to the catchment are shown by arrows on Map 21.

8.1.2 Potable Water Supply - Groundwater

General

Water is abstracted from groundwater sources (boreholes) for domestic water supply purposes (ie drinking, washing etc). Groundwater is the major source of water for public water supplies abstracted in the catchment. All such abstractions are controlled by abstraction licences issued by the NRA.

Local Perspective

There are 12 groundwater sources licensed for public water supply use in the catchment. Water is abstracted from boreholes in the local Chalk aquifer. It is of high quality and generally requires little treatment. This water is used primarily to meet domestic demand within the catchment but also meets some industrial demand. Water abstracted from the sources at Barrow, Barton, Goxhill, Ulceby and Thornton in part supplies the Scunthorpe area to the west.

The total licensed abstraction for public water supply use is 47,360 tcma. The 12 sources licensed for public water supply account for 75% of the total quantity of water licensed for all uses in the catchment. In 1993 abstraction for this use was approximately 80% of the licensed quantity and accounted for 78% of all abstraction in the catchment.

The locations of all public water supply abstractions are shown on Map 21.

8.1.3 **Industrial Abstraction**

General

Water is abstracted from groundwater sources for industrial purposes. All such abstractions are controlled by abstraction licences issued by the NRA.

Local Perspective

There are 18 groundwater sources licensed for industrial use in the catchment accounting for 21% of the total licensed abstraction. The water is used for industrial processes, chemical works and food processing.

Many of the industrial users on the Humber Bank have two sources of water for use; direct abstraction from the Chalk aquifer and water supplies from Anglian Water Services Ltd, which may be derived from groundwater sources, Covenham reservoir and/or the River Ancholme via Elsham treatment works. (In some cases Anglian Water Services Ltd may supply a blend of surface and groundwater to industry.)

The total licensed abstraction for industrial use in the catchment is 13,731 tcma (four of the 18 licences accounting for 75% of the industrial licensed quantity). In 1993 water abstraction from the Chalk was just in excess of 10,000 tcma. Total industrial water use on the Humber Bank is greater than this amount owing

to the quantities supplied direct to industry from Anglian Water Services Ltd.

The locations of all industrial abstractions are shown on Map 21.

8.1.4 **Agricultural Abstraction and Livestock Watering**

General

Water is abstracted from ground and surface waters for agricultural use including spray irrigation and general agricultural use (stock watering, crop spraying etc). All uses, except general agricultural abstractions of less than 20 cubic metres per day from surface waters, require a licence.

The total agricultural abstraction is < 1% of all licensed water abstraction in the catchment.

Local Perspective.

General Agriculture:

There are 70 licensed groundwater abstractions for this purpose in the catchment, totalling 147 tcma. Abstraction in 1993 was only 5 tcma.

Spray Irrigation:

There are only 13 licences for this use in the catchment, totalling 673 tcma. The majority of these licences are from the Chalk aquifer. Abstraction in 1993 totalled 241 tcma.

The locations of all agricultural abstractions are shown on Map 21.

Livestock Watering:

The majority of streams and drains in the catchment have a potential to be used for livestock watering. For those watercourses which are monitored for their quality and which have this identified use, water quality objectives under development will provide standards to protect their use.

8.2 WATER QUALITY

8.2.1 Industrial Discharges

General

Trade effluents from industrial areas and principal towns are usually treated at STWs operated by Anglian Water Services Ltd. However a number of major trade effluent discharges are made, after treatment, to controlled waters.

The conditions which must be complied with by those discharging effluent to controlled waters are specified in consents issued by the NRA. Consents are calculated taking into account upstream water quality and dilution available in 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.

Local Perspective

Within the Catchment there are 32 industrial discharges, 18 of which are to tidal waters. The major industrial dischargers are as follows:-

Tioxide U.K. Ltd, Pyewipe
Courtaulds, Pyewipe
SCM Chemicals Ltd, Stallingborough
Hydro Fertilisers, Immingham
Conoco Oil Refinery, Killingholme
Lindsey Oil Refinery, Killingholme

Surface water run off from industrial areas can have a significant impact on water quality.

Map 22 shows the location of industrial discharge sources which are located in or discharge to the catchment.

8.2.2 Sewage Treatment Works

General

One of the most significant uses of watercourses is as a conduit of sewage effluent.

The NRA issues consents to those wishing to discharge such effluent to controlled waters. These consents specify the conditions dischargers must comply with in terms of quality and quantity. Consents are calculated taking into account upstream water quality and dilution available in 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.

Local Perspective

There are 14 Sewage Treatment Works operated by Anglian Water Services Ltd (3 of which discharge to tidal waters) and 13 private ones located within the catchment.

The location of Anglian Water and other private sewage treatment works in the catchment are shown on Map 23.

8.2.3 Groundwater Protection

General

Groundwater is the principle water resource within the catchment. It is vital that its quality is protected. It is very difficult, and often impossible to clean up groundwaters once they have become polluted.

The NRA has developed a Policy for the Protection of Groundwater which provides guidance to developers, planners and industrialists on which activities pose risks of pollution and what safeguards and restrictions are necessary. Under this policy, areas of protection zones around potable groundwater sources and the most vulnerable areas of the Chalk aquifer to pollution have been identified.

In addition to specific Source Protection Zones, which protect the Chalk from general pollution, two pollutant specific protection zones are being established to address high nitrate concentrations. In part of the aquifer a Nitrate Sensitive Area was designated in the Catchment in 1994 and a number of areas to be designated Nitrate Vulnerable Zones are currently being defined.

Local Perspective

Within the catchment there are a number of risks to groundwater quality including landfill sites, contaminated land, pipelines, roads and storage of hazardous materials.

The NRA has developed a Groundwater Protection Policy which defines those developments which, in specific areas, pose an unacceptable risk of groundwater pollution.

The policy defines the vulnerability of the Chalk aquifer and defines areas to be specifically protected around potable sources. In this way the policy's two main concepts; resource protection (groundwater in general) and source protection (around potable sources) are defined.

The vulnerability of the groundwater resource depends on a number of physical circumstances including nature of the strata, nature of the overlying soil and the depth of the unsaturated zone. **A generalised map of groundwater vulnerability in the Grimsby catchment is shown on Map 24.**

There are 12 groundwater sources used for Public Water Supply in the catchment and under the Groundwater Protection Policy there are three source protection zones:

Zone 1 - Immediately adjacent to the source and including up to 50 days travel time (to protect from biological contaminants).

Zone 2 - A zone extending out to 400 days travel time (to protect from slowly degrading pollutants).

Zone 3 - The total catchment area of a source.

The location of these zones in the Grimsby catchment are shown on Map 25.

Within the catchment two other types of "protection zone" have been defined to deal with the levels of nitrate in groundwater arising principally from agricultural sources:

i) Nitrate Sensitive Areas (NSA's)

These are managed by MAFF and are designated under the Water Resources Act. The Wolds NSA was designated in 1993 and includes the groundwater catchments of the potable groundwater sources at Habrough, Little London and Healing. Within the area a variety of restrictions apply on nitrate loadings and timing.

ii) Nitrate Vulnerable Zones (NVZ's)

These zones are to be established by MAFF under the EC Nitrate Directive to protect potable source catchment areas. Within the zones, nitrate applications will, when the zones are introduced in 1995, have to comply with a Code of Good Agricultural Practice.

The location of NSA's and NVZ's in the Grimsby catchment are shown on Map 10.

Connection between the Chalk aquifer and the Humber Estuary in the Grimsby area leads to the movement of saline water into the aquifer. This salinity affects a number of industrial water abstractions close to the Pyewipe coast. The degree of saline intrusion is related to the balance between groundwater abstraction and aquifer recharge and the NRA seeks reductions in abstraction by industrial and public supply abstractors to protect the aquifer from more widespread saline contamination. The NRA uses a specifically developed computer model to plan the level of acceptable abstraction.

8.2.4 **Landfill Sites and Contaminated Land**

General

The disposal of waste materials commonly involves the use of landfill sites by waste operators. Where waste is disposed of in this manner, there is a risk of polluting materials escaping and contaminating groundwater and surface waters.

Before a Waste Management Licence can be issued under the Environmental Protection Act (Part II) a valid planning permission is required unless the site is exempt.

A Waste Management Licence regulates the operational phase of any site, and also the post closure phase. Surrender of the site is only permissable when the site no longer poses a risk of pollution.

The NRA is a statutory consultee on waste disposal matters to Humberside County Council, the main Waste Regulatory Authority for this catchment. The NRA is also a consultee of Planning Authorities under the Town & County Planning Act.

A wide range of waste disposal operations require a Waste Management Licence including scrap yards, transfer stations, incinerators, waste storage etc. In

recognition of the particular need to protect groundwater resources the NRA's Groundwater Protection Policy seeks to guide planners, developers and industrialists on how to dispose of wastes without placing groundwater resources at risk.

Local Perspective

There are 53 landfill sites within the catchment that accept waste with the potential to generate leachate capable of causing pollution. There are 37 others that take inert material only. **The location of these sites in shown on Map 26.**

New landfill sites taking leachate generating wastes are constructed as engineered containment sites, using either natural or artificial liners. Effective leachate management is necessary to ensure the pollution risks associated with landfilling are minimised. To accomplish this, landfill sites are filled in phases exposing the minimum amount of waste to rainfall; liquid waste inputs are strictly controlled and leachate depth is regulated. When landfilling has been completed, the site is capped with engineered low permeability material to prevent further infiltration of rain water.

In the past, landfilling has been carried out in unlined sites. Such sites, where leachate migration may pose a threat to surface waters and groundwaters, are identified and appropriate action taken.

The landfill sites in the catchment are principally located in the coastal strip where although the vulnerability of the Chalk remains high, there is a protective layer of clay. Only a small number of sites exist on the more vulnerable outcrop areas.

8.2.5 Diffuse Sources

General

Water quality problems are sometimes caused by pollutants being discharged to watercourses or groundwater over a wide area, as a consequence of land use eg. farming.

Excessive nutrient concentrations in watercourses, nitrates and phosphates, can sometimes lead to a condition known as "Eutrophication". The algal population in a watercourse becomes dominant and the natural balance of water quality is destroyed.

Nitrates and pesticides, including herbicides and biocides, can also become diffuse pollutants. They sometimes remain active in the environment for long periods of time, and are gradually washed into our groundwater and river systems, where they may cause exceedence of water quality standards.

Local Perspective

A large part of the Grimsby Catchment overlays the Chalk aquifer, a water resource of strategic importance to the area. Particular attention must be given to farming to avoid diffuse source pollution. Guidelines such as the Code of Good Agricultural Practice issued by MAFF must be followed, for example, to avoid over application of nitrate based fertilizers. For areas with elevated nitrate concentrations, designation as a Nitrate Vulnerable Zone or a Nitrate Sensitive Area aims to limit the level of nitrate leaching from agricultural activities.

Controlling diffuse source pollution may require long-term strategies for change in land use and development.

Diffuse pollution risks within the catchment principally relate to the application of nitrate and pesticides to the agricultural area of the Wolds.

Nitrate applications principally from agricultural activity on the Wolds has led to increased nitrate concentrations in Chalk groundwaters in some areas. Protection zones are being set-up to limit future nitrate applications in particularly sensitive or vulnerable areas (see Section 2.3.2).

There is increasing concern over the concentrations of pesticides present in groundwaters at some water sources.

Wherever necessary, potable waters are treated to ensure nitrate and pesticide levels do not exceed set drinking water standards.

8.2.6 **Mineral Extraction**

General

Mineral extraction can affect both water quality and water quantity. It can restrict recharge to an aquifer and divert groundwater flow. Purification of groundwater which occurs as water percolates through the unsaturated aquifer cannot occur if it has been removed by quarrying. Subsequent use of mineral extraction sites for landfill can pose significant risk to water quality.

Local Perspective

There is currently only a limited amount of mineral extraction in the catchment. Historically there have been a number of Chalk quarries and clay extraction operations. A number of open quarries and clay pits (several are flooded) remain.

8.3 FLOOD DEFENCE

General

This use deals with the provision of effective defence for people and property against flooding from rivers and the sea. Normally, flooding is a result of extreme climatic conditions, such as high winds or very heavy rainfall.

The level of flood defence constructed will depend on the type of land being protected and whether it is being protected from tidal or fluvial flooding. Urban flood defences are usually built to a higher standard than those for agricultural land.

Responsibility for the maintenance of flow in watercourses normally rests, in the first instance, with the riparian landowner, however, under the Water Resources Act 1991, the NRA exercises a general supervision over all matters relating to flood defence in England and Wales and has powers to control obstructive works on any watercourse. Internal Drainage Boards have similar powers for watercourses, within their areas.

Main arterial watercourses are formally designated as the "Statutory Main River". On the main rivers, the NRA has special powers to carry out works or 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.

The nature of works carried out for flood defence sometimes conflicts with other catchment uses, for example proposed improvement works to tidal defences may encroach upon valuable wildlife habitat. The NRA seeks to reduce such conflicts and prior consultation with other users seeks to ensure that such works are executed without detriment to the environment and that where possible environmental enhancements are made when carrying out flood defence works.

Local Perspective

The catchment is bounded to the north and east by the Humber Estuary and to the west and south by the ridge formed by the Lincolnshire Wolds. A coastal plain of low lying land approximately 3km wide lies between the Wolds and the Estuary.

Tidal Defences:

Map 4 highlights the area of land below normal high tide levels and also identifies that area of land which was inundated by the flood of 1953.

The towns of Grimsby, Cleethorpes and Immingham are located within this low lying area of land along with a concentration of high value industrial land immediately behind the Humber Bank between Grimsby and North Killingholme. Obviously the maintenance of tidal defences is vitally important to the region.

Land Drainage:

Land drainage systems facilitate the discharge of surface water to the sea and minimise water logging problems of low lying land. They also provide land and property owners with protection against fluvial flooding.

The drainage system for this catchment consists of a number of natural watercourses carrying highland waters from the wolds across the coastal plain before discharging to the Estuary, the larger of which are maintained by the NRA. There is also a "secondary" system of largely artificial drainage channels administered and maintained by local Internal Drainage Boards. Many of these waters require pumping facilities for their ultimate discharge to the Estuary.

NRA and IDB maintained watercourses are shown on Map 27.

Flood Warning:

The NRA provides information and advice to the County police forces for the purpose of giving them warnings of areas likely to be affected by flooding for both tidal and fluvial events.

Fluvial events within the catchment can develop quickly and are substantially affected by the coincidence or otherwise of the peak flow and high tide; tidal events by contrast develop more slowly. The NRA provide the police with warnings based on a colour phase system which indicates the likelihood and severity of a particular event.

8.4 FISHERIES, RECREATION AND CONSERVATION

8.4.1 Fisheries

General

The NRA has a duty to maintain, improve and develop fisheries and to further the conservation of fish species. Fish populations are affected by the quality and quantity of water as well as by the availability of suitable physical habitat features. Fish are, therefore, important indicators of the overall health of the river.

This use covers both coarse and non-migratory trout fisheries.

Local Perspective

All the rivers in this catchment contain coarse fish populations. Breeding trout populations have been recorded in the Laceby Beck and anecdotal evidence indicates that other smaller river headwaters eg. Brocklesby Beck could also support trout populations.

The NRA normally aims to undertake fish population surveys on major rivers on a 3 year rolling programme. Within this catchment, surveys are conducted only on the River Freshney and Laceby Beck. Data has been collected on this system on 3 occasions; 1983, 1986 and 1992, and this has been used to calculate 2 fisheries classification systems.

Traditionally, fisheries classification has been based purely on fish biomass, this survey method has now been extended to include physical river features, namely width and gradient. The rivers are now graded on an A to E scale for both biomass and species richness.

Maps 12 and 13 show classes for fish biomass and species richness respectively, based on 1986 and 1992 survey data.

The Laceby Beck and River Freshney both sustain a poor fish biomass (Grade C/D), and low species diversity. The results of these surveys reflect the effect of low river flow conditions and the effects of the prolonged drought on the rivers and the fact that the NRA had to rescue fish from this system during the drought. Historically, the Laceby Beck has contained a trout population, however, the drought also appears to have had a significant impact on this species as no trout were recorded in that 1992 survey. Carp now inhabit the River Freshney

probably having escaped from adjacent still waters or having been introduced illegally. The NRA have started to restock the River Freshney following the drought.

