local environment agency plan

LOUTH COASTAL

CONSULTATION REPORT

MARCH 1998

ENVIRONMENT AGENCY

General

Total Area: 1040 km^2

Population: (Approximate) 90,000 (Residential)
150,000 (Additional at Peak Season)

Main Towns (populations):	Residential	Summer (Estimate)
Louth	14,248	
Skegness	16,355	38,000
Mablethorpe & Sutton on Sea	10,253	33,000 (including Trusthorpe)

Environment Agency Organisation:

Anglian Region (Northern Area) Area Office at Lincoln.
Catchment Office (Lincolnshire) Manby

Water Utility Companies

Anglian Water Services Limited

Internal Drainage Boards:	Lindsey Marsh Consortium (Louth, Alford & Skegness)
Length of Statutory Main River:	225.4 km
Length of Navigable River:	0 km (Potential for 21.5 km - Louth Navigation)
Length of Course Fishery:	108.1 km
Length of Trout Fishery:	83.1 km
Length of Embanked Fluvial River:	113.8 km
Length of Embanked Tidal River:	4.6 km
Length of Sea Defence:	62.0 km
Area of land below highest astronomical tide	376.0 km^2
Flood Storage Reservoirs:	3

Water Quality

Biological Quality Grades 1996		**Chemical Quality Grades 1996**	
Grade	length of river (km)	Grade	length of river (km)
'very good'	49.6	'very good'	30.1
'good'	35.3	'good'	48.2
'fairly good'	50.5	'fairly good'	38.9
'fair'	0	'fair'	14.0
'poor'	9	'poor'	13.2
'bad'	0	'bad'	0

Integrated Pollution Control Authorisation Sites:
Conoco (UK) Limited, Theddlethorpe
Conoco Ltd, Tetney Tank Site

Sites of Special Scientific Interest:	25
Scheduled Monuments:	77

Waste Management Facilities:

Licensed Landfill Sites	7
Licensed Transfer Stations	7
Licensed Treatment Plant	0
Licensed Scrap yards	5

Water Resources

Annual rainfall	653 mm
Total licensed abstraction	Groundwater 26188 TCMA
	Surface water 42243 TCMA


key details
RIVER HUMBER
Grimsby
N
Waithe Beck
A18
A1031
Louth Canal
North Somercotes
Binbrook
South Dyke
A16
Louth
Long Eau
Mablethorpe
A157
Great Eau
A153
Woldgrift Drain
A1111
A52
Alford
Chapel St Leonards
A1104
River Lymn
A16
A1028
Willoughby High Drain
A158
Spilsby
A158
Skegness
River Steeping
A52
Wainfleet All Saints
Main River
Coastline
Plan boundary
'A' Roads

your views

This document forms the basis for consultation between the Environment Agency and all those with interests in the Plan area.

The Environment Agency would welcome your views on the future management of this area:

- **Have all the important environmental issues been identified?**
- **Have all the options and solutions to issues been identified?**
- **Which issues and options do you support or oppose?**
- **Do you have any other information or ideas you would like to express?**

All comments received will be treated as public information unless you explicitly state otherwise in your response.

Following the consultation period all comments received will be considered in preparing the next phase, the Action Plan. The consultation report will not be rewritten as part of the Action Plan process.

We intend that the Plan should influence the policies and actions of developers, planning authorities and other organisations as well as assisting in the day to day management of the Plan area.

Correspondence on the Consultation Report should be sent to:

John Leach
LEAPS Officer
Environment Agency
Waterside House
Waterside North
Lincoln
LN2 5HA

All contributions should be made in writing by 10 July 1998.

ENVIRONMENT AGENCY

FOREWORD

Local Environment Agency Plans are being developed by the Agency for the whole of England and Wales. Their primary purpose is to enable us to identify and focus upon the problems and issues for those areas of the environment over which we have an influence, and to develop a plan of actions to remedy those problems. This Consultation Document marks the first step in the process by discussing the issues we have identified in our consideration of the Louth Coastal Plan area and a range of options to resolve them.

Through the process of developing these Plans and through this consultation mechanism, as an organisation, we benefit from our interaction with partner organisations and the public. By addressing the issues from a wider perspective we hope to cultivate integrated solutions thereby improving our management of them.

This consultation process gives you an opportunity to influence our decision making and actions. We ask therefore that you read this document and let us know what you feel about the issues raised, have you any alternative solutions you feel we should consider and are there issues in the area which we have not addressed?

We would also like to use this opportunity to ask the public to comment upon the water quality targets as set out in the body and appendices of this document. It is important that long-term objectives reflect the likely uses of the watercourses in the area and a public view on the potential uses for specific watercourses would be valued.

Your responses should be returned to the address on the front cover no later than 10 July 1998.

I would like to thank the individuals and organisations who have contributed to the development of the Plan to this stage, particularly members of the Lincolnshire Area Environmental Group - our customer consultative committee who advise us on the development of LEAPs.

Ron Linfield
Northern Area Manager

SONGS FROM 'THE BROOK'

I come from haunts of coot and hern,
I make a sudden sally
And sparkle out among the fern,
To bicker down a valley

By thirty hills I hurry down,
Or slip between the ridges,
By twenty thorps, a little town,
And half a hundred bridges.

Till last by Philip's farm I flow
To join the brimming river,
For men may come and men may go,
But I go on forever.

I chatter over stony ways,
In little sharps and trebles,
I bubble into eddying bays,
I babble on the pebbles.

With many a curve my banks I fret
By many a field and fallow,
And many a fairy foreland set,
With willow-weed and mallow.

I chatter, chatter, as I flow
To join the brimming river,
For men may come and men may go,
But I go on forever.

I wind about, and in and out,
With here a blossom sailing,
And here and there a lusty trout,
And here and there a grayling,

And here and there a foamy flake
Upon me, as I travel
With many a silvery waterbreak
Above the golden gravel,

And draw them all along, and flow
To join the brimming river,
For men may come and men may go,
But I go on forever.....

Alfred Lord Tennyson.

DRAFT VISION

The Louth Coastal Area is situated within the County of Lincolnshire and covers an area of 1040 km². It is a predominantly rural area, home to some 90,000 people - a figure which can be swelled by the influx of holiday makers during the summer season to well over 240,000. Tourism is obviously vital to the wealth of this area, a factor influenced by the quality of its seven E.C. Designated Bathing Waters all of which comply with the Mandatory standards.

Drainage in the catchment is provided by a number of medium-sized embanked watercourses which take waters from the Lincolnshire Wolds across the coastal plain before discharge to the sea. In the low lying coastal strip drainage is provided by the local Internal Drainage Boards. Of significant importance to this catchment are the extensive sea defences along the coastline, which serve to protect large areas of land from tidal inundation. These are made even more significant by the long term predictions for rising sea levels.

The pressures of additional development in the Plan area, leading to increased demands for water, will present a major challenge as it is acknowledged that available water resources in the catchment are inadequate to meet the demands placed upon it. There is particular concern that abstraction from the chalk aquifer is contributing to depleted spring flows which have an effect on channel morphology and the habitat of in-river flora and fauna.

Further pressures are exerted by the increasing production of waste which must be disposed of safely and sustainably whether to land, air or water. A challenge in the Plan area is to combat the issue of landfill gas from Kenwick Landfill Site and this will be achieved by working together with the site operators in order to provide and encourage sustainable solutions.

The Agency continues to liaise with Anglian Water Services Ltd with respect to upgrading the sewerage system for Louth. Improvement works to the town's sewers have commenced with completion due in mid 1998. The scheme will reduce the volume and frequency of sewer discharges and should improve the quality of the River Lud/Louth Canal.

Within the next 10 - 15 years we aim to achieve, in partnerships with others, the following actions that are particularly relevant to the Louth Coastal Plan area:

- To maintain and improve water quality, particularly improving the quality of the River Lud/Louth Canal;
- To maintain the generally high standard of flood defences and, where necessary, improve levels of protection for people and property in low lying areas.
- Using initiatives, such as the Biodiversity Action Plans, realise opportunities to improve the wildlife conservation value of the Plan area.
- To make progress towards a better understanding of the links between lack of flow in spring fed watercourses and its impact on the flora and fauna.
- To encourage sustainable solutions to the issue of landfill gases.

The successful future management of the Plan area requires us to respond effectively to ever increasing pressures exerted on the environment and thereby ensure its protection. The conflicting demands on the environment of the Louth Coastal Plan area will be reconciled and resources will be targeted where most needed.

It is through establishing strong links with local communities, working together with industry, the local planning authorities, the water company and agriculture, and increasing public awareness of the need to protect our environment that this vision will become a reality.

Map Number 1: The Louth Coastal Local Environment Agency Plan and Adjacent LEAPs

INTRODUCTION

The Environment Agency was formed on 1 April 1996 and inherits the many and varied functional responsibilities of the National Rivers Authority, Her Majesty's Inspectorate of Pollution, the Waste Regulatory Authorities, and also some technical units of the Department of the Environment (now the Department of the Environment, Transport and the Regions). Our principal aim is to protect and enhance the environment as a whole, in order to play our part in attaining the objective of sustainable development and to take a much wider view of environmental regulation and management than was possible individually for our predecessors. We have responsibility in England and Wales for:

- Regulating industrial processes with the greatest polluting potential, using a regime of Integrated Pollution Control;
- Advising the Environment Secretary on the development of the Government's National Air Quality Strategy, and providing guidance to local authorities on the strategy and their local Air Quality Management Plans;
- Regulating the disposal of radioactive waste, including nuclear sites and the keeping and use of radioactive material;
- Regulating the treatment and disposal of controlled waste, involving waste management sites and carriers;
- Implementing the Government's National Waste Management Strategy in our waste regulation work;
- Preserving and improving the quality of rivers, estuaries and coastal waters through our pollution control powers, including water discharge consents and regulation of sewage works;
- Action to conserve and secure proper use of water resources, including licensed water abstractions;
- Exercise a general supervision of all matters relating to flood defence; it also has powers to take certain flood defence measures as approved by Regional Flood Defence Committees:
- Conserving the water environment and promoting its use for recreation;
- Maintenance and improvement of salmon, trout, freshwater and eel fisheries, including issue of angling licences;
- Maintaining and improving non-marine navigation, including boat licensing;
- Regulating the management and remediation of contaminated land designated as special sites; and

- Providing independent and authoritative views on a wide range of environmental issues.

In order to further the objectives of sustainable development it is clearly important to increase general and public awareness of the various issues involved. This document marks the start of that process by inviting the public and all organisations with an interest in the environment to comment on its contents, to identify their concerns for the Louth Coastal Plan area and to suggest options for their solutions.

The Agency works towards Sustainable Development through seven objectives, set by Ministers:

- An integrated approach to environmental protection and enhancement, taking into consideration the impact of activities on natural resources;

- Delivery of environmental goals without imposing disproportionate costs on industry or society as a whole;

- Clear and effective procedures for serving our customers, including the development of single points of contact with the Agency;

- High professional standards, using the best possible information and analytical methods;

- Organisation of our own activities to reflect good environmental and management practice, and provision of value for money for those who pay our charges, as well as for taxpayers as a whole;

- Provision of clear and readily available advice and information on our work;

- Development of a close and responsive relationship with the public, local authorities and other representatives of local communities and regulatory organisations.

We have chosen to continue the concept of Catchment Management Planning which was developed by the former National Rivers Authority, to help achieve our aims. With the increased scope and responsibilities of the Agency, however, these Plans will embrace issues relating to air and waste within the catchment, in addition to the water environment and will be known as Local Environment Agency Plans (LEAPs). A LEAP will seek to identify and resolve problems within a catchment in an integrated way, developing a partnership approach, where appropriate, towards dealing with those problems.

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PART I

1.0 THE LEAP PROCESS

In producing the LEAP, we recognise that to achieve our objectives we must work with, or seek to influence Central Government, local government, industry, commerce, the farming community, environmental organisations, riparian owners and the general public.

The preparation of a LEAP will require us to:

- identify the current state of the environment and activities within the Plan area which impact upon it;
- set environmental targets which ensure that uses occur in ways which are sustainable and do not impact unacceptably upon other uses;
- identify shortfalls against existing targets, along with other issues of concern;
- undertake consultation on the targets, issues and options;
- prepare an Action Plan to address the issues;
- implement the Action Plan and maintain ongoing monitoring and review of the Plan.

Through detailed consultation with all interested organisations, we seek to:

- confirm the range and extent of plan uses and activities;
- obtain views on the issues facing the environment and on options to resolve them;
- begin the process of identifying Action Plans;
- form partnerships to sustain local resources and resolve issues;
- ensure decisions on the future management of the Plan Area take account of views expressed from interested parties.

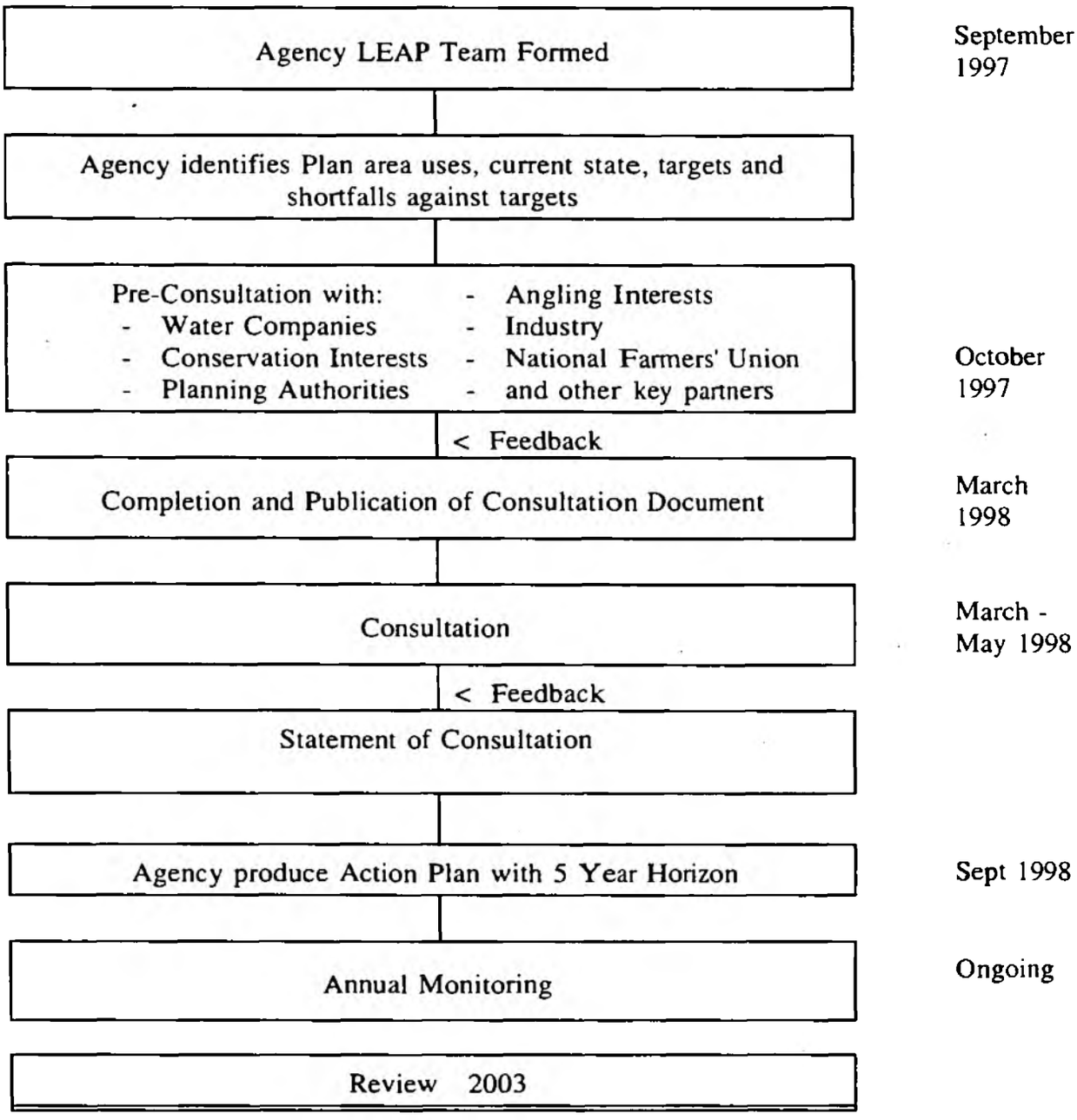
The publication of this consultation report marks the start of a three month period of formal consultation. This will enable external organisations and the general public to work with us in planning the future of the environment in the Louth Coastal Plan area.