There is no fisheries survey data for other watercourses in the catchment.

During dry/drought periods the sea doors at the lower end of the watercourses in the catchment are sealed to retain river levels. It is likely that this is affecting elver movement and eel populations.

8.4.2 Recreation and Amenity

General

This use deals with all recreational activities associated with the water environment. The NRA has a duty to generally promote the use of inland and coastal waters, and land associated with them for the purpose of recreation.

Local Perspective

The water environment in the catchment is extensively used for recreational purposes, including angling, sailing, immersion sports and general recreational and amenity access for walking and relaxation. Organised wildfowling takes place along the Estuary with a number of clubs, including the Barton and Barrow and Saltfleet on Skidbrook Wildfowlers Associations, being active.

The Humber Estuary and adjacent areas represent a significant recreational asset to the catchment. Specific locations such as Cleethorpes Beach, the Humber Country Park and the Humber Bridge, attract significant numbers of visitors. The River Freshney is an important recreational and amenity asset for the major urban area of Grimsby.

There are several lakes in the catchment, many used for angling, where amenity, recreation and conservation value are seriously affected by dry/drought periods.

Public Access:

Many people live adjacent to watercourses and sea defences in the catchment and many more come to visit to undertake general recreational activities. The visual appearance and colour of waters is therefore of importance to these users. The significance of the amenity value may range from high amenity, eg a watercourse passing through an area often frequented by the public, to a low amenity

watercourse passing through remote inaccessible countryside.

Many river banks in the catchment have access available to the general public and a series of footpaths exist along the Humber Bank. It is not possible to walk the full length adjacent to the Estuary as in some places no access exists on the frontage, eg Immingham Dock. The Viking Way starts its 130km journey to Oakham from the Barton Clay Pit Centre. The Way skirts along the western edge of the catchment. Some access is available on parts of some rivers, eg the Freshney Parkway Scheme, and the Lower Buck Beck (which links in with the Humber Footpath).

Angling:

Angling for coarse fish occurs throughout the catchment on rivers and lakes. The River Freshney is probably the most important river in the catchment from an angling point of view, Map 5 shows that fishing is controlled on stretches of this water by the Grimsby Borough Council and by the Witham and District Joint Anglers Federation.

Throughout the catchment access is limited and consequently angling tends to be concentrated around bridges and other access points where car parking is available.

Coarse fishing on lakes is popular, particularly in the Barton Clay Pit Complex, but other waters exist and are being developed throughout the catchment.

Sea angling and beach casting take place on the coast around Grimsby and between Cleethorpes and East Halton. Competition fishing takes place during many weekends throughout the year with approximately 80 - 90 anglers taking part.

Immersion Sports:

Immersion sports is the term used to describe sports where contact with water occurs and includes swimming, canoeing, sailing, wind surfing, water skiing, etc.

The NRA discourages swimming in all rivers, primarily because of the risk of drowning, but also because of the possibility of contracting water borne diseases. It also recommends that those involved in any watersport which results in contact with the water, take sensible precautions to avoid such diseases.

The Barton Clay Pits Complex has, within its boundary, the Humberside Outdoors Pursuits Centre, which caters for, and can provide instructions in, sailing, canoeing, wind surfing and other watersports. The North Lincolnshire and South Humberside Sailing Club caters for sailing and windsurfing and also gives instructions as required. Water Skiing occurs at 2 sites in the Clay Pits, namely at the Humber Bridge Water Ski Club and New Holland Mere.

This catchment also provides marinas, particularly at Grimsby, but also at Humberston for sailing, motor boats, etc, in the Humber.

Key recreation and amenity features are shown on Map 6.

8.4.3 Conservation - Ecology

General

The NRA has a statutory duty when exercising all its functions to further the conservation of flora and fauna. This includes wildlife such as otters, kingfishers, may-flies and water violets, which are truly dependent upon the river for their existence, and those species which simply exploit the river corridor. In formulating its own proposals or considering proposals from other parties, the NRA must take into account:-

- The protection of areas formally designated as being of particularly high conservation value, eg RAMSAR sites, Special Protection Areas (SPA), Environmentally Sensitive Areas (ESA), National Nature Reserves (NNR) and Sites of Special Scientific Interest (SSSI).

- The protection of those sites which, although valuable in ecological terms, are not formally protected, eg. County Trust Nature Reserves and Sites of Nature Conservation Interest (SNCI).

- Consultations with outside organisations where NRA work or consent is likely to impact on the sites above.

The Government through the Countryside Commission is now encouraging farmers to combine their commercial farming practises with conservation awareness. The scheme called Countryside Stewardship allows farmers financial compensation for returning land to a more natural state - such as watermeadows. This has obvious environmental benefits and in some instances flood defence

benefits for the NRA.

Local Perspective

The NRA has undertaken River Corridor Surveys on main river watercourses to establish the degree of plant, bird and habitat diversity. The diversity of flora and habitat gives an indication of the overall health of the water environment.

Plant diversity in the river channels, river corridors and along the tidal defences are shown on Maps 14 and 15 respectively.

Man's influence on the river systems in this catchment has resulted in a limited variety of "in-channel" habitat and aquatic plant diversity. Around 90% of the rivers in the catchment have a low species diversity, having less than 10 aquatic plant species per 500m length. A number of influences including canalization, low river flows/levels, water quality and saline influence are likely to have brought about this situation. River corridor diversity in the catchment is average with around 90% of lengths surveyed having 51 - 89 species per 500m length surveyed. River banks in many areas are dominated by plants most often associated with disturbed ground such as nettle, thistle and rough grasses.

Surveys along the Humber Estuary tidal defences indicate that species diversity is limited by "hard" defences and mowing regimes which leave cuttings to choke less vigorous plants. However, along some 85% of the defence plant diversity is above average. Areas associated with saltmarshes (8% of surveyed stretches) have a high species diversity of over 90 species per 500m length.

Development changes in the coastal plain, and the associated tidal defences and drainage system have resulted in the loss of a number of wetland habitats. The principal wetland areas in the catchment are:

i) The Humber Flats and Marshes RAMSAR/SPA sites. The mudflats are rich in invertebrates and support internationally important colonies of waders and wildfowl and nationally important colonies of Scaup, Grey Plover, Redshank, Dunlin and Curlew.

ii) Abandoned clay pits which lie along the landward side of the Humber from North Killingholme to Ferriby. An extensive complex at Barrow and Barton supports large stands of reedbeds with a diversity of warblers and the Wainscot moths. These areas are at risk of losing their specialised flora and fauna as a result of natural succession changes.

In total there is 1 RAMSAR/SPA sites and 7 distinct SSSI's in the catchment. Additionally there are 10 Nature Reserves and 10 Sites of Nature Conservation Importance. **These sites are shown on Maps 6 and 28.**

8.4.4 **Conservation - Archaeology/Heritage**

General

The landscape of Britain contains a rich heritage of historic and archaeological features. These can vary from megalithic monuments, Roman remains, castles, deserted villages, ecclesiastical buildings, great halls and bridges down to single coins and flints. Some sites protected or managed for their historic interest are also valuable for wildlife and as a result can form important habitats. Archaeologically, rivers, lakes, and alluvium-covered areas are important because of the types of site preserved, and the possibility of anaerobic conditions permitting the preservation of organic materials. Of all landscape environments, rivers, lakes and alluvium spreads are possibly the least well documented archaeologically, probably because, until disturbed, remains preserved in these areas are among the best protected in the country.

The NRA has a duty to have regard to features of archaeological and historic interest during all aspects of NRA work under the Water Resources Act 1991. However, the principal legislation affecting ancient monuments in England is contained in the Ancient Monuments and Archaeological Areas Act 1979, which was subsequently amended by the National Heritage Act 1983. The Secretary of State is required to compile and maintain a schedule of monuments to which statutory protection is afforded.

Historic landscapes within the catchment are designated by English Heritage, whilst Scheduled Ancient Monuments (SAM's) are designated by the Department of National Heritage on advice from English Heritage. Other historical and archaeological sites may fall within areas designated as Environmentally Sensitive Areas by MAFF or be covered by the Countryside Stewardship agreement with the Countryside Commission.

Local Perspective

All County Councils in the area maintain a detailed list of known archaeological sites, the Sites and Monuments Record, and these are updated as fresh information is made available as a result of new excavation and survey work. The NRA recognises the County Sites and Monuments Record as the primary source of archaeological information and advice and will consult them as a matter

of course regarding such data.

Any new designations will be notified to the NRA who will ensure accurate, up to date listings are maintained.

There are 15 Scheduled Ancient Monuments in the catchment which are of national importance. **The locations of these sites are shown on Map 6.**

In addition, numerous non-statutory sites exist which have been identified as valuable or potentially valuable.

The NRA aims to improve links with county archaeologists and other appropriate organisations. Wherever possible, the NRA will continue to seek to protect sites associated with watercourses from direct damage and from drying out. At present, legislation often only protects the monument itself or a specific building, in future, sites may well include adjacent land in context with the scheduled monument. This will have implications for the NRA where a site is adjacent or close to a watercourse.

8.5 LAND USE/DEVELOPMENT

Land Use:

A high proportion of the land, in the order of 83%, is used for agricultural purposes, the remainder being urban and industrial. **Map 16 shows a land use classification for the catchment.**

Data supplied by MAFF (1993 Base) indicate 75% of agricultural land use is set to crops or fallow, 10% is grassland and 10% has been set aside. There is a trend away from crops and grassland as set-aside has been taken up. The 1994 target for set-aside being 15%. Animal husbandry trends indicate a decline in the number of sheep, cattle and poultry being farmed and an increase in the number of pigs.

MAFF are promoting several policies towards improving the water environment such as Countryside Stewardship, the Code of Good Agricultural Practise for the Protection of Water, and defining Nitrate Sensitive Areas (to help protect groundwater sources used to supply drinking water). There are also other EC initiatives relating to Nitrate Vulnerable Zones.

Development:

The catchment is situated within the administrative boundaries of Humberside and Lincolnshire County Councils, Cleethorpes, Great Grimsby and Glanford Borough Councils and West and East Lindsey District Councils. **The location of administrative boundaries is shown on Map 7.**

A feature of this catchment is the high growth it has seen over the past 25 years, particularly the development of the "Humber Bank Industries", such as petro-chemical and power generating businesses and the expansion of ports and wharfs between Killingholme and Immingham.

The Humber Estuary itself is the third largest shipping complex in Britain, and the availability of large flat areas adjacent to the deep water navigation and the proximity of water for abstraction and effluent disposal gives this area of Humber Bank significant potential for further expansion. An area of some 1,400 hectares has been identified in the Structure Plan for this catchment for Estuary area development. Statistics taken from Humberside County Council's Structure Plan suggest the population of Cleethorpes Borough and Grimsby Borough Councils is likely to grow by area 1.6% by the year 2011.

The catchment is served by an improving road network which serves both urban areas and docks and wharfs. There is a mainline railway link to the south and north via Lincoln and Doncaster.

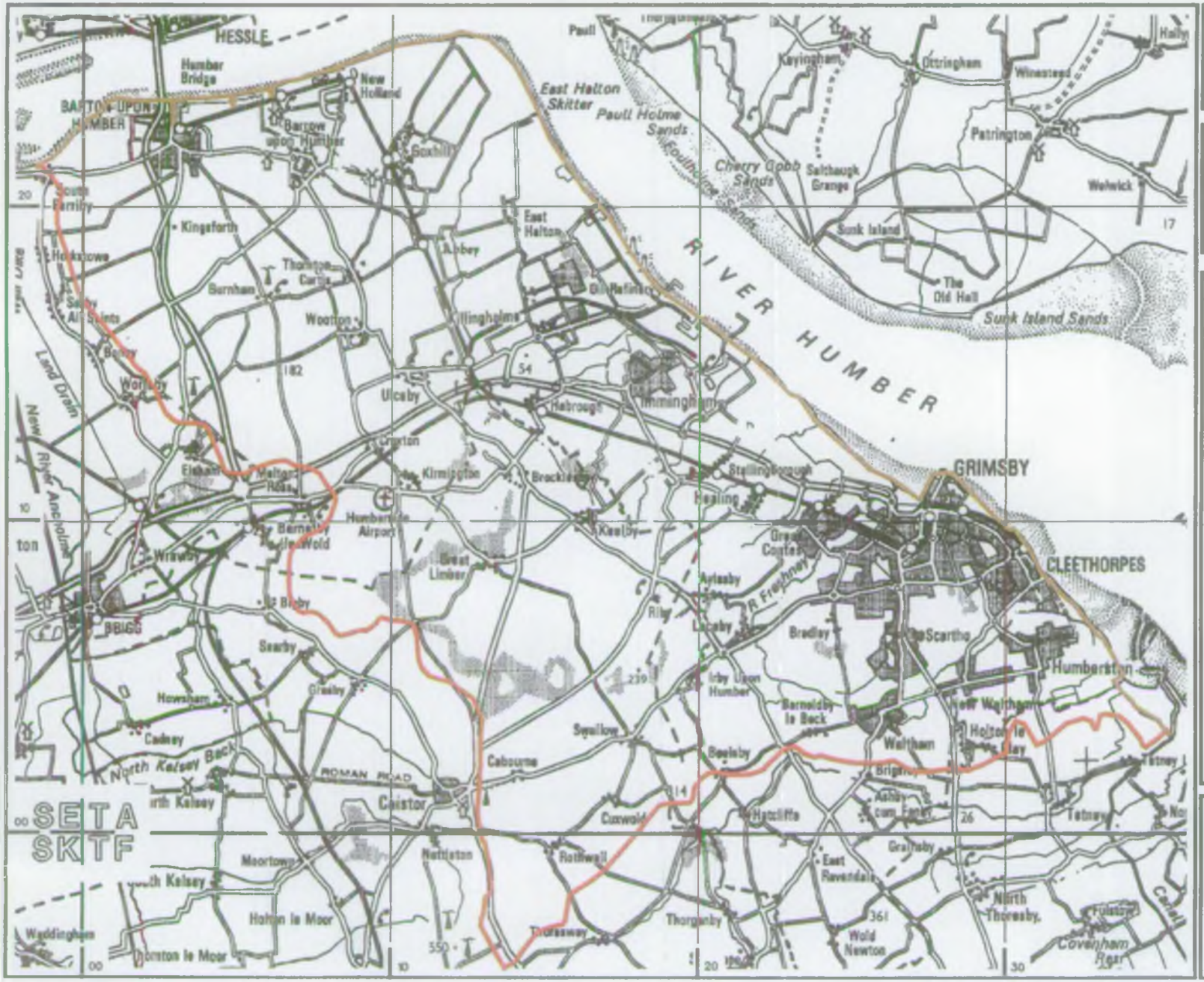
Humberside airport provides convenient links to Europe and has extended its runway facilitating the use of larger aircraft.

The general infrastructure in the catchment is shown on Map 29.

APPENDIX 2 - MAPS

Map No.