Following the consultation period we will produce an Action Plan which will form the basis for both the Agency and other partners' actions within the Plan area over the following five year period. We will seek the commitment to planned actions by others where necessary.

A summary of the LEAP process and relevant timescales for the Louth Coastal LEAP is shown below:-

Figure 1: The LEAP Process and Louth Coastal LEAP Timetable

The LEAP Process and Timetable



2.0 EXECUTIVE SUMMARY

The Louth Coastal Plan extends over an area down the East Coast of Lincolnshire inland as far as the Lincolnshire Wolds. The northern extent of the Plan is the sub catchment of the Waithe Beck and to the south that of the River Lymn/Steeping.

Within the Plan area there are two distinct landscapes. Between the Wolds and the coast the land is generally flat and largely under cultivation. Despite this, there are habitats rich in wildlife including meadow and pasture grasslands, saltmarsh, sand dunes and some woodland. In the past, large areas of saltmarsh and wet marsh have been reclaimed for cultivation. Since the war, more and more grasslands have increasingly been ploughed up for arable farming which has significantly reduced the wildlife value of the area. The Wolds themselves provide a rolling landscape that rises up to 150 metres above sea level which supports interesting habitat variation in the form of chalk grasslands, rivers, streams and some woodland. Tetford Wood is the best example of semi-natural woodland in the Lincolnshire Wolds Natural Area and nationally important alder carr woodlands can be found scattered along some of the river valleys.

The area does not have a single major urban centre, instead it has a series of relatively small market towns which have grown to serve numerous scattered villages and holiday centres.

Louth is the major inland town in East Lindsey, its markets and shops are the focus for a great deal of economic and tourist activity. Louth is an important employment centre and there are a number of industrial sites scattered throughout the predominantly residential areas. The holiday industry is the main economic base in Skegness and Mablethorpe; both Skegness and Sutton on Sea have developed rapidly as retirement centres over the last decade.

Development pressures look set to continue in the area with much of it concentrated in the "defined towns" identified in the Structure Plan; in addition there is an increasing demand for holiday and cabin development with touring caravans playing an increasingly important part in the local tourism economy.

Agriculture is the predominant economic activity within the Louth Plan area. Arable crops and fallow account for the largest percentage of agricultural land use although recent data indicates a decline of such crops compared with 10 years ago. Predominant crops are cereals such as wheat and barley. Large scale industry is limited within the Plan area. However, the presence of Conoco (UK) Ltd at Theddlethorpe and Conoco Ltd at Tetney, and Ross Youngs at North Thoresby provide examples of development of this nature.

Within the area are two major landfill sites, situated on the outskirts of Louth and Skegness, which can accept biodegradable household, commercial and industrial wastes. The lifespan of Middlemarsh Landfill, near Skegness, is estimated at a further sixteen years. Kenwick Landfill, near Louth, is estimated to have another forty years life subject to planning approval for further mineral extraction being obtained.

Middlemarsh Landfill, near Skegness is licensed to accept limited amounts of special waste as defined under the Special Waste Regulations 1996. However, material classed as special under previous regulations is not permitted for disposal, and indeed the majority of special waste has to go out of the county for disposal.

Of the four inert landfill sites within the area, only one is currently accepting inert construction and demolition waste. Since the introduction of the Landfill Tax in October 1996 disposal of this type of material to landfill has decreased with waste producers diverting their material to schemes exempt from waste management licensing where possible.

In the Plan area there are two active chalk workings at South Thoresby and Welton Le Marsh, and two inactive chalk workings at North Ormsby and Tetford Hill. There are no workings for sand and gravel or for limestone. Lincolnshire is the only source of chalk in the East Midlands. A high proportion is used for non-aggregate purposes.

Belleau Springs

The principal water resources of the Plan area are the Chalk and Spilsby Sandstone aquifers which are an important source of water for public water supplies. The Great Eau river is also an important source of water as river water is transferred from Cloves Bridge (by Anglian Water Services Ltd) to the Louth Canal at Alvingham, via a raw water pipeline. Water is subsequently abstracted from the Louth Canal to fill Covenham Reservoir. The reservoir provides some water to the Louth catchment and further north for public supply but is principally for industrial use on the Humber Bank.

River water is the most significant source of water for spray irrigation in the Plan area, particularly the catchments of the Rivers Lymn and Steeping where a number of abstractions are closely concentrated.

Anglian Water Services Ltd abstract from 16 sources in the Chalk and Spilsby Sandstone, seven of which are located in the south of the area. Overall, public water supply accounts for 97% of the water licensed for abstraction. Water abstracted is used to meet demand, including the peak summer demands of the east coast holiday resorts.

There are considerable fluctuations in groundwater levels in chalk and sandstone observation wells. These fluctuations do not reflect the seasonality of recharge and there is a need to further understand the groundwater flow processes that occur and the relationship with springs and river flows across the area to manage water resources in a sustainable manner. There is concern that abstraction from the chalk aquifer as a whole is leading to depleted spring flows.

Water is not infinitely available, the limiting factor being the rate at which it is replenished by rainfall. It is therefore important to manage this valuable and fragile resource in a sustainable manner. This entails careful management, balancing the varied and competing needs for the water available.

Land drainage in the area is provided for by three distinct systems reflecting the varying topography of the area. Upland watercourses tend to be natural, swift flowing streams with narrow flood plains and with little in the way of major improvement for flood defence or land drainage purposes. As these streams flow off the high land, they cross the low lying flat coastal plain on their progression towards the sea. Much of the plain lies below the level reached by the highest tides and the streams change noticeably from swift flowing to sluggish typical fen type drains, often embanked and greatly improved from the land drainage and flood defence perspective.

Drainage within the coastal plain is provided by three Internal Drainage Boards. Due to the low lying nature of the plain much of the drainage system is reliant on pumping stations operated by the IDBs to raise drainage waters sufficiently to discharge to the sea or to the arterial watercourses.