1	The Grimsby Catchment
2	Water Resources Overview
3	Water Quality Overview
4	Flood Defence Overview
5	Fisheries and Recreation Overview
6	Conservation Overview
7	Development Overview
8	Water Resources Status
9	River Ecosystem Classes
10	Groundwater (Source/Nitrate Protection Zones)
11	Existing Standards of Flood Protection
12	Fish Biomass Index
13	Fisheries - Habitat Zone and Species Richness
14	River Channel Aquatic Plant Diversities
15	Plant Diversity along River Corridors and Tidal Defences
16	Land Use Classification
17	Water Resource Shortfalls
18	Water Quality Shortfalls
19	Flood Defence Shortfalls
20	Fisheries and Conservation Shortfalls
21	Water Resources Catchment Uses
22	Industrial Discharge Sources
23	Sewage Treatment Works
24	Groundwater Vulnerability
25	Source Protection Zones
26	Landfill Sites
27	Main River and Internal Drainage Board Districts
28	SNCI and Nature Reserves
29	Infrastructure



GRIMSBY
CATCHMENT MANAGEMENT PLAN
MAP NUMBER 1
NOV 1994

THE GRIMSBY CATCHMENT

KEY
- Catchment Boundary
- Tidal Defences

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Northern Area
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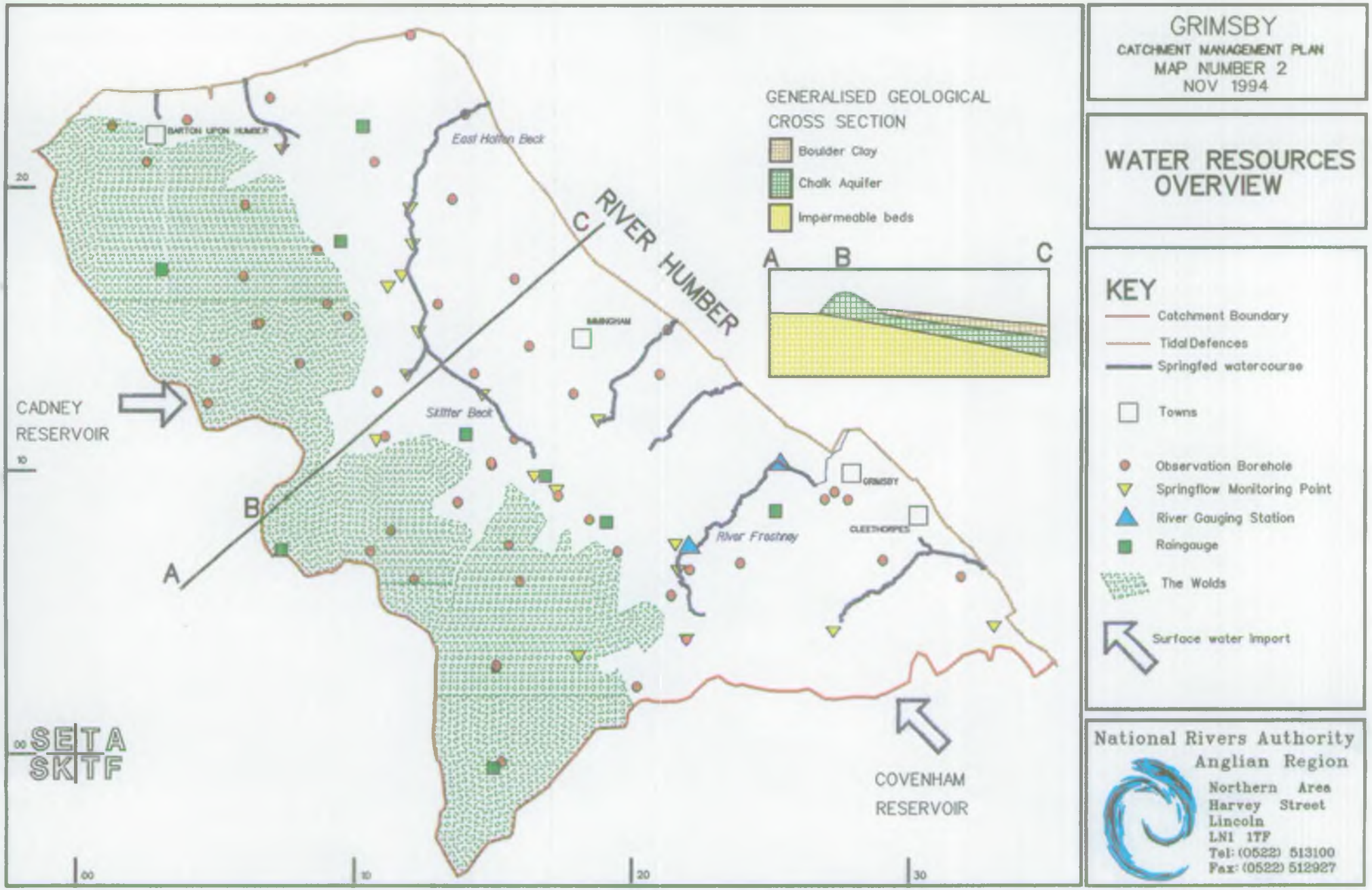
Fax: (0522) 512927

MAP NUMBER 1



GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 2

NOV 1994

WATER RESOURCES OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences
- Springfed watercourse
- Towns
- Observation Borehole
- Springflow Monitoring Point
- River Gauging Station
- Raingauge
- The Wolds
- Surface water import

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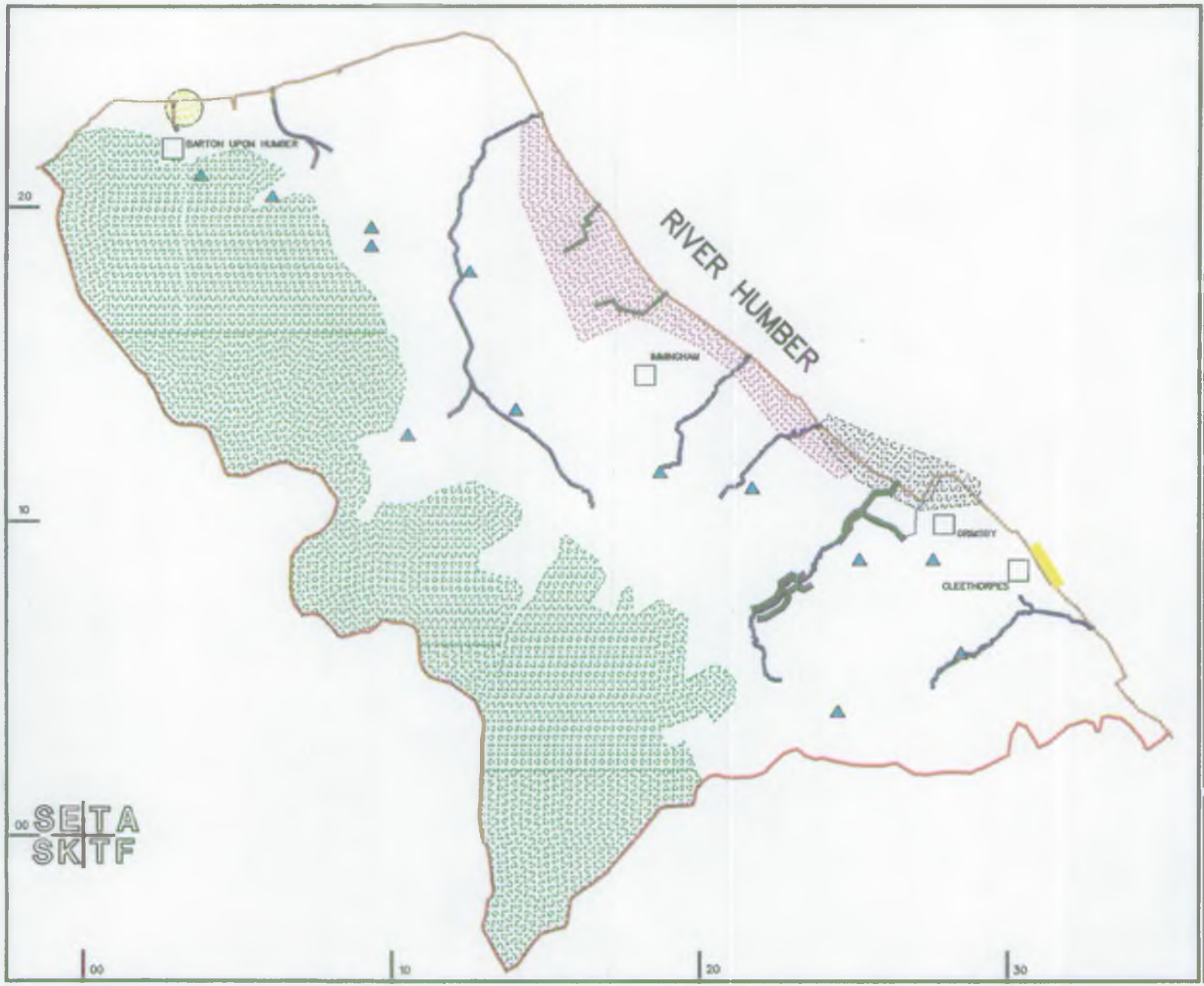
MAP NUMBER 2



GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 3

NOV 1994

WATER QUALITY OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Poor water quality
- Towns
- Poor bathing water quality
- Approximate Area of saline intrusion
- Contaminated land
- The Wolds
- Industrial areas discharging to the Humber estuary
- Public Water Supply Boreholes

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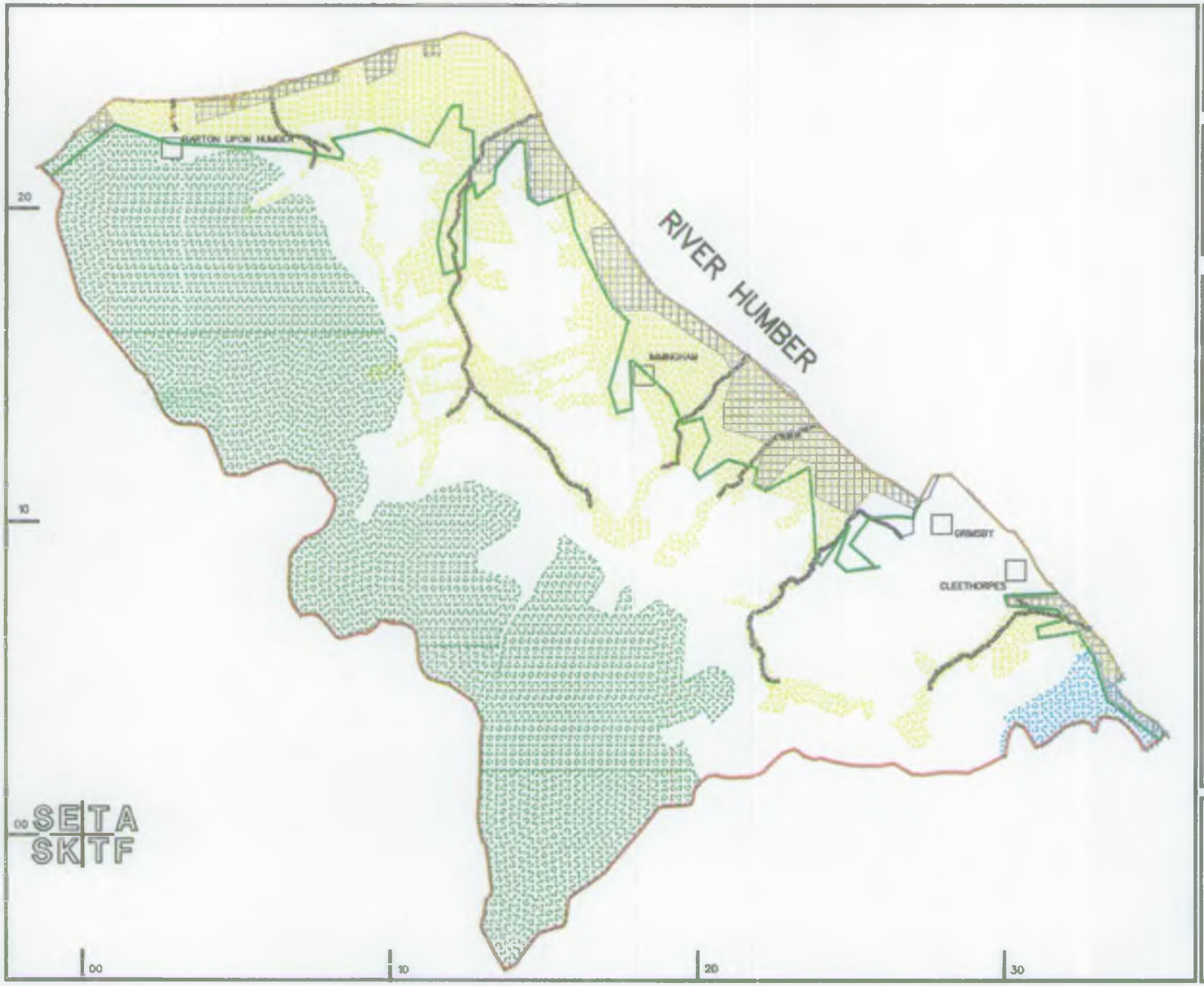
MAP NUMBER 3



GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 4

NOV 1994

FLOOD DEFENCE OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Boundary of land below high tide level
- Towns
- North East Lindsey IDB District
- Louth IDB District
- The Wolds
- 1953 Flooded area

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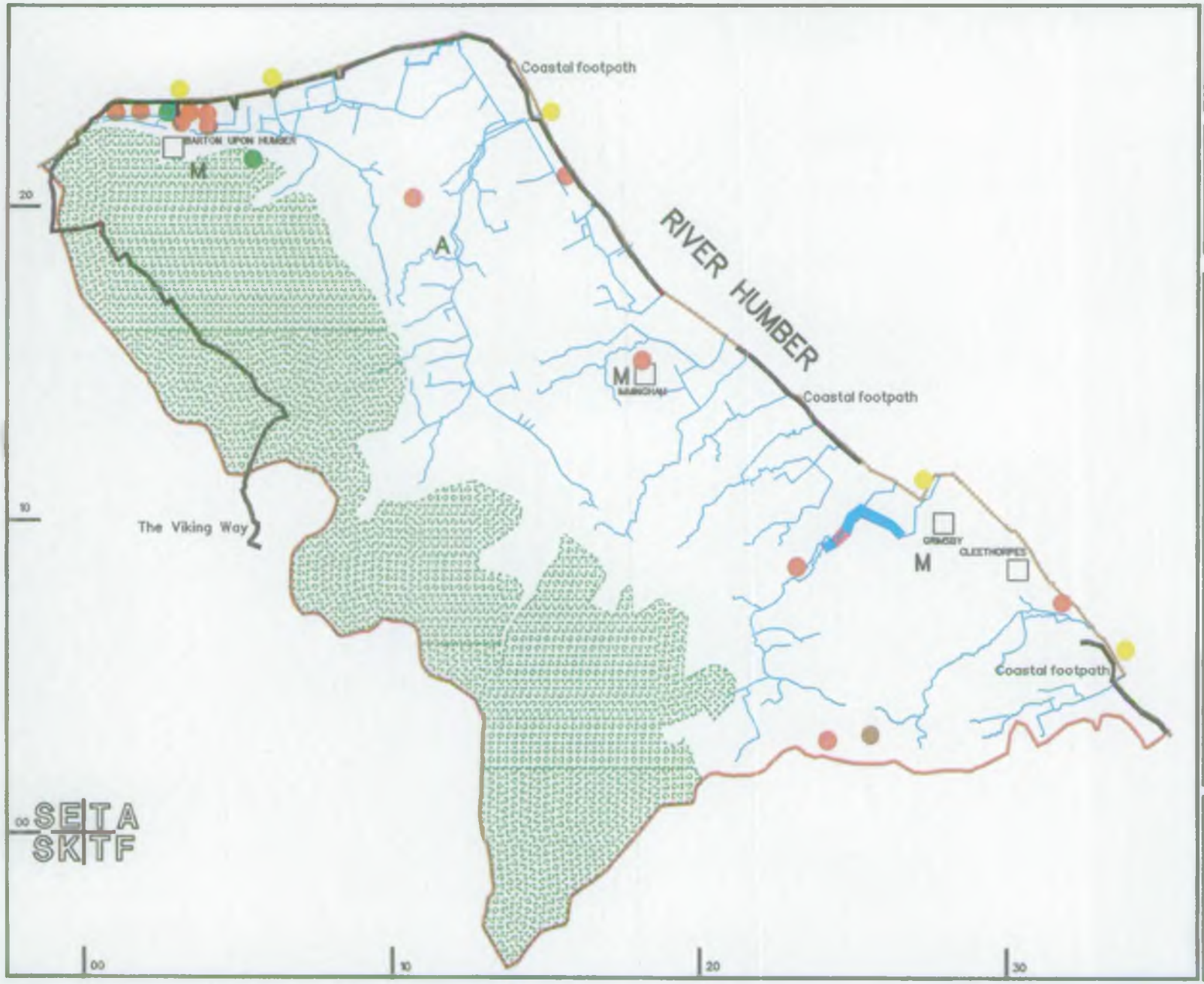

GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 5

NOV 1994

FISHERIES & RECREATION OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Long distance footpaths
- The Wolds
- Towns
- A Abbey
- M Museum
- Picnic Site
- Marina
- Windmill
- Still water coarse fishery