Tidal defences are of particular significance along this stretch of the East Coast. Historically, the area has been subject to tidal inundation - the event of 1953 being uppermost in peoples minds. Since then heavily engineered concrete defences fronting the most densely populated areas between Mablethorpe and Skegness have been constructed and maintained, these are currently being augmented with beach nourishment to replace the sands which are constantly being eroded by coastal processes. To the north of Mablethorpe and south of Skegness, beach levels are generally accreting or stable and natural defences in the form of sand dunes supplemented by man-made clay banks protect the low lying land behind. These defences have also to be managed to maintain the standard of protection afforded.

Mablethorpe - Convalescent Home

In the Plan area there are approximately 2100 archaeological sites ranging from urban sites in Louth to rural priory sites (eg Markby), Roman Settlements (eg Binbrook), Neolithic and Bronze Age burial mounds, medieval settlement sites, maritime sites and so on. Many of these sites are protected as Scheduled Monuments. Several of the sites in the Eastern Marsh area of the county are buried under earlier marshland deposits, some at a depth of over three metres and are thus well protected. The sites in this area are some of the best preserved in the country and due to the high water table have very good organic and environmental preservation. Any change in the water table (both upward and downward) can upset the delicate anaerobic conditions and lead to the decay of the fragile remains. Obviously in our undertaking of land drainage and sea defence work, which can potentially impact on both archaeological remains and water levels, we have to have regard to such.

The River Steeping is popular as a recreational fishery, it rises as the River Lymn in the Wolds above Tetford and drains a predominantly sandstone catchment located to the west of the Wold Chalk escarpment. Some trout angling is practised on the River Lymn with the bulk of recreational angling taking place further downstream on the River Steeping and the Wainfleet Relief Channel. The main species sought on the River Steeping are roach, bream, tench, and pike. The Louth Canal is also renowned as a coarse fishery with roach being the most popular species caught. Small trout fisheries exist on the upper Great and Long Eau, the Waithe Beck and River Lud.

In recent years the numbers of small stillwater coarse fisheries within the Plan area have

expanded. This reflects the popularity of angling amongst the east coast holidaymakers- recreational angling contributes greatly to the local economy during the holiday season.

Both the coastal fringe and Wolds are popular recreational areas. The Plan area contains a wide variety of recreational walks, cycle routes and bridle ways. Recreational walking sites are located at Louth, Burgh le Marsh, Alford, and Tetford at the source of the River Lymn. There are also a number of cycle routes and bridle ways situated towards the edge of the Wolds escarpment which are mostly used during peak holiday periods by tourists visiting the east coast. Recreational sailing activities take place on Covenham Reservoir near Louth and elsewhere along the east coast.

There are a number of important breeding and over wintering reserve sites within the Plan area including the Sea Bank Clay Pits, Donna Nook, Saltfleetby and Theddlethorpe Dunes, and Gibraltar Point all of which provide important habitats for a wide range of birds and constitute a vital element to the east coast migration route. These sites are very popular with bird watchers all year round.

Water quality in the Plan area is generally good to fair, reflecting its rural nature and the lack of major effluent discharges to its main watercourses. Only one stretch of river significantly fails to meet its target standard, the length of the Louth Canal downstream of Louth town to Alvingham footbridge and it is anticipated this will in part be remediated by improvement works to combined sewer overflows, currently in hand by Anglian Water Services Ltd. However, marginal quality failures do exist within the Plan area and these are generally associated with drought related conditions and nutrient enrichment. The trend in the biological quality of rivers is steadily improving. In terms of Bathing Water quality all of the Bathing Waters identified comply with the EC Bathing Waters Directive.

In essence, many of the water quality issues in our previous Management Plan for this area were related to low flows and drought conditions. These have to some extent been alleviated by a mixture of work prompted by ourselves, undertaken by the major dischargers and other partner organisations and the return of more favourable flow conditions due to increased rainfall events. There are however, persisting issues identified relating to drought and saline intrusion. The diversity of macroinvertebrates has been impacted due to these environmental pressures.

Concerns remain relating to eutrophication, nitrate concentrations and low flows. Eutrophication is the enrichment of water by nutrients, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and the quality of the water concerned. The key nutrient controlling eutrophication in freshwater is phosphate. The principal sources of this are sewage effluent discharges and surface water run-off from agricultural land. The slow moving nature of watercourses also contributes to this problem. A number of the watercourses in the area are considered to be eutrophic, one of which - the Louth Canal - has been designated as a Sensitive Area (Eutrophic) under EC Legislation.

Nitrate is a chemical of concern in the aquatic environment because of its contribution to eutrophication in rivers and if its concentration exceeds the maximum admissible limit for drinking water it can limit use for public supply. The Plan area includes a significant section of the North Lincolnshire Wolds Nitrate Vulnerable Zone (NVZ). When the NVZs come into force (1998/9) farmers within these zones will have a statutory obligation to comply with action programmes based on the MAFF Code of Good Agricultural Practice for the Protection of Water. This means, for example, that fertiliser applications must be determined by crop needs, timing in relation to crop growth, soil conditions and so on.

Air quality within this predominantly rural area is relatively good and has been improving in recent years. These improvements are set to continue over the next decade. The new systems for dealing with industrial pollution introduced by the Environmental Protection Act 1990, new vehicle standards, and other measures aimed at mitigating the environmental effects of traffic are addressing the reduction of emissions. The UK confidently expects to meet its existing international commitments for reductions in emissions of volatile organic compounds and oxides of nitrogen and sulphur dioxide.

The coastline of the LEAP area contains habitat of national and international importance for wildfowl and waders. To the north is the North Lincolnshire Coast SSSI, within which is the RSPB Reserve at Tetney and the Lincolnshire Trust Reserve at Donna Nook. Below this are the English Nature and Lincolnshire Trust reserves within the Saltfleetby - Theddlethorpe Dunes SSSI. These sites are also important for their breeding colonies of grey seal and natterjack toad. To the south is the SPA, candidate SAC, SSSI and National Nature Reserve at Gibraltar Point. This is important for its dunes and other coastal habitats and their associated invertebrates and migratory and breeding birds.

Wet grasslands and meadows near the coast support large numbers of wildfowl and coastal birds such as lapwing, snipe and redshank. Both of these meadow and pasture habitats have been declining due to drainage and conversion to arable land.

Freshwater habitats along the coast and its adjacent marsh area include slow flowing streams, drainage ditches, blow wells and disused sea bank clay pits all supporting a wide diversity of wildlife. However, over two hundred years of land drainage activity and the needs of flood defence have left plant diversity along river corridors generally low.

River headwaters and chalk streams constitute the main aquatic and riparian habitats in the Wolds area of the Plan with small areas of marsh and spring line flushes occurring in the steep river valleys. Important alder carr and other woods on the valley bottoms have been highlighted in our survey work, demonstrated by the high diversity of woodland species on the upper River Lymn and Waithe Beck. The most extensive woodland in the Plan area is to be found where the Wolds overlap the Coast and Marsh Natural Area particularly on the clay soils between Willoughby and Louth.

Nesting - Great Crested Grebe

Mammals and birds tend, by their nature, to have a higher profile in the public eye when it comes to protecting and conserving species. In this catchment otters and water voles are present, both national priority species with a high profile. Local priority species include kingfishers and snipe. Action to protect and conserve individual species such as otters involving the restoration of habitat which benefits a wider range of species, such as dragonflies, damselflies and water shrews is required.

Many of the diverse habitats in the Plan area have been damaged in the last sixty years. Climate change, urban expansion and development, needs of the leisure and recreation industry, changes in agricultural practises and modern land drainage techniques have all contributed to an overall decrease in the areas biodiversity.

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TITLES OF LEAP ISSUES

Managing Our WATER RESOURCES

1a Available water resources in the catchment are inadequate to meet future industrial demand and summer spray irrigation demand.

1b Available water resources in the catchment are inadequate to meet future growth in public water supply demand, above existing licensed commitments.

1c There is a limited understanding of the groundwater hydrogeology south of Louth.

Enhancing BIODIVERSITY

2a Changes in land drainage and agricultural practices have reduced habitat diversity within rivers their surrounding flood plains and the coastal marsh area.

2b Alien American Signal Crayfish are believed to have colonised the River Lymn.

2c On the Rivers Lymn and Steeping there are a number of spray irrigation licences that do not have adequate conditions to protect the water environment.

2d There is concern that abstraction from the Chalk aquifer is leading to depleted spring flows.

Managing Our FRESHWATER FISHERIES

3a Fish movement between river stretches is limited by river control structures.

Delivering INTEGRATED RIVER-BASIN MANAGEMENT

4a The discharge consent conditions for a number of Sewage Treatment Work (STW) discharges will not protect downstream water quality if significant development occurs within the catchment.

4b Inadequate local sewerage systems in some villages result in localised pollution and/or public health problems.

4c Nutrient enrichment of water bodies in the Plan area impacts on water quality and affects flora and fauna and other uses of water e.g.navigation, amenity and fishing. River Ecosystem quality targets can be compromised.

4d Routine biological and chemical monitoring has revealed a problem with water quality on the stretch of the Louth Canal downstream of Louth to Alvingham footbridge.

4e Salt water intrusion into East Coast streams can affect water quality.

4f The proposals by the Louth Navigation Trust to restore the Louth Navigation are constrained by water resources, water quality, flood defence and environmental concerns.

Conserving the LAND

5a The standard of flood protection provided to the coastal strip between Donna Nook and Saltfleet Haven is uncertain.

5b The long term capability of Wainfleet and the old Chapel St Leonards pumping stations, to discharge flood waters, is in doubt.

5c The condition of a length of flood bank along the Waithe Beck is uncertain.

5d The standard of flood protection provided on the Woldgrift Drain is uncertain.

5e Under certain conditions windblown sand may leave the beach and be deposited in urban areas.

Managing WASTE

6a Unauthorised disposal of waste from caravan sites takes place within the Plan area.

6b Landfill gas emissions from Kenwick Landfill site are causing odour problems in the locality.

Addressing CLIMATE CHANGE

7a A fuller understanding of coastal processes and their impact on sea defences is required to enable the formulation of sustainable sea defence strategies.

In September 1997 the Environment Agency produced a document entitled 'An Environmental Strategy for the Millennium and Beyond'. This strategy is essentially based upon the need to take an integrated approach to the management of the whole environment. In producing this Plan we have therefore used the principal and immediate concerns set out in the *Strategy* to collate the Issues and show how LEAPs utilise integrated action for local environmental improvement.

Our principle and immediate environmental concerns in the Louth Coastal area relate to:

- Managing our WATER RESOURCES.
- Enhancing BIODIVERSITY.
- Managing our FRESHWATER FISHERIES.
- Delivering INTEGRATED RIVER-BASIN MANAGEMENT.
- Conserving the LAND.
- Managing WASTE.

The boxes at the beginning of each Section explain what the Environment Agency are doing nationally to deal with each of these challenges, and each Issue helps to highlight local strengths and weaknesses against these targets. Our intended approach for dealing with these challenges is set out in the following text and tables, which show:

- The **Title** of the Issue.
- Supporting **background text** to explain the Issue.
- Proposed **Options** for resolutions of the Issue.
- Responsible **organisations** who will implement the proposed activities, either in a lead role or in partnership with others.
- **Advantages** of the Option.
- **Disadvantages** of the Option.

The following points should also be noted:

- Our everyday work commits substantial resources to monitoring and managing the environment. This work is explained fully in Part II of the document, under the Uses, Activities and Pressures Section and the State of the Environment Section.

- Some actions will require feasibility studies and cost-benefit appraisal of Options prior to work commencing. In some cases, depending on the outcome of these studies, further action may not be justified.

- Should more Issues become apparent during the Consultation Period , further Actions will be added at the Action Plan stage.

- The Issues and Options are not presented in any order of priority and the Options are not mutually exclusive.

Managing our WATER RESOURCES

We will:

- demand a more efficient use of water by the water companies and by industry in general;
- encourage a more efficient use of water by the public and a change in public attitude to water usage;
- promote the development and sale of low-water usage domestic appliances, supported by legislative changes, if necessary;
- demand reductions in leakage by the water companies before considering any cases for investment in new reservoirs;
- support the imposition of compulsory selective metering where water supplies are under stress and where meters and economically sensible to install;
- support the voluntary acceptance of water meters when accompanied by other water-saving incentives for the Customer;
- vigorously apply our Groundwater Protection Policy to ensure that the quality and use of our groundwaters is improved;
- examine water transfer schemes carefully to ensure that no environmental damage would result from their introduction;
- not approve the exploitation of new environmental resources until water saving measures have been introduced;
- implement the current programme of alleviating low-flow rivers as quickly as possible;
- seek new legislative powers to reform the use of 'licences of right' to extract water from the environment;
- seek new powers to facilitate the inter-basin transfer of water, and for the open and transparent provision of plans and information relating to such schemes in order to broaden the public debate on these important issues;
- ensure that the practical limitations arising from water supply and treatment are fully considered by providing planning authorities with all information relevant to new housing or industrial developments;
- ensure that the UK's experience and needs are reflected in the scientific and technical discussions within the development of the EC's *Water Framework Directive*;
- ensure that all environmental needs are fully taken into account within the next Asset Management Plans (AMPs) negotiations with the water companies; and,
- research into more efficient methods for the management of water, and into the potential risks for the aquatic environment arising from its mis-management.

Issue 1a Available water resources in the catchment are inadequate to meet future industrial demand and summer spray irrigation demand.

Background

The resources of the local groundwater aquifers are fully committed to existing abstraction licences and the environment. The Chalk is over committed in licence terms and the Sandstone is fully committed. The Spilsby Sandstone aquifer lies beneath the Chalk aquifer. The Agency's policy on all local aquifers is not to grant abstraction licences for additional water from groundwater. This policy has been in force for a number of years. Similarly, summer surface water resources are fully committed and licences for additional water abstraction are not granted. Winter surface water is unlikely to be available in sufficient quantities for industrial use, but abstraction of winter water and storage for summer use for spray irrigation is encouraged.

An application for additional water for industrial use from the Spilsby Sandstone aquifer was refused in 1996. The applicant appealed but the decision of the Environment Agency was upheld.

Effects

Growth in demand for water beyond existing licensed commitments from local water resources would be unsustainable.

Options	Responsibilities	Advantages	Disadvantages
Industry: *Make developers aware of the lack of water availability within the Plan area, through the planning consultation process.*	*Environment Agency / Planning Authorities*	*Developers aware of the situation at an early stage.*	*Very limited future industrial development opportunities where large quantities of water are required.*
Spray irrigators: *Encourage the construction of winter storage reservoirs.*	*Environment Agency / NFU / Farmers*	*Improved reliability of water available for irrigation.* *In the medium term this will lead to less pressure on the river environment in summer when coupled with a reduction in summer water abstraction.*	*Initial cost to farmers of constructing winter storage reservoirs.*
Do nothing			Farmers/developers will not be aware of the lack of available water or alternatives.