ANGLING CLUB/ASSOCIATION

- Witham & District Joint A.F.
- Grimsby Borough Council Fishing rights

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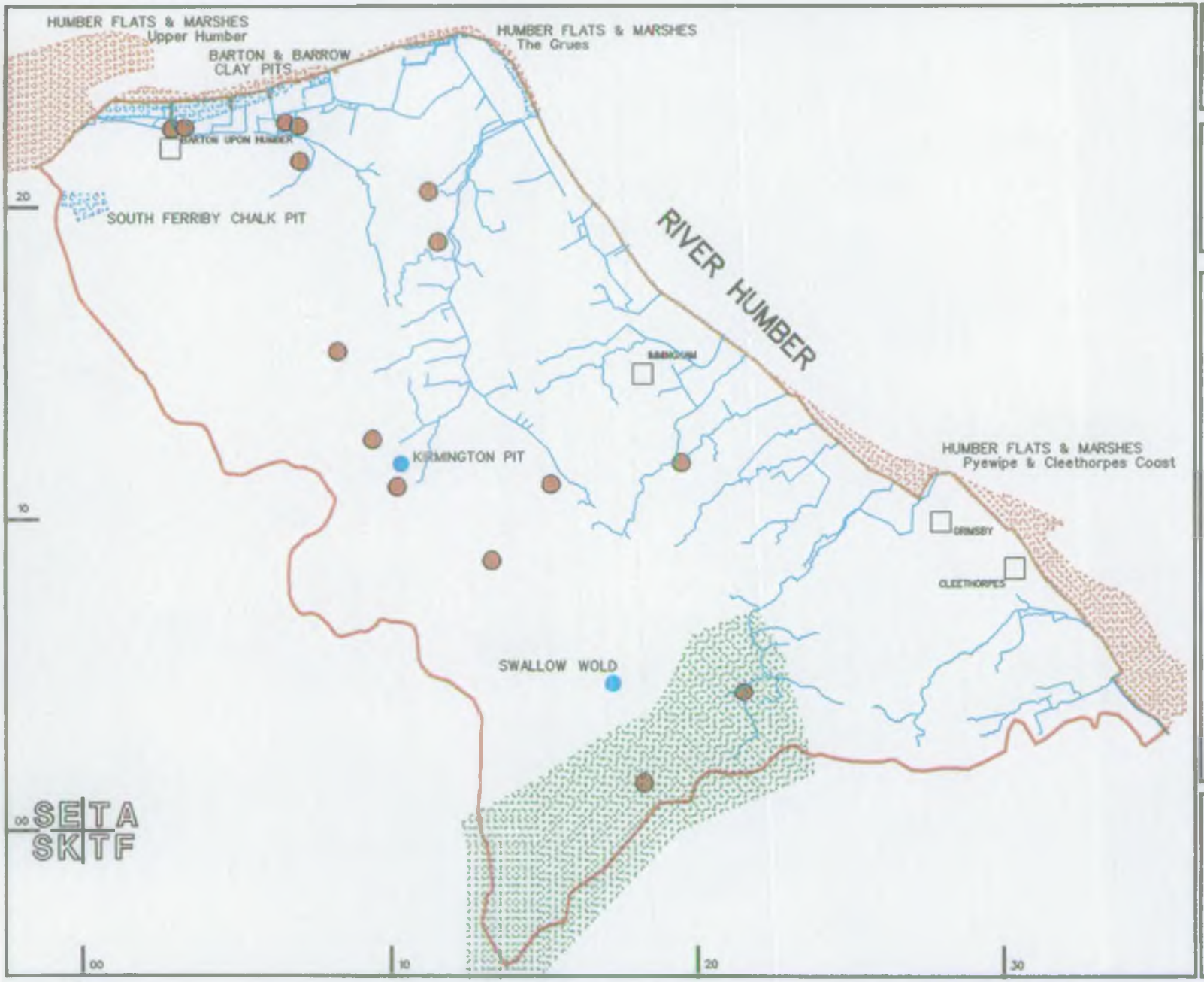
MAP NUMBER 5



GRIMSBY

CATCHMENT MANAGEMENT PLAN
MAP NUMBER 6
NOV 1994

CONSERVATION OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Towns
- RAMSAR/ Special Protected Area
- Site of Special Scientific Interest
- Scheduled Ancient Monuments
- Area of Outstanding Natural Beauty

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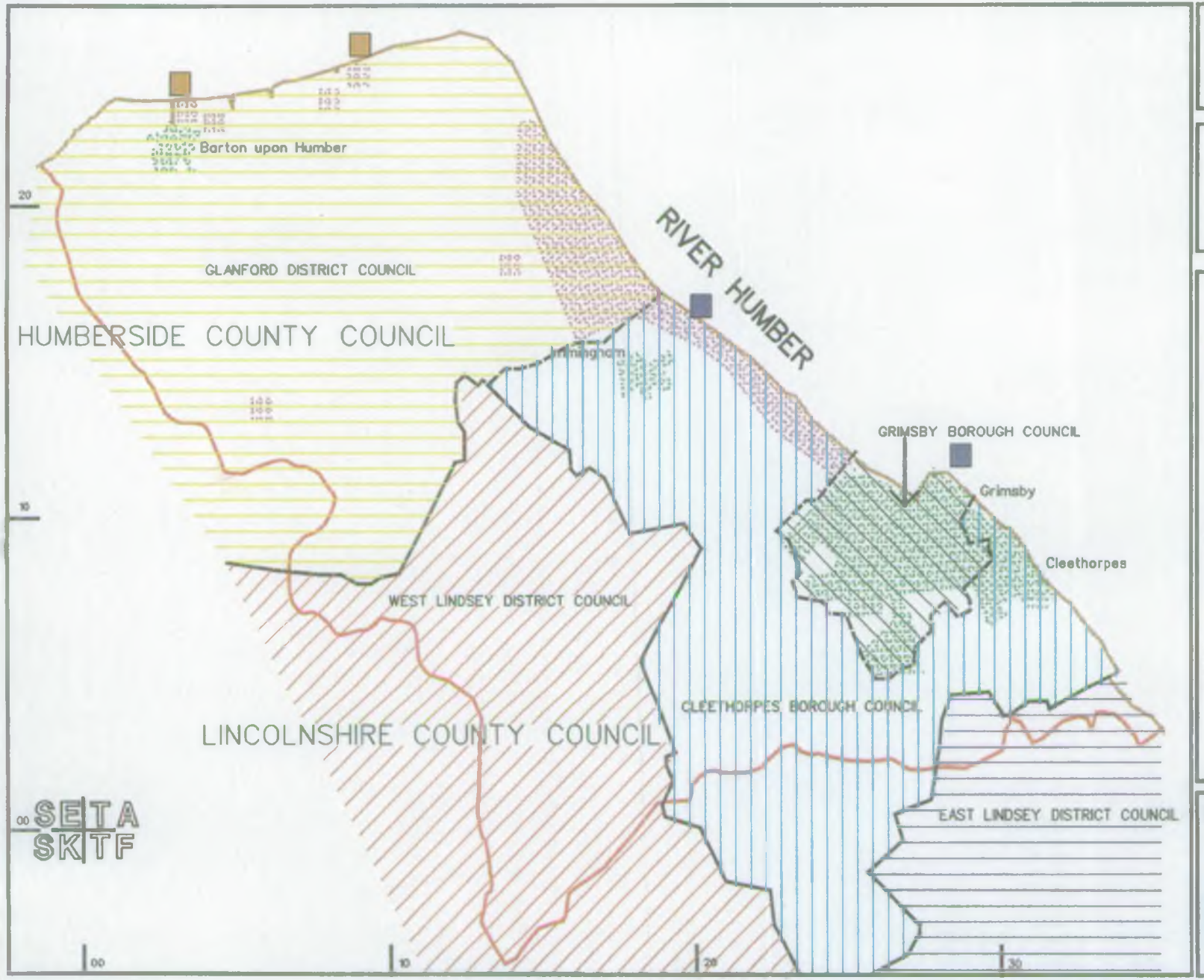

GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 7

NOV 1994

DEVELOPMENT OVERVIEW

KEY

- Catchment Boundary
- Tidal Defences

ADMINISTRATIVE BOUNDARIES

- County Council boundary
- District Council boundary
- Major Conurbation
- Dock
- Wharf
- Industry

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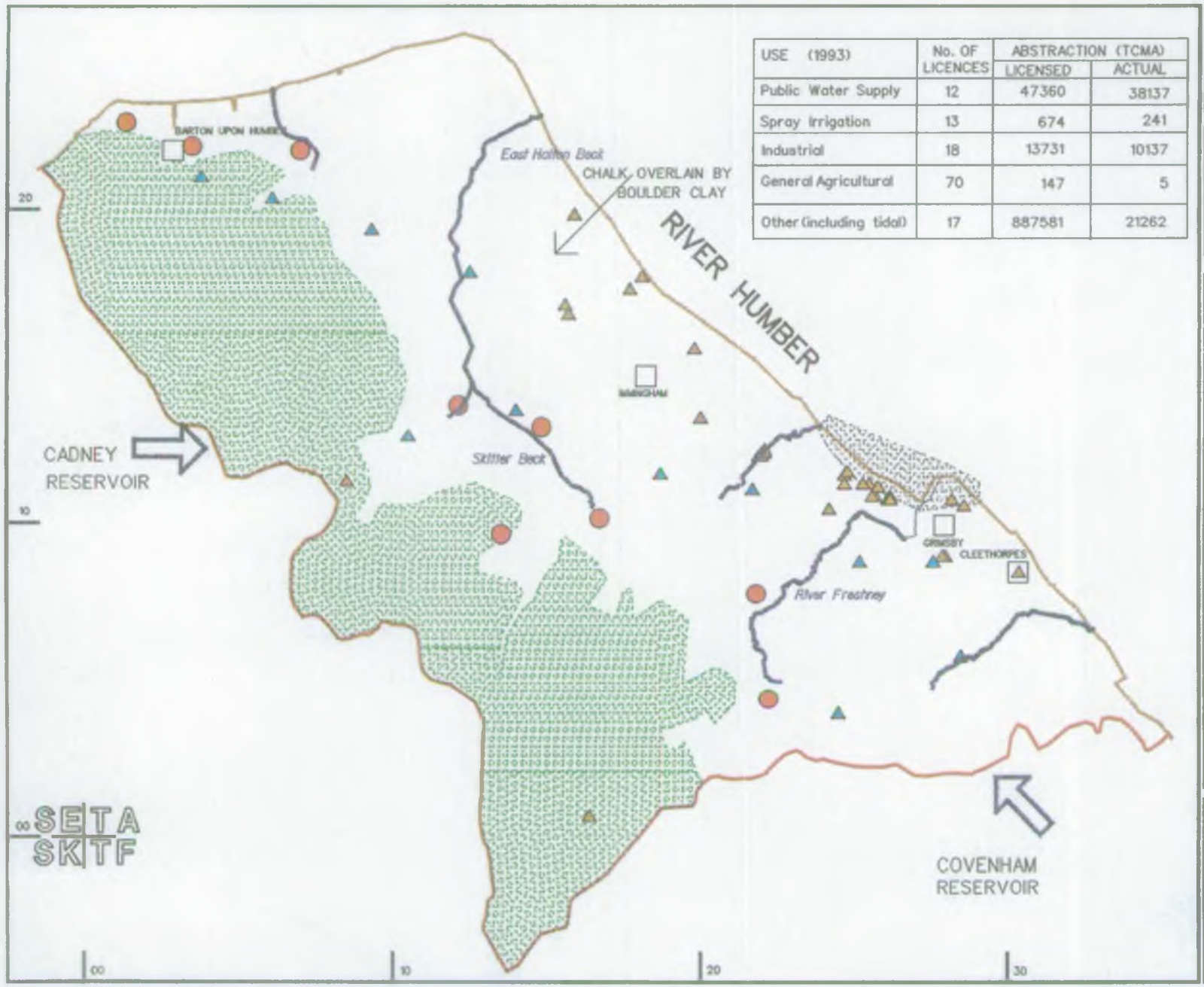
MAP NUMBER 7



USE (1993)	No. OF LICENCES	ABSTRACTION (TCMA)	
		LICENSED	ACTUAL
Public Water Supply	12	47360	38137
Spray Irrigation	13	674	241
Industrial	18	13731	10137
General Agricultural	70	147	5
Other (including tidal)	17	887581	21262

GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 8

NOV 1994

WATER RESOURCES STATUS

KEY

- Catchment Boundary
- Tidal Defences
- Rivers affected by low flows
- Springs/Blow-Wells affected by low flows
- Towns
- Groundwater affected by saline intrusion
- Public water supply Abstraction point
- Industrial abstraction point
- Chalk Outcrop/Recharge area
- Surface water import

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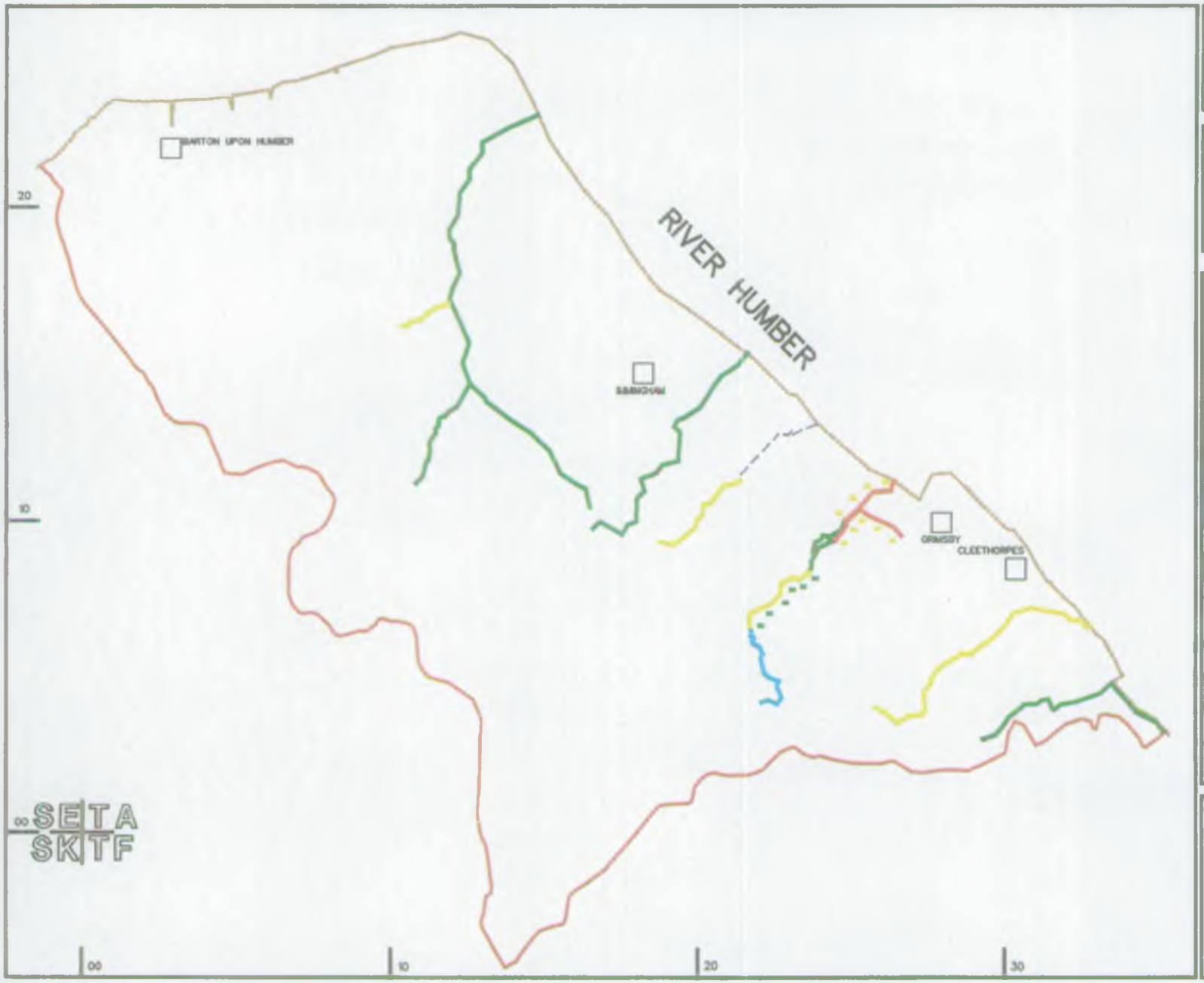
MAP NUMBER 8