Issue 1b: Available water resources in the catchment are inadequate to meet future growth in public water supply demand, above existing licensed commitments.

Background

The resources of the local groundwater aquifers are fully committed to existing abstraction licences and the environment. The Chalk is over committed in licence terms and the Sandstone is fully committed. The Spilsby Sandstone aquifer lies beneath the Chalk aquifer. The Environment Agency policy on all local aquifers is not to grant abstraction licences for additional water from groundwater. This policy has been in force for a number of years. Similarly, summer surface water resources are fully committed and licences for additional water abstraction are not granted. Both aquifers are important sources for public water supplies.

Anglian Water Services Ltd have licences to abstract water from 10 sources in the Spilsby Sandstone and 6 sources from the Chalk aquifer within the Plan area (See Map Number 5). In 1991/92, a number of 10 year time limited abstraction licence variations were granted to AWS from both Spilsby Sandstone and Southern Chalk sources. The overall effect of these licence variations was to enable some operational flexibility in where water was abstracted, although overall no additional water abstraction was permitted. From a group of 7 sources in the Spilsby Sandstone, abstraction has ranged from 75 to 94 % of licensed quantity in recent years. Public water supply demand forecasts have fallen considerably since 1992. Forecasts in 1994 indicated that there would be little or no growth in demand for public water supplies. Current policy for the local aquifers is to permit no additional water to be licensed since from our current understanding of resources, there are no further local resources available. In future, demand management (metering, water company leakage control, etc) should lead to a reduction or flattening of growth in demand for water. If demand for water increases considerably then additional water may be required in the Plan area. Supplies would have to be met from elsewhere (possibly supplies from Covenham Reservoir).

Effects

Growth in demand for water beyond existing licensed commitments from local water resources would be unsustainable.

Options	Responsibilities	Advantages	Disadvantages
Demand management by Water Company.	*Anglian Water Services Ltd*	*Reduces water demand / stems growth in demand for water. Delays the investment and development of the next water resource.*	*Potential costs to water company.*
Make plans/consider options and feasibility for making further water available after demand management options	Anglian Water Services Ltd	Long term plans in hand to meet demand for public water supplies in a sustainable manner.	Investment costs in new water resources and cost to consumers.
Do nothing			Demand for water will grow and lead to an earlier need for further investment in new water resources and potentially more pressure on the general water environment.

Issue 1c: There is a limited understanding of the groundwater hydrogeology south of Louth.

Background

The confined southern Chalk aquifer relies on recharge from the northern Chalk aquifer to meet the needs of abstraction for public water supplies from the southern Chalk. The resources of the northern Chalk aquifer are over committed. The Spilsby Sandstone aquifer lies beneath the southern Chalk aquifer and is also used as a source for public water supplies and is fully committed. It is believed that there is some connection/ hydraulic continuity between the Chalk and Sandstone aquifers. There are mathematical models of each aquifer that were independently developed and there is a lack of agreement between the two models. There is a need to further our understanding of the availability of sustainable water resources.

Effects

Without a greater understanding of the groundwater movement and availability, the Environment Agency would be failing in its duty to secure the proper use of water resources.

Options	Responsibilities	Advantages	Disadvantages
Carry out further investigation and groundwater modelling.	*Environment Agency.*	*Improved understanding of groundwater movement and resource availability leading to better long term management of water resources for the environment and abstractors.*	*Cost.*
Do nothing.		Potentially inappropriate management of water resources in future.	No furthering of understanding of aquifer interactions. Possible ineffective management of water resources over the longer term.

Enhancing BIODIVERSITY

We will:

- play a full part in implementing the EC *Habitats Directive*;
- play a full and active part in delivering the UK's Biodiversity Action Plan by acting as the 'contact point' for twelve species of aquatic animals and plants, and by acting as the 'lead partner', either singly or in collaboration with others, for ten of them;
- ensure that all aspects of the Biodiversity Action Plan are incorporated into the Agency's guidance and become part of its Local Environment Agency Plans;
- implement a series or regional projects, in partnership with local conservation groups, to deliver biodiversity targets at specific sites;
- allocate specific resources to conservation projects aimed at increasing biodiversity;
- control eutrophication, where feasible, in order to enhance biodiversity;
- improve the management of wetlands for conservation purposes;
- use and promote best environmental practice for the protection and restoration of river habitats;
- develop and set conservation criteria for all of the Agency's environmental licensing activities;
- implement specific projects to restore habitats in rivers and lakes, increase the area of reedbeds and other water plants, and improve river banks;
- ensure that there is no deterioration in the quality of the aquatic environment in particular, and deliver significant improvements in river and still water quality by tackling diffuse pollution of them; and,
- carry out research into the management of species in the aquatic environment in order to meet fully all biodiversity action plan targets.

Issue 2a: Changes in land drainage and agricultural practices have reduced habitat diversity within rivers, their surrounding flood plains and the coastal marsh area.

Background

For most of this century river management across the Region was heavily influenced by agricultural policy to improve drainage within low lying land to maximise crop production, notably cereals. This has resulted in the degradation and loss of many in-channel and flood plain habitats and a consequent reduction in biodiversity. Within the Long and Great Eau catchment for example, considerable changes in land drainage, flood defence, and more recently agricultural practise have taken place over the last 150 years resulting in a dramatic reduction in flora and fauna. Previously noted fauna included salmon, sea trout, otter and kingfisher, of these only kingfisher are now known to breed in small numbers. Further losses of habitat have occurred with the conversion of a significant proportion of the once extensive grazing marsh to areas of arable land.

Effects

The relationships between water level and surrounding flood plains has been broken leaving many rivers to flow within an over widened deep channel with very few riparian habitats upon which flora and fauna depend for their survival. Many rivers display poor habitat diversity together with limited plant communities. The arable conversion of grassland along the coast has negated the need for 'wet fences' and 'cattle drinks' and allowed the dropping of ground water levels by drainage practices, which in turn has facilitated more efficient arable cropping. This has led to a progressive drying out of areas that once provided habitat for a diversity of wetland species of both flora and fauna such as great burnet and breeding snipe.

Options	Responsibilities	Advantages	Disadvantages
Collaborate with landowners to restore wetland habitats and create buffer zones where appropriate.	*Environment Agency\MAFF*	*Can involve collaboration between several interested parties with associated pooling of resources and funding.*	*Cost*
Install gravel bars and riffles at suitable sites as opportunities arise.	*Environment Agency/ MAFF*	*Fulfils duties to further conservation.* *Can be achieved with neutral or even beneficial impact on standards of flood defence in the catchment.*	*Cost*
Improve operational management of Main rivers. *Encourage good grazing practice.*	*Environment Agency/MAFF*	*As above.*	
Review water level management adjacent to, and within, Statutory and local sites of conservation importance.	*Environment Agency, IDBs, English Nature, Wildlife Trusts, Landowners*	*Establish targets to maintain habitat and species significance of sites.*	*Cost.*
Do nothing			Continued paucity of biodiversity.

Issue 2b: Alien American Signal Crayfish are believed to have colonised the River Lymn.

Background

Nationally the Native Crayfish *(Austropotamobius pallipes)* is a threatened species protected by both UK and EC legislation. Native crayfish are one of the species identified for protection as part of the UK.'s Biodiversity Action Plan.

Since the 1970's the national population has come under increasing threat from several non-native species, such as the American Signal Crayfish, introduced for the aquarium and restaurant trade. The spread of introduced species eliminates native populations by competitive exclusion (food and habitat), predation, (such species being highly aggressive and difficult to confine), and the introduction of the fungal disease, "crayfish plague". Habitat modification and management of rivers are also factors causing loss or decline in native populations.