GRIMSBY

CATCHMENT MANAGEMENT PLAN
MAP NUMBER 9
NOV 1994

RIVER ECOSYSTEM CLASSES

KEY

- Catchment Boundary
- Tidal Defences
- Towns

RIVERS ECOSYSTEM CLASSES
CURRENT CLASS

- class 1 very good
- class 2
- class 3
- class 4
- class 5 poor

TARGET CLASS (WHERE DIFFERENT)

- class 3
- class 4

- No data available

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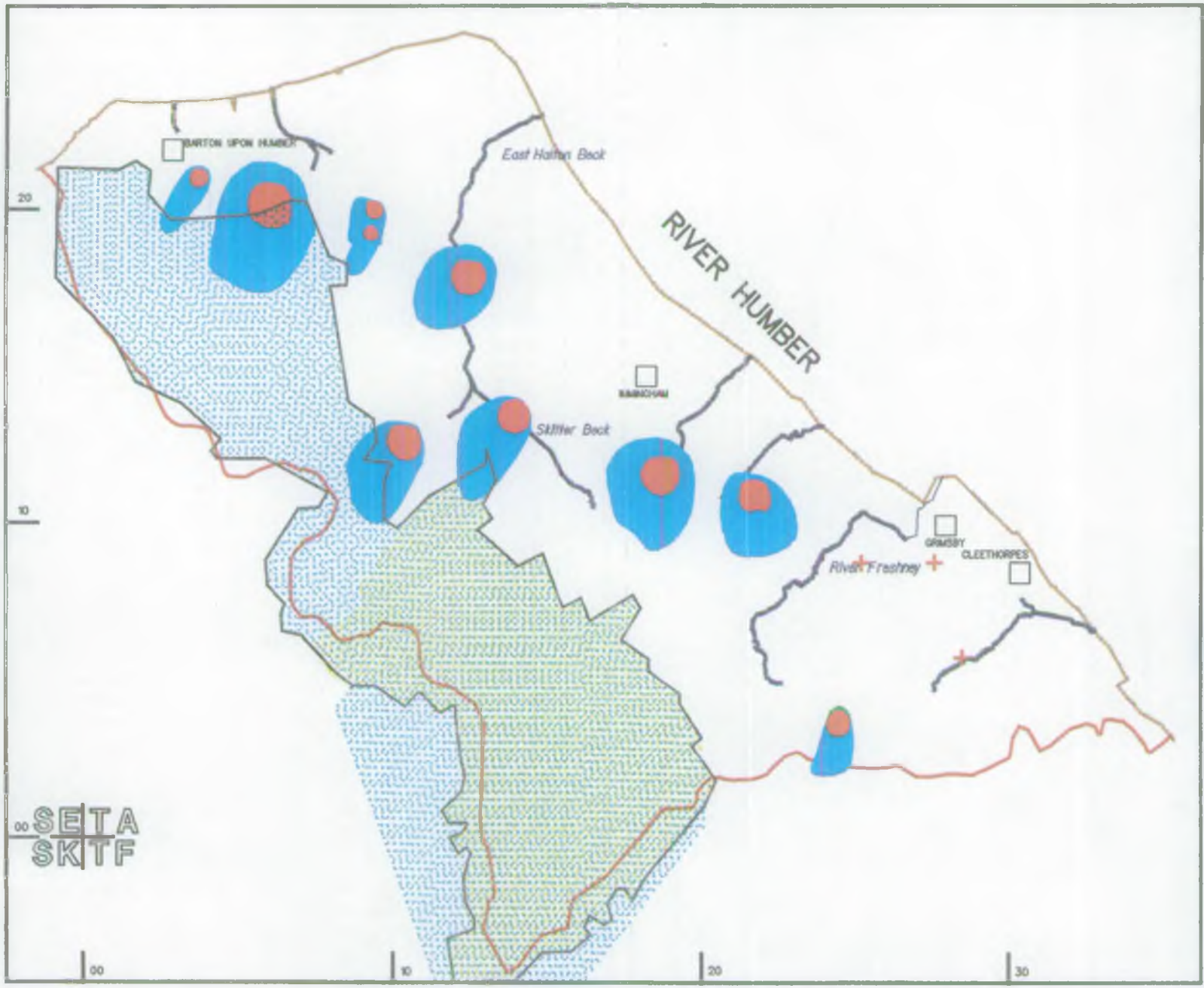

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 10
NOV 1994

GROUNDWATER SOURCE/NITRATE PROTECTION ZONES

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Towns
- Nitrate Vulnerable Zone
- Nitrate Sensitive Area Within N.V.Z.

SOURCE PROTECTION ZONE CATEGORIES

- 50 Day Travel Time
- 400 Day Travel Time
- Zone vulnerable to diffuse pollution
- Sources where protection zones have not yet been determined (Planned for 1995)

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MAP NUMBER 10

GRIMSBY
CATCHMENT MANAGEMENT PLAN
MAP NUMBER 11
NOV 1994

EXISTING STANDARDS OF FLOOD PROTECTION

KEY

Catchment Boundary

Towns

RETURN PERIOD (YEARS)

	FLUVIAL	TIDAL
		150-199 Years
	51-100 Years	50-149 Years
	21-50 Years	20-49 Years
	11-20 Years	5-19 Years
	< 10 Years	< 5 Years

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MAP NUMBER 11

GRIMSBY

CATCHMENT MANAGEMENT PLAN

MAP NUMBER 12

NOV 1994

FISH BIOMASS INDEX

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Towns

GRADE

- A Good (Target)
- B
- C
- D
- E Poor

Outfalls sealed during low flow periods limiting fish movements

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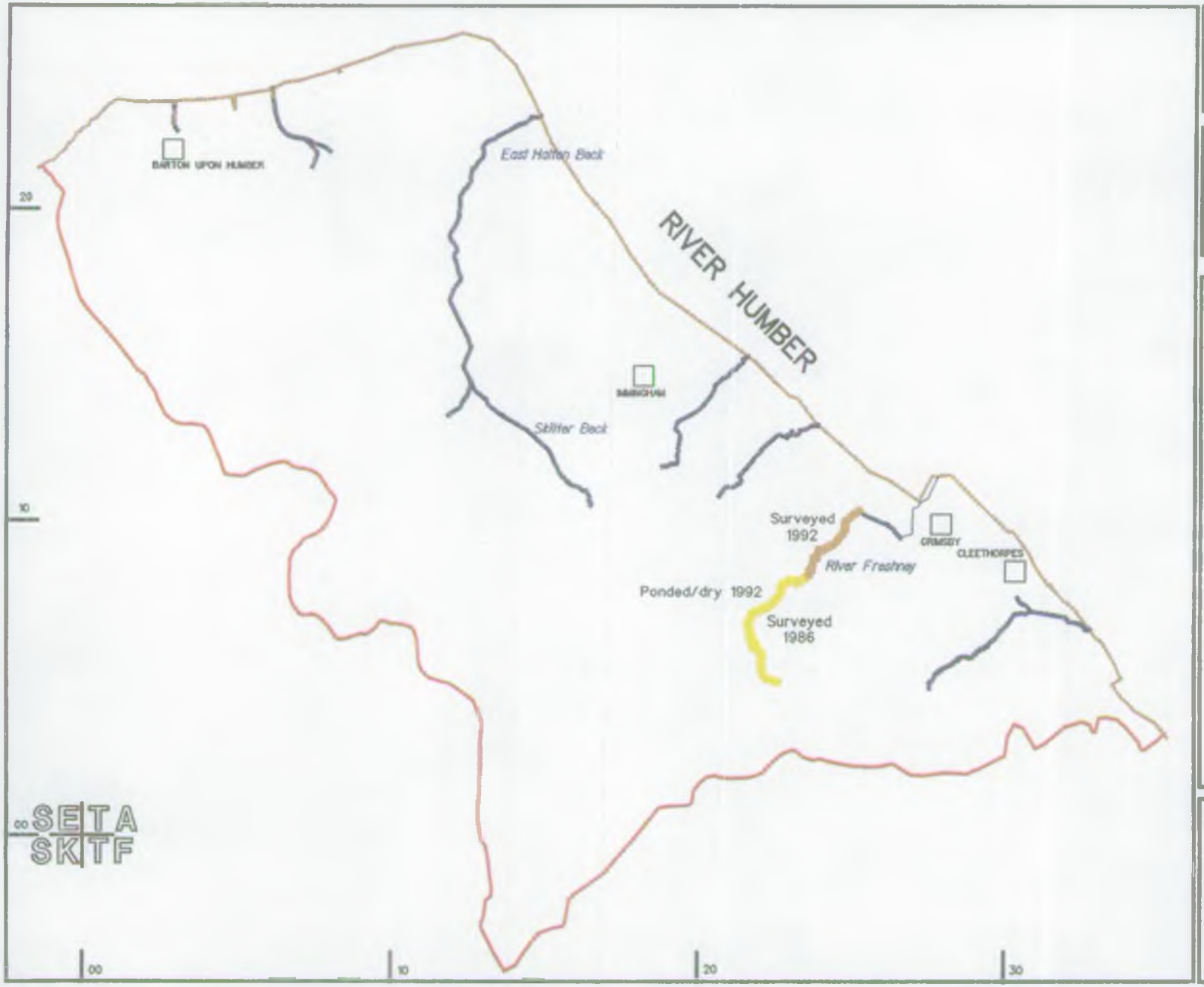
MAP NUMBER 12



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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 13
NOV 1994

FISHERIES HABITAT ZONE & SPECIES RICHNESS INDEX

KEY

- Catchment Boundary
- Tidal Defences
- Main River - No survey data
- Towns

GRADE

- A Good (Target)
- B
- C
- D
- E Poor

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MAP NUMBER 14
NOV 1994

RIVER CHANNEL AQUATIC PLANT DIVERSITY

KEY

- Catchment Boundary
- Tidal Defences
- Towns
- >20 Species — High
- 10-19 Species — Average
- 1-9 Species — Low

Unit of measurment:
Number of species per 500m length of watercourse surveyed

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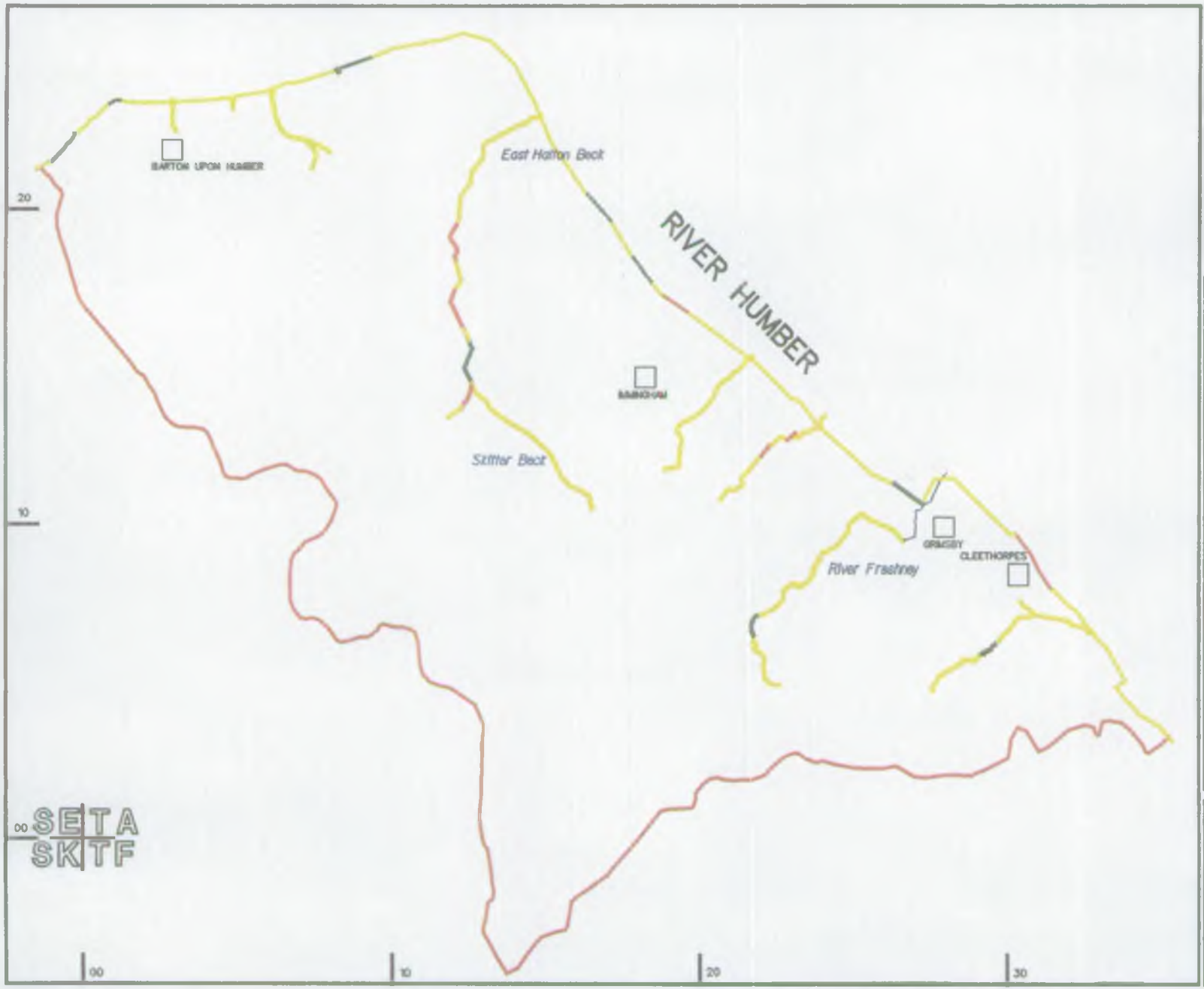

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CATCHMENT MANAGEMENT PLAN

MAP NUMBER 15

NOV 1994

PLANT DIVERSITY ALONG RIVER CORRIDORS AND TIDAL DEFENCES

KEY

Catchment Boundary

Towns

>90 Species	High
51-89 Species	Average
<50 Species	Low

Unit of measurment:

Number of species per 500m length of watercourse surveyed

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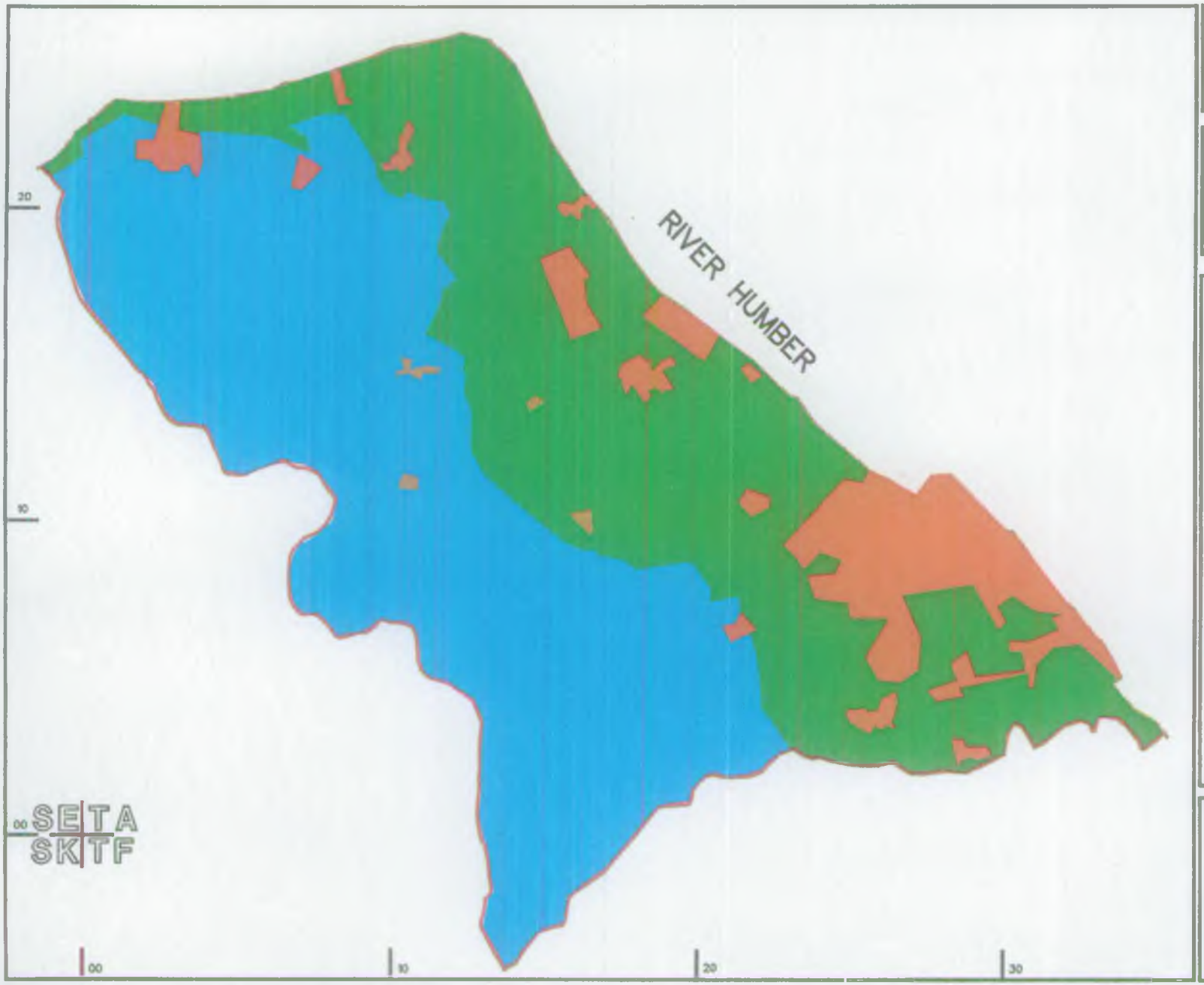

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 16
NOV 1994

LAND USE CLASSIFICATION

KEY

- Catchment Boundary
- Tidal Defences
- High Density Urban
- Medium Density Urban
- Low Density Urban/ High Grade Agricultural
- Medium Grade Agricultural
- Low Grade Agricultural

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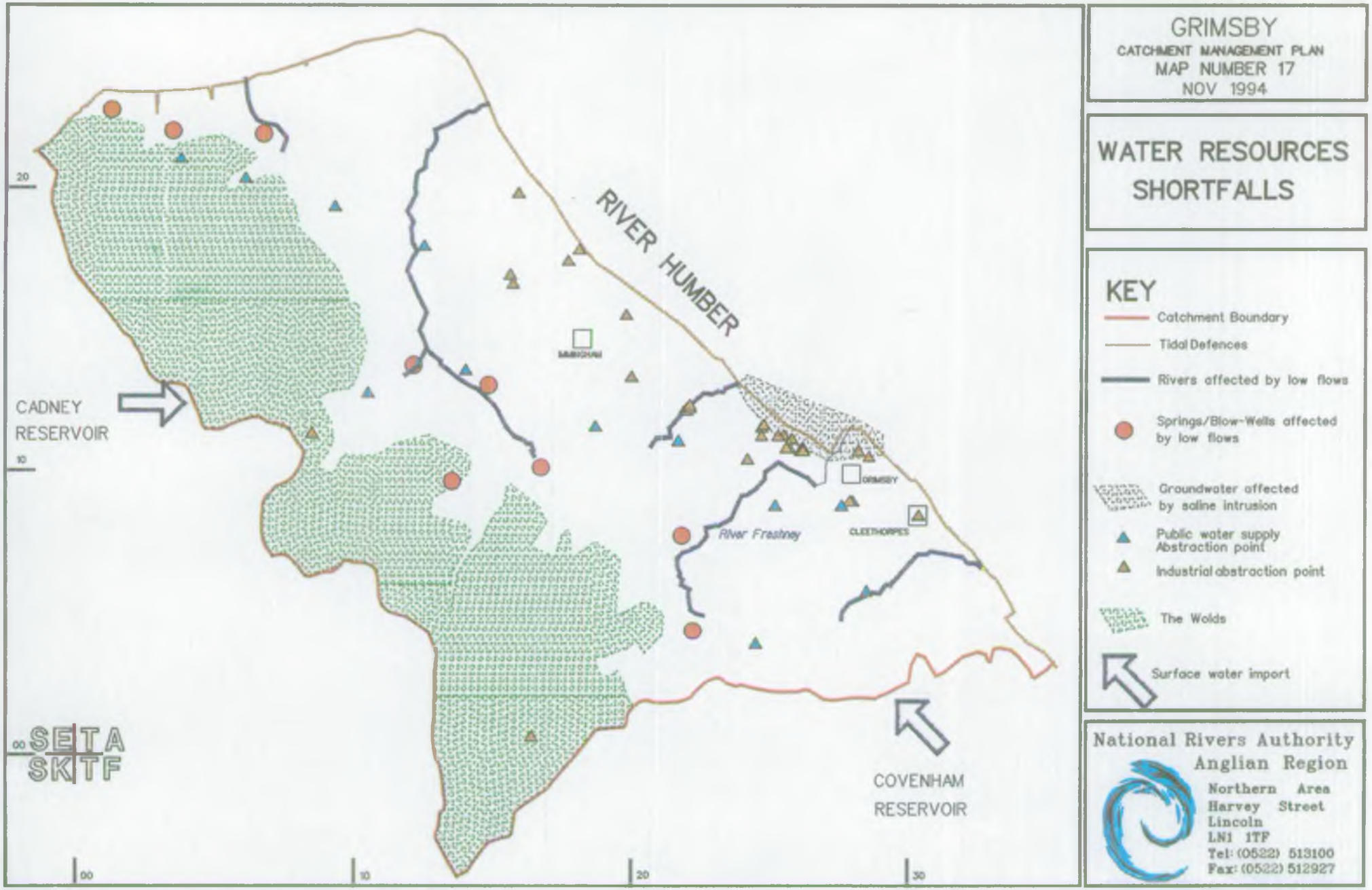

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MAP NUMBER 17
NOV 1994

WATER RESOURCES SHORTFALLS

KEY

- Catchment Boundary
- Tidal Defences
- Rivers affected by low flows
- Springs/Blow-Wells affected by low flows
- Groundwater affected by saline intrusion
- Public water supply Abstraction point
- Industrial abstraction point
- The Wolds
- Surface water import

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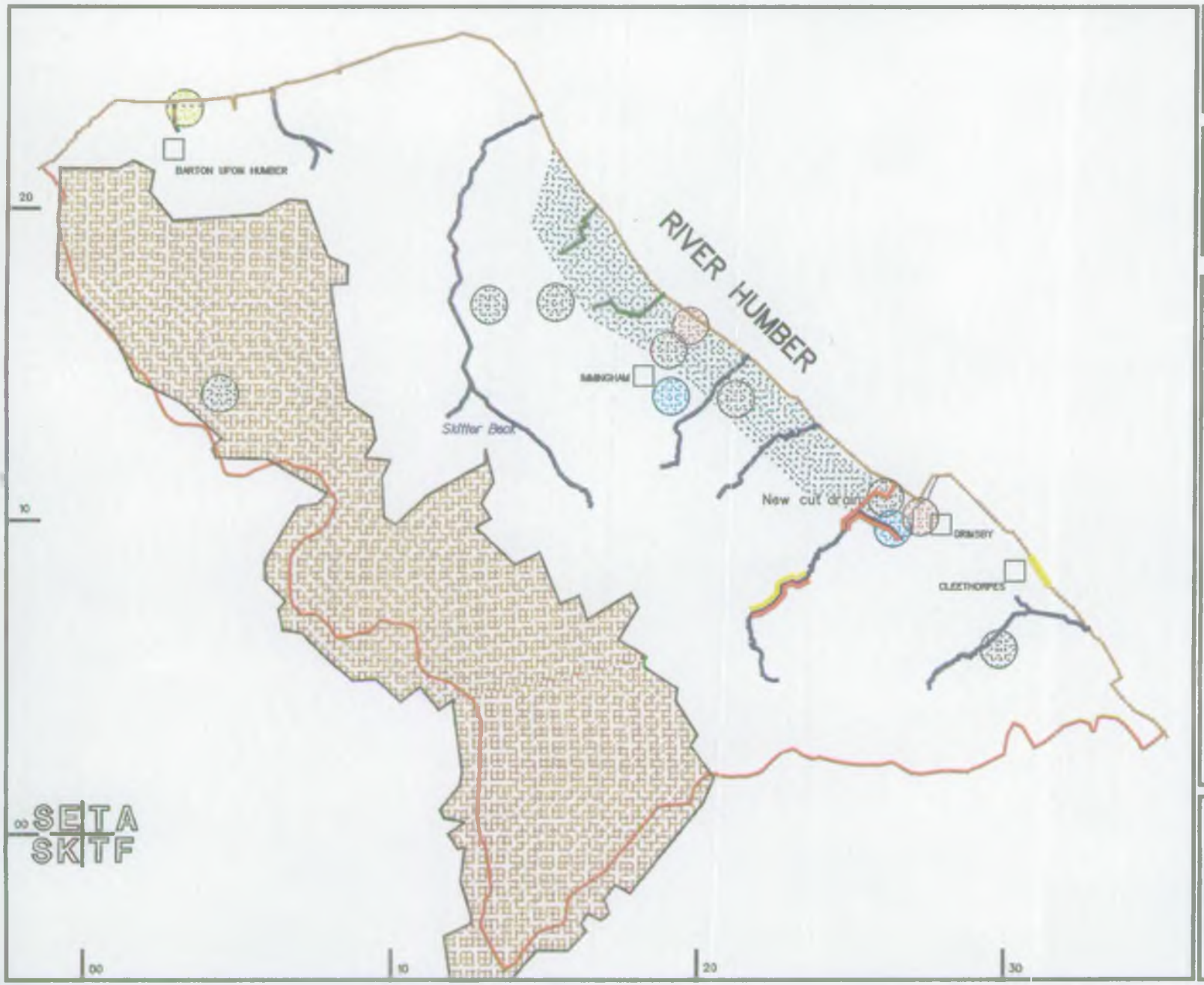

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 18
NOV 1994

WATER QUALITY SHORTFALLS

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- River Ecosystem Shortfall
- Failure Against other Targets
- Towns
- Watercourse with poor biology
- Area requiring improvements in effluent quality and/or pollution prevention measures
- Area vulnerable to diffuse pollution
- Oily Bilge Waters
- Litter
- Industrial areas
- Contaminated land

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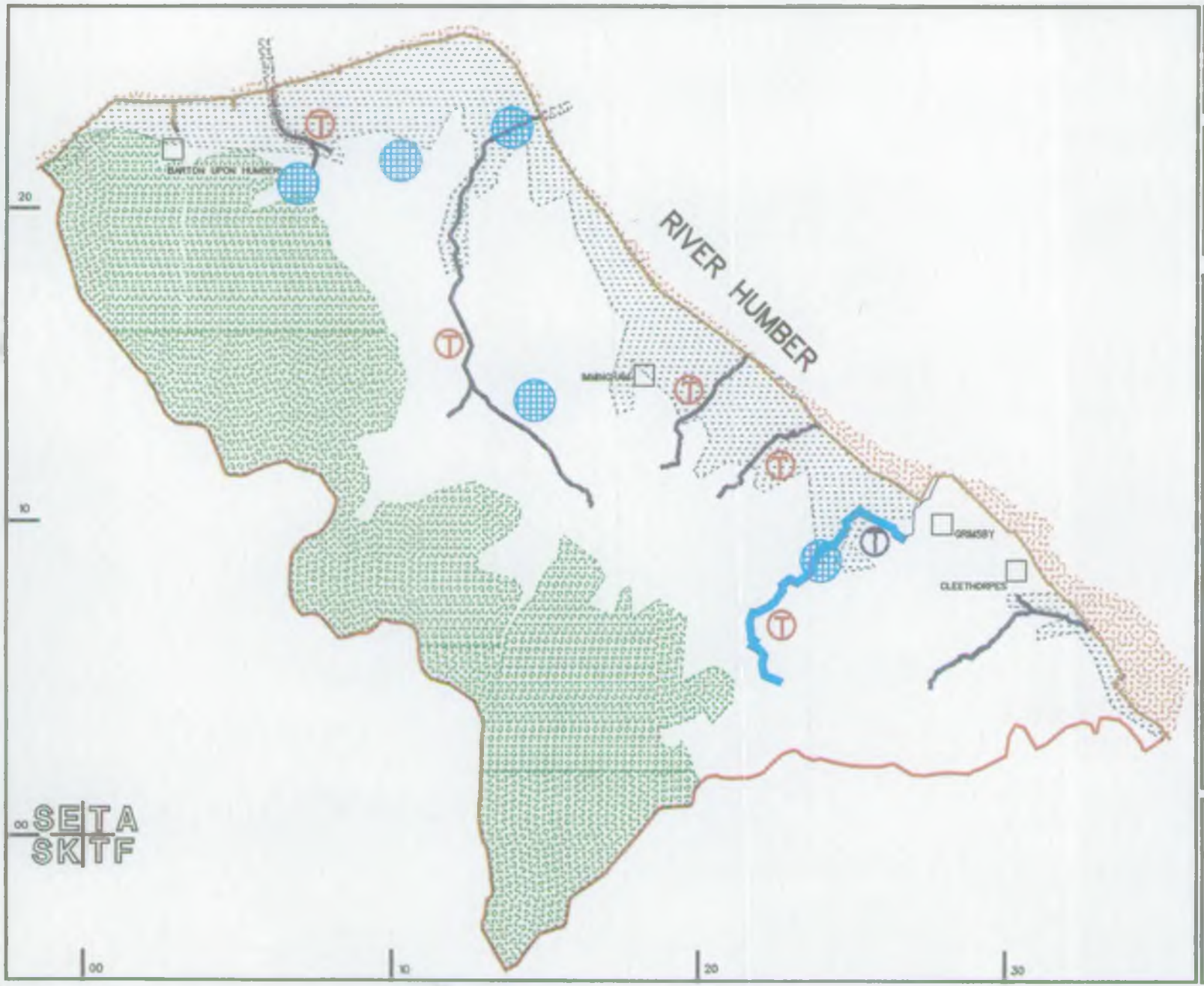

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 19
NOV 1994

FLOOD DEFENCE SHORTFALLS

KEY

- Catchment Boundary
- Main River
- Area at risk of tidal flooding
- Towns
- Tidal Defences requiring improvement
- Length of rivers below indicative standards of flood protection
- Localised drainage problems
- Eroding foreshore
- The Wolds
- Outfall Siltation
- Additional river telemetry requirement
- Existing river telemetry