Prior to 1996, the keeping of non-native crayfish had to be licensed under the Import of Live Fish Act (1980). Following a review of that legislation, to allow the commercial development of non-native crayfish for the food market, the original legislation was relaxed and only certain waters with designated "significant populations" of native crayfish are protected. The differentiation between protected waters and others is administered by the designation of postal areas were licences are not required. The River Lymn has been designated as a protected watercourse.

A stillwater site close to the River Lymn has been identified that contains an abundant population of signal crayfish and there is concern that they might escape and inhabit the River Lymn and hence threaten the habitat and native population (If currently present).

Effects

The presence of non-native species presents an unacceptable risk of disease and damage to habitat, leading ultimately to the extinction of the native species.

Options	Responsibilities	Advantages	Disadvantages
Remove the immediate threat of the non-native crayfish from the area i.e the affected pond.	*Environment Agency/Pond owner*	*Reduced risk of non-native crayfish entering the River Lymn.*	*Cost of carrying out action.* *Potential impact on the other flora and fauna in the pond.*
Establish the density and distribution of native and non-native crayfish within the River Lymn, and remove the alien species.	*English Nature Environment Agency*	*Confirm unsubstantiated reports of native crayfish in the River Lymn.* *Assist in restricting spread of non-native crayfish (avoiding consequent impact on native species) and maintain ecological balance.*	*Cost.*
Develop and implement Local Biodiversity Action Plans.	*Environment Agency, English Nature, MAFF*	*Protection of native crayfish.*	
Education of landowners\ restuaraunters to the potential dangers of non-natives.	*As above*	*As above*	*Cost*
Do nothing			Eventual Extinction of Native Crayfish.

Issue 2c: On the Rivers Lymn and Steeping there are a number of spray irrigation licences that do not have adequate conditions to protect the water environment.

Background

The demand for surface water for spray irrigation from the River Lymn during dry summers can lead to very low river flows and insufficient protection for the water environment. There is insufficient surface water available in dry summers to reliably meet the needs of existing spray irrigation licence holders. A number of the spray irrigation licences are Licences of Right; others have no controls to protect the river environment. The Environment Agency has used its powers in recent years to restrict spray irrigation to protect the river environment when there is an exceptional shortage of rainfall.

Effects

During dry summers and low flows, without some intervention, abstraction under current licenses can lead to environmental impacts on the river. The current licences are not very reliable for their intended use and long term are not sustainable without causing environmental impact.

Options	Responsibilities	Advantages	Disadvantages
Encourage the construction of winter storage reservoirs. (Abstraction of water in winter and storage for summer use)	*Environment Agency / NFU / Farmers.*	*Improved reliability of water available for irrigation. In the medium term this will lead to less pressure on the river environment in summer when coupled with a reduction in summer water abstraction.*	*Initial cost to farmers of constructing winter storage reservoirs.*
Persuade abstractors to adopt new level/flow conditions on summer Spray irrigation abstraction licences.	*Environment Agency / Farmers.*	*No compensation costs for Environment Agency. Responsible and proactive action by the farming community in adopting new level/flow conditions.*	*Limited incentives for farmers unless they have winter storage reservoirs.*
Continue as present; ie using powers to introduce restrictions in periods of exceptional shortage of rain.	Environment Agency / Farmers.	Effective in curtailing demand for water from the river in summer.	Limited reliability of water availability for farmers. Staff time intensive for the Environment Agency in managing the water situation. Can only be implemented during periods of exceptional shortage of rain.
Impose conditions on abstraction licences.	Environment Agency.	Effective in protecting the river environment.	Compensation may be payable. Unlikely to be popular with spray irrigators.
Adoption of a pro active policy of reducing licensed quantities by requiring (any) existing summer licences to be traded in as a condition of granting winter storage licences.	*Environment Agency*	*Reduction of pressure on the water environment during summer and low flows. Environmental gain. Lower abstraction charges to farmers abstracting winter water for storage.*	*Increases reservoir construction costs to abstractors.*
Ensure issues are raised in connection with the Government's abstraction licensing review announced in May 1997 (Water Summit).	Environment Agency.	Appropriate legislation is drafted to afford adequate protection for the water/river environment.	The implementation of any changes affecting existing licences is likely to be longer term.
Do nothing			There will be adverse impact on the river environment. Long term the current position is not sustainable.

Issue 2d: **There is concern that abstraction from the chalk aquifer is leading to depleted spring flows and there is limited understanding of the linkages between river flow regimes and water needs to sustain river life.**

Background

The confined southern Chalk aquifer relies on recharge from the northern Chalk aquifer to meet the needs of abstraction for public water supplies. The resources of the northern Chalk aquifer are over committed. The Spilsby Sandstone aquifer lies beneath the southern chalk aquifer and is also used as a source for public water supplies and is fully committed.

There are particular concerns over the lack of flow in spring fed watercourses of the catchment. From some initial research it is known that there are links between river flows, channel morphology and the habitat of in river flora and fauna. There is a need to better understand these links and identify species and habitats impacted by low flows and only then can steps be taken to manage the river flow regime to ensure the protection of river life.

Effects

Without greater understanding of the relationships between river flow and river life the Environment Agency would be failing in its role to ensure the long term protection of the river environment.

Options	Responsibilities	Advantages	Disadvantages
Carry out investigation/ studies to determine the requirements for flow in spring fed streams in the catchment following the establishment of ecological targets for flora and fauna.	*Environment Agency.*	*Improvements to our understanding of the relationships between in river needs for flow, river morphology and habitat, leading to actions to ensure protection of the river environment.*	*Cost. Progress is likely to be slow as research is ongoing; there are no established criteria set out defining the relationships between flow, river substrate and habitat.*
Do Nothing.			No scope to understand the in river needs and protect the river environment. Potential for ineffective management of water resources for the river environment.

We will:

- secure a more robust funding base for fisheries management by improved marketing and the setting of fair charges to anglers;
- review the economic basis of fisheries management;
- introduce a standard fisheries classification scheme;
- monitor every river fisheries over a five year rolling cycle;
- restore spawning grounds for freshwater fish;
- implement a programme of minimum acceptable flows for rivers;
- develop specific longer-term strategies for salmon, trout and coarse fisheries;
- reduce poaching to a minimum and bring rod licence evasion to under 10%;
- consider the likely costs and benefits of fixed penalty fine schemes for rod licence offences;
- consider the desirability of introducing mandatory rod licence display systems; and,
- research into the factors which affect the viability of our unique freshwater fisheries populations.

Issue 3a: Fish movement between river stretches is limited by river control structures.

Background

Obstructions and barriers prevent the free passage of fish, species such as brown trout, dace, chub, minnow, grayling, brook lamprey and eel which need to move freely throughout a river system during certain stages of their lifecycle. Restriction of movement because of artificial barriers can have an adverse influence on the distribution of the natural fish population.

The UK Biodiversity Action Plan was published in 1994 as a result of the commitment of government to the 1992 earth summit in Rio. The Agency is one of many organisations responsible for delivery of the plan. The brown trout, grayling and brook lamprey are fish species which have been particularly noted as being under threat and are on the Biodiversity Long List for an action plan and impacted by barriers to migration.

Effects

Barriers have restricted the movement of migratory fish species impacting directly on the diversity and density of all migratory species.