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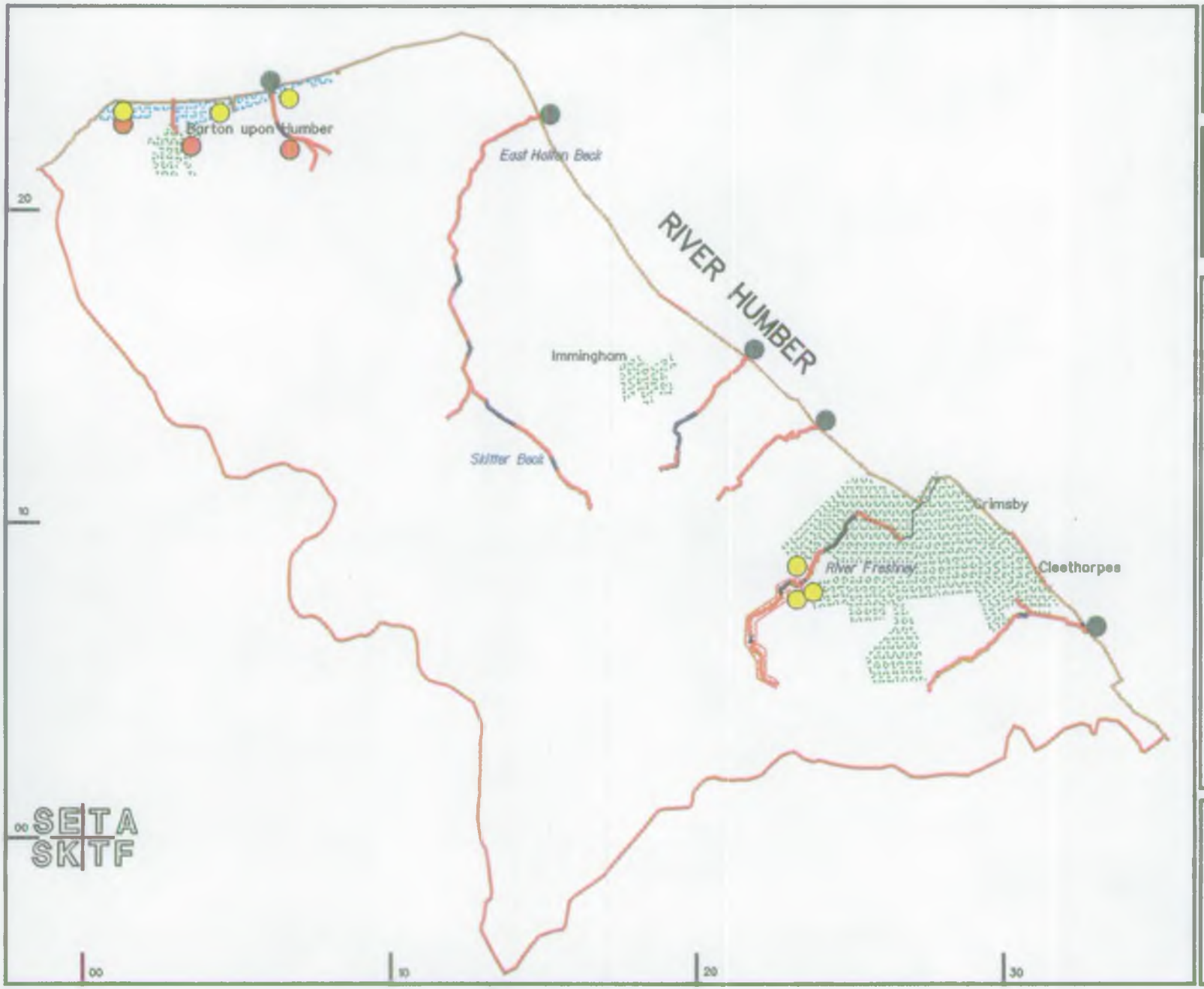

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 20
NOV 1994

FISHERIES AND CONSERVATION SHORTFALLS

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Barrow and Barton claypits affected by succession
- Major Conurbation
- Blow-Wells affected by low flows
- Lakes affected by drought
- Low diversity of river channel/corridor plants
- Rivers with known poor fish biomass
- Outfalls sealed during low flow periods limiting fish movements

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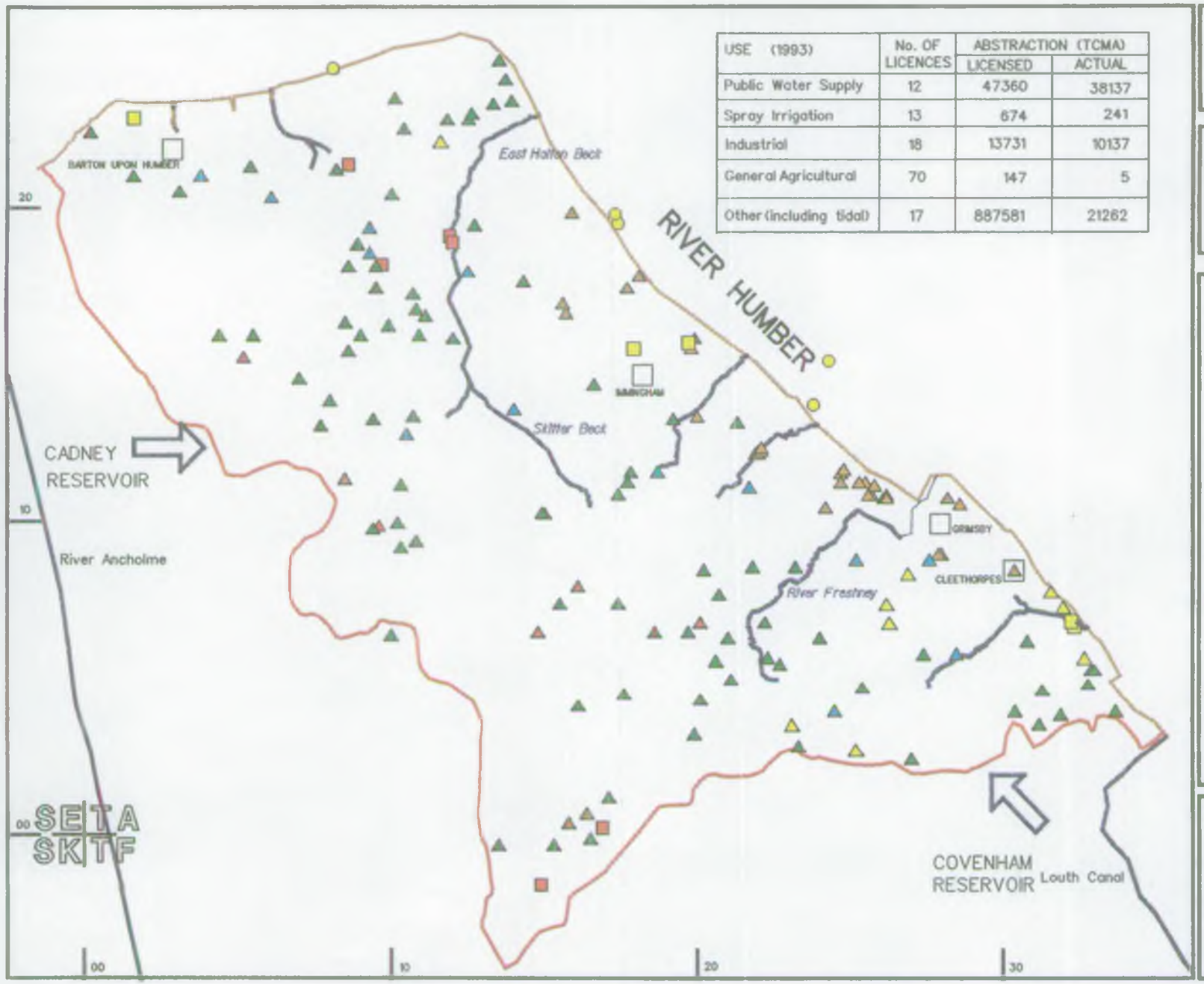

USE (1993)	No. OF LICENCES	ABSTRACTION (TCMA)	
		LICENSED	ACTUAL
Public Water Supply	12	47360	38137
Spray Irrigation	13	674	241
Industrial	18	13731	10137
General Agricultural	70	147	5
Other (including tidal)	17	887581	21262

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 21
NOV 1994

WATER RESOURCES CATCHMENT USES

KEY

- Catchment Boundary
- Tidal Defences
- Main River

ABSTRACTION SOURCES

Surface water / Ground water / Tidal waters

- Public Water Supply
- Spray Irrigation
- Industrial
- General Agricultural
- Other
- Surface water import

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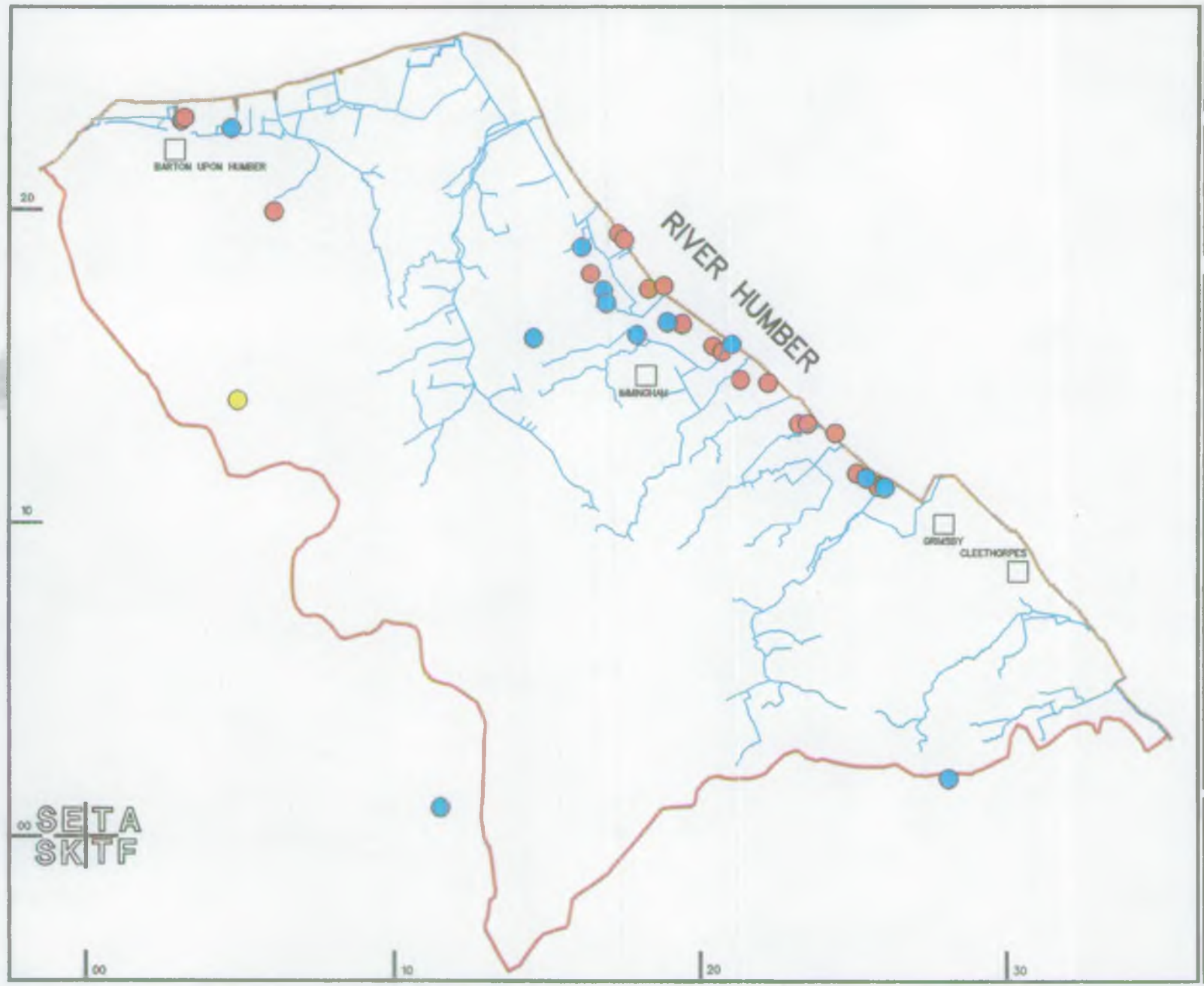

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CATCHMENT MANAGEMENT PLAN

MAP NUMBER 22

NOV 1994

INDUSTRIAL DISCHARGE SOURCES

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Towns

DISCHARGING TO

- Tidal
- Freshwater
- Groundwater

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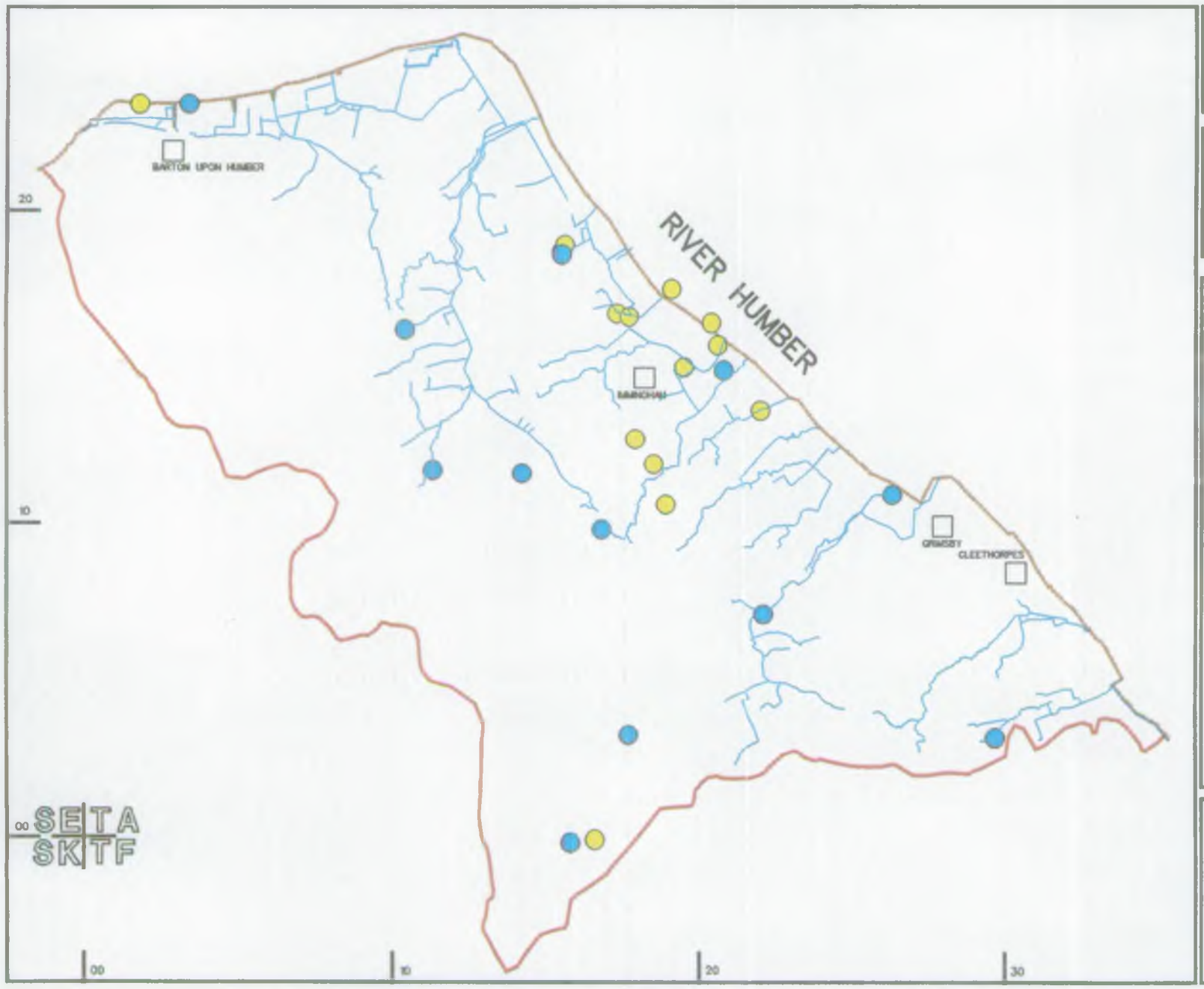

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 23
NOV 1994

SEWAGE TREATMENT WORKS

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Towns
- Anglian Water S.T.W.
- Private S.T.W.