Options	Responsibilities	Advantages	Disadvantages
Install fish passes to all appropriate control structures.	*Environment Agency*	*Permits fish to move freely throughout river system.*	*Cost.* *Some depletion of water resources.*
Ensure that new structures include a fish pass.	Environment Agency	As above	As above.
Restock rivers with fish.	Environment Agency	Improved fish biomass and species diversity.	Not sustainable.
Do nothing			Potential extinction of migratory species.

We will:

- manage river-basins in an integrated way, via Local Environment Agency Plans;
- ensure that all waters are of sustainable quality for their different uses;
- deliver a continual improvement in overall water quality;
- provide effective flood defence;
- provide an effective flood warning system;
- increase the numbers of rivers and still waters capable of supporting viable fisheries;
- enhance and conserve inland navigations, as national assets of environmental, economic, social and recreational value;
- secure the most appropriate legislation, management systems and financial arrangements to ensure the sustainability of our navigational waters;
- work with others to improve and develop inland waterways as an integrated network;
- improve river habitat quality, as measured by river habitat surveys;
- improve wetland management;
- improve riverside landscapes;
- improve bathing water quality;
- improve estuarine waters for shellfisheries;
- increase the number of Agency-owned sites available for public recreation; and,
- work with local authorities to maximise the conservation and recreational use and value of our river-basins.

Issue 4a: The discharge consent conditions for a number of Sewage Treatment Work STW discharges will not protect downstream water quality if significant development occurs within the catchment.

Background

Currently, some AWS Sewage Treatment Works (STWs) in the Plan area are operating to a better standard than that required by their Discharge Consent (in terms of volume discharged and/or quality of effluent). This occurs, for example, due to the provision in the consent for growth/development.

As growth occurs in the STW catchment or as STW performance approaches that required by the consent, a deterioration in water quality may occur resulting in a failure of the watercourse to meet its River Ecosystem target. The risk of deterioration in discharge performance in most cases is low, provided that current operational practices continue and only modest growth occurs within the sewerage catchment areas served by these STWs.

Effects

There are a number of "over performing" STWS in this catchment, for example, Binbrook, Mablethorpe, and Tetford which could result in the failure of a water quality objective.

Current Agency consenting policy and planned investment, as agreed by Government during negotiations on water charges (AMP2), do not allow the Agency to take steps to prevent this.

Options	Responsibilities	Advantages	Disadvantages
Maintain and improve effluent quality through discussion and cooperation with AWS.	*Environment Agency/ AWS*	*Downstream water quality protected.*	*No obligation on AWS to maintain performance above that required in the consent.* *Additional Capital Expenditure/ Operational Expenditure for AWS.*
Review flow data upstream of discharges to confirm dilution flows; re-calculate "protective" consent conditions as required. Review the rate of development.	*Environment Agency*	*Gives confidence to the calculations of "protective " consent calculations.* *Better decision making.*	*Will not improve current risks.* *No obligation for AWS to improve effluent to meet "protective" conditions.*
Identify as priorities for future investment for future investment under the third Asset Management Plan (AMP 3).	*Environment Agency.*	*Improved water quality in the longer-term.* *Cost-effective prioritisation of investment, enables compliance with long-term WQOs in the long term.*	*Cost.*
Do nothing			"Over-performing" STWs may lead to a failure of a water quality objective.

Issue 4b: Inadequate local sewerage systems in some villages result in localised pollution and/or public health problems.

Background

Small villages in rural areas have traditionally relied upon each dwelling having individual septic tanks. The overflow from such tanks are designed to drain into the soil via a below-ground soakaway. In poorly drained areas with clay soils, or where the water table is high, common practice was to drain the tanks to the nearest watercourse.

Effects

The problem manifests itself in terms of localised pollution and public health concerns. These effects are worst during periods of dry weather and low dilution flows.

Where such watercourses run through the centre of villages, the pollution and smell nuisance resulted in the watercourses being piped-in and buried. In such cases, the piped watercourse became known as the 'village drain' or 'sewer' and many were maintained by the local council.

Recent changes in legislation enable applications to be made to AWS for the provision of a first time rural sewerage scheme. Applications are considered by AWS and assessed against certain technical and economic criteria Where a duty exists to provide a sewerage scheme, the expenditure is planned. Applications have been made for several locations including Anderby, Firsby, Gayton Le Marsh, Saltfleet St Peter, South Reston, Station Road Tetney, South Somercotes, Tathwell and Theddlethorpe All Saints. At the time of going to press, the Agency is aware that AWS have accepted Station Road Tetney. The other applications are being considered.

First time rural sewerage schemes are included in AMP 3 negotiations with Anglian Water Services Ltd.

Options	**Responsibilities**	**Advantages**	**Disadvantages**
Individual householders to provide adequate sewage disposal.	*Householders, developers, Environment Agency*	*Situation improves through pollution prevention.*	*Cost to householder.* *Piecemeal solution, proliferation of individual package treatment plants, which provide less satisfactory treatment than a single larger one.*
Co-operative investment in larger package treatment plant.	*Property owners, developers, Environment Agency*	*Situation improves, provides more co-ordinated approach.*	*Cost to householders.* *Such initiatives suffer delays and difficulties due to the need to set up a management company responsible for the maintenance, upkeep and other costs etc.*
AWS provide first time sewerage schemes for villages affected.	*Householders, Local Authorities, AWS*	*Improved water quality and reduction in nuisance.* *Sewerage treatment facilities provided and maintained by statutory sewerage undertaker.*	*Cost.*
Do nothing			Localised pollution and/or public health problems persist.

Issue 4c: **Nutrient enrichment of water bodies in the Plan area impacts on water quality and affects flora and fauna and other uses of water eg. navigation, amenity and fishing. River ecosystem quality targets can be compromised.**

Background

The quality of many watercourses in the Plan area is adversely affected by eutrophication. Eutrophication arises as a consequence of the enrichment of water with nutrients, principally from sewage treatment works discharges and surface water run-off from agricultural land. Eutrophication is a difficult problem to solve - there are no quick or immediate solutions.

The Agency is currently developing a National Eutrophication Strategy to address this issue.

Effects

As a consequence of eutrophication, water quality and aquatic communities sensitive to nutrient enrichment become adversely affected and the aquatic ecosystem becomes ecologically disturbed, giving rise to excessive weed growth and changes in the composition of plant and animal communities. Recreational use of the waterway may also at times be compromised by these effects notably , eg. angling.

Under the Urban Waste Water Treatment Directive (UWWTD), watercourses directly/indirectly receiving a qualifying discharge (works serving populations greater than 10,000), and that fulfil certain criteria set out in DoE guidance can be designated as a Sensitive Area (Eutrophic) SA[E]. Designation as a SA[E] requires phosphate removal to Directive standards at implicated STWs, unless it can be demonstrated that such removal would have no effect on eutrophication.

The Louth Canal and Covenham Reservoir are designated as SA[E]. Louth STW effluent will be treated to comply with UWWTD nutrient standards within the required timescales (31 December 1998)

The Steeping River also experiences the effects of eutrophication. However there are no "qualifying" discharges to the river and thus nutrient removal from sewage effluent under the UWWTD is not available .

The diagram at **Appendix 2** illustrates eutrophic influences on our watercourses.

Options	Responsibilities	Advantages	Disadvantages
Investigate benefits of non-UWWTD driven phosphorous controls for new and existing discharges.	*Environment Agency/ AWS*	*Assess requirement for nutrient reduction.*	*Cost.*
Promote good agricultural practices to reduce diffuse phosphate inputs into watercourses (eg. reductions in fertiliser application rates, the uses of buffer zones, etc).	*Environment Agency/MAFF* *NFU/FWAG* *