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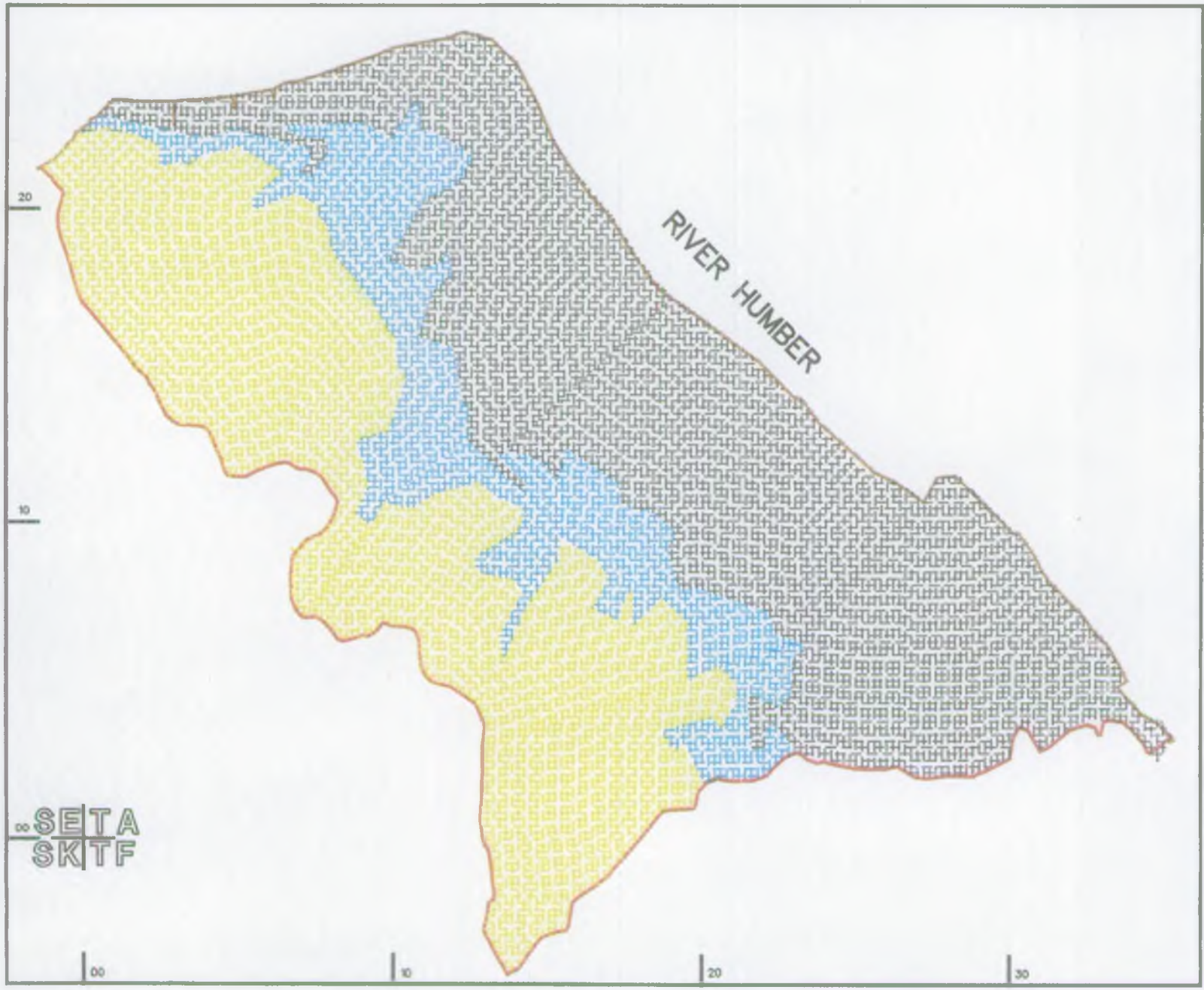

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CATCHMENT MANAGEMENT PLAN

MAP NUMBER 24

NOV 1994

GROUNDWATER VULNERABILITY

KEY

- Catchment Boundary
- Tidal Defences
- Highly vulnerable aquifer overlain by light permeability soils
- Highly vulnerable aquifer overlain by intermediate permeability soils
- Highly vulnerable aquifer overlain by low permeability soils

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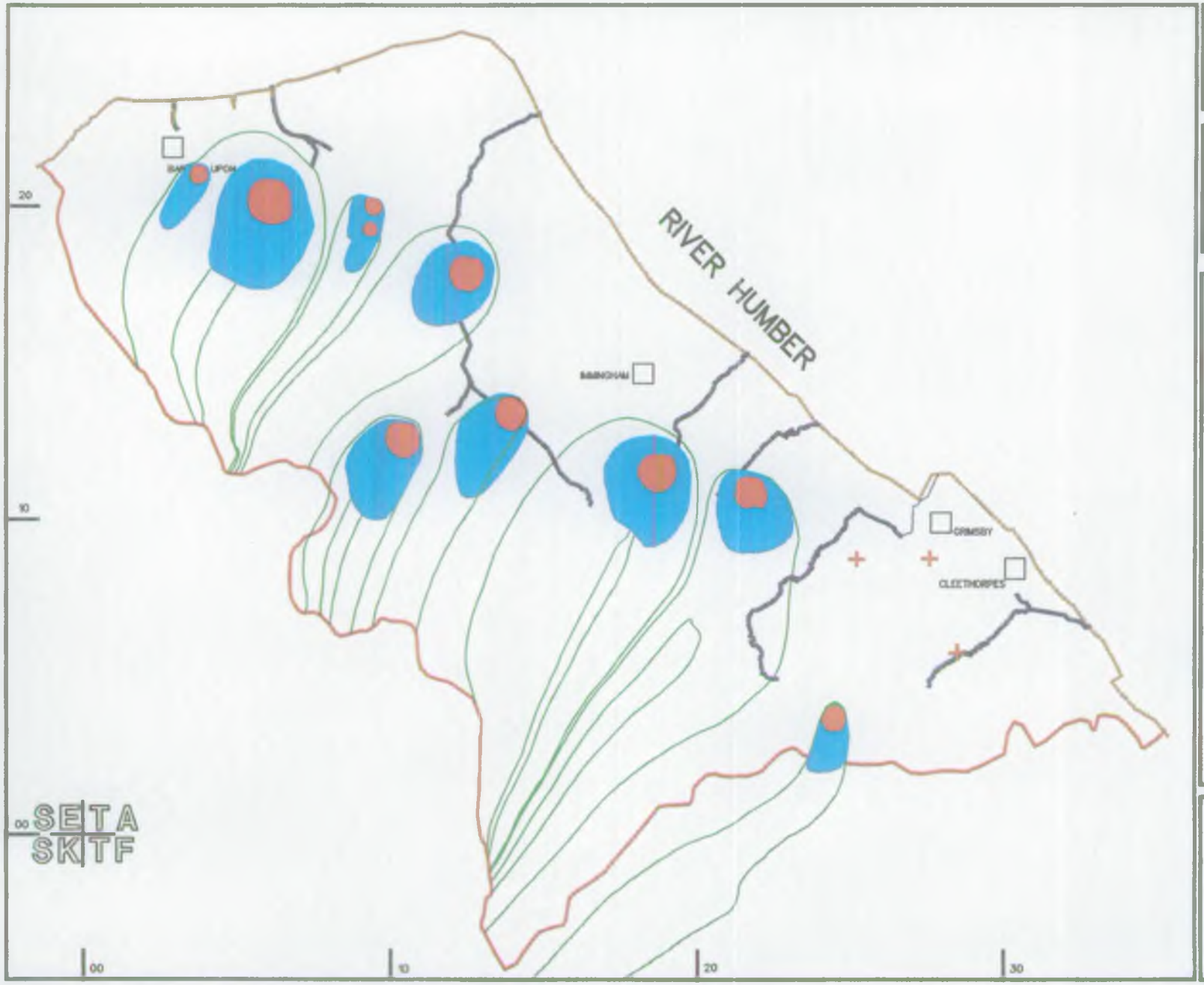

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 25
NOV 1994

SOURCE PROTECTION ZONES

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- Towns

ZONE CATEGORIES

- Total catchment Area
- 50 Day Travel Time
- 400 Day Travel Time
- + Sources where protection zones have not yet been determined (Planned for 1995)

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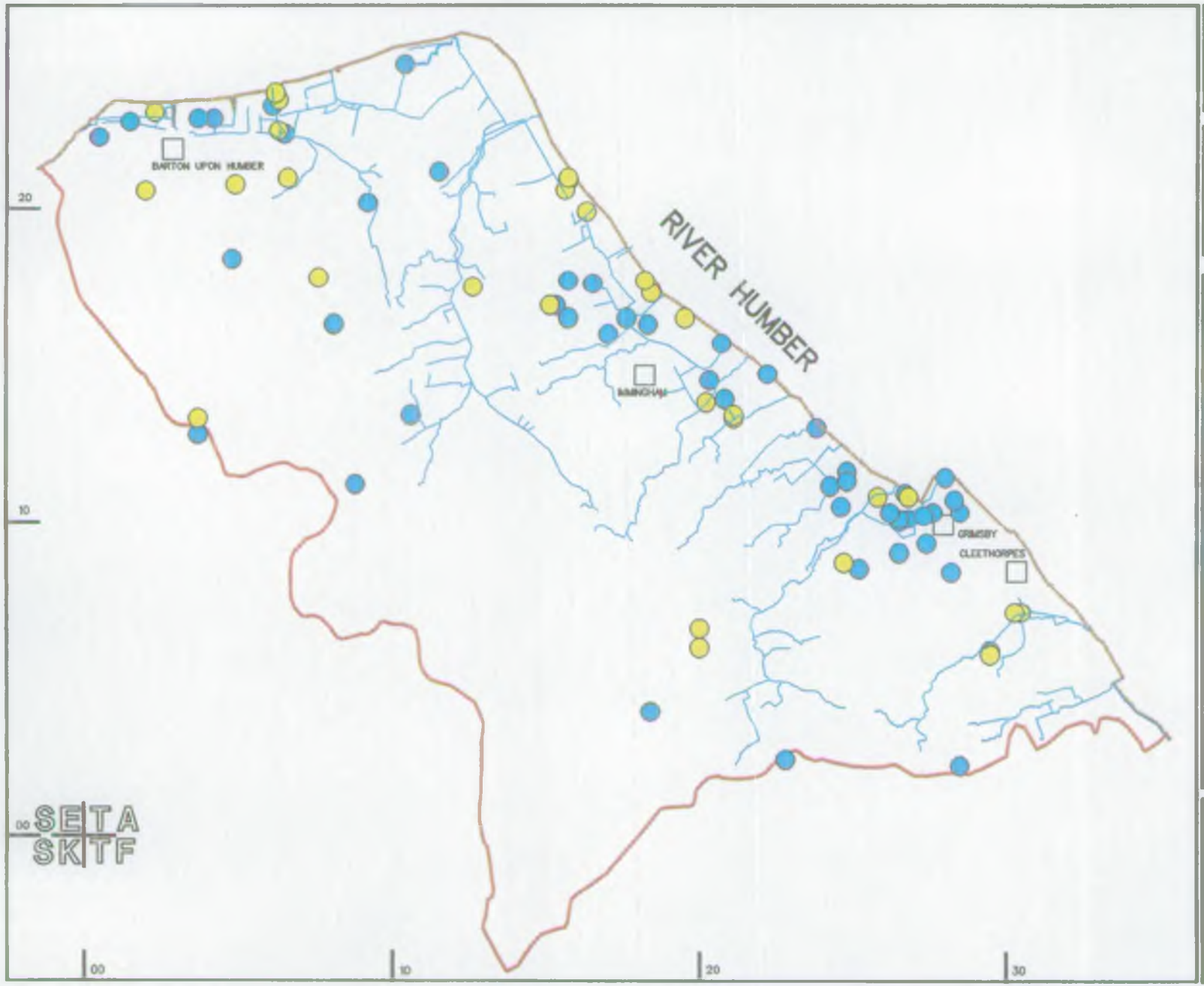

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 26
NOV 1994

LANDFILL SITES

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Towns
- Sites in use and receiving waste
- Sites no longer receiving waste

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 27
NOV 1994

MAIN RIVER AND INTERNAL DRAINAGE BOARD DISTRICTS

KEY

- Catchment Boundary
- Tidal Defences
- Main River
- I.D.B. Watercourse
- North East Lindsey I.D.D.
- Louth I.D.D.

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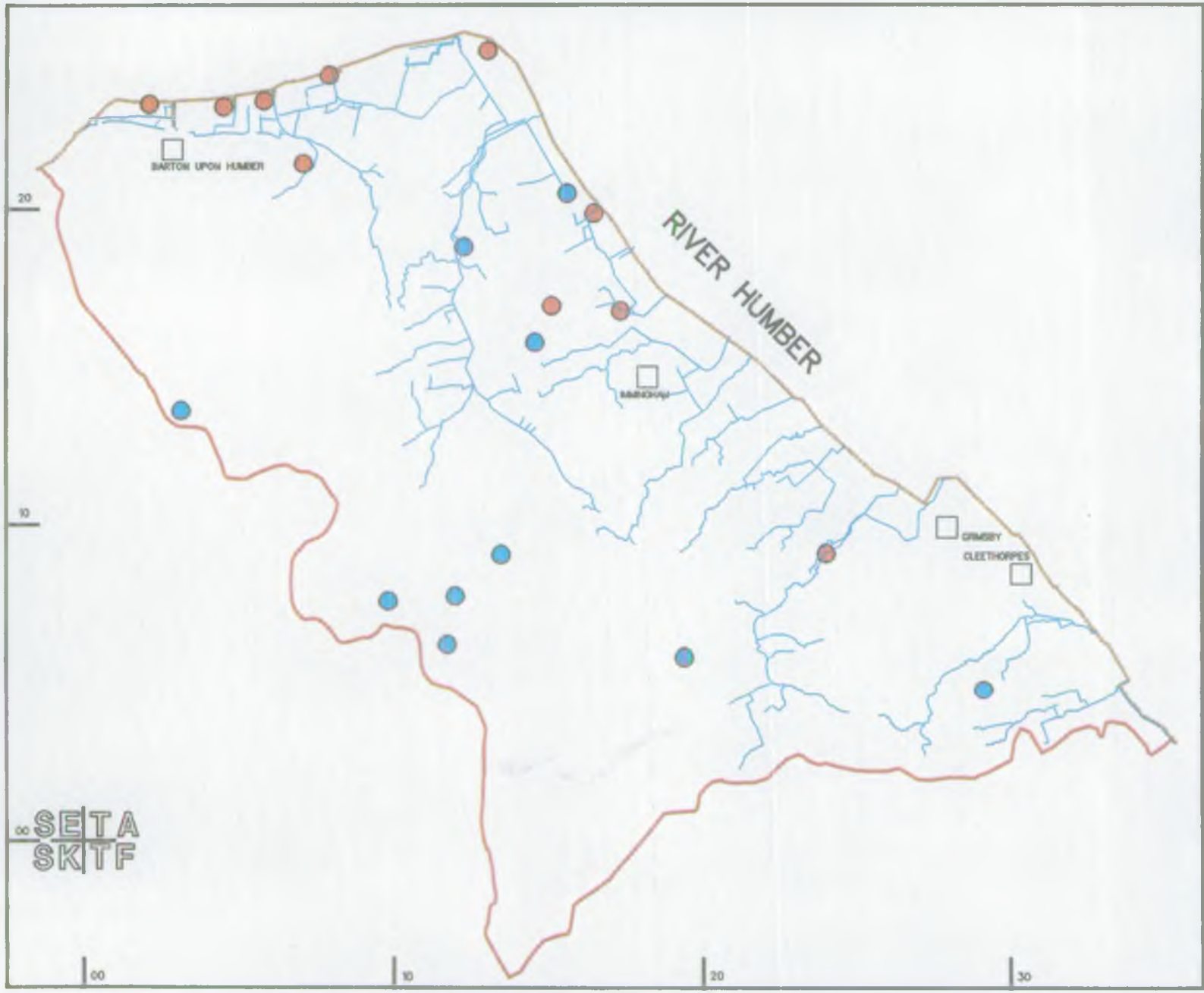

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CATCHMENT MANAGEMENT PLAN
MAP NUMBER 28
NOV 1994

SITES OF NATURE CONSERVATION INTEREST AND NATURE RESERVES

KEY

- Catchment Boundary
- Tidal Defences
- Watercourse
- Towns
- S.N.C.I.
- NATURE RESERVES

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CATCHMENT MANAGEMENT PLAN

MAP NUMBER 29

NOV 1994

INFRASTRUCTURE

KEY

- Catchment Boundary
- Tidal Defences
- Principle "A" road
- Main line railway
- Branch railway
- Major Conurbation
- Dock
- Wharf
- Industry
- Airport

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GRIMSBY CATCHMENT MANAGEMENT PLAN

CONSULTATION DOCUMENT

CONSULTATION RESPONSE

Please use this sheet to make your general response on the plan and Sheet 2 for comments on Issues. Please photocopy as necessary

Response by: ..... (Your name and/or that of your

..... organisation)

Date: .....

Cont./ Overleaf

Respond to:
Richard Kisby, National Rivers Authority, Aqua House, Harvey Street, Lincoln. LN1 1TF

Cont./ 2

GRIMSBY CATCHMENT MANAGEMENT PLAN

CONSULTATION DOCUMENT

CONSULTATION RESPONSE

Please use this sheet to make your comments on Issues (numbered 1-34).
Please photocopy as necessary

Response by: ..... (Your name and/or that of your

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Date: .....

Issue No. ____

Issue No. ____

Issue No. ____

Cont./ Overleaf

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Cont./ 2

Issue No. ___

Issue No. ___

Issue No. ___

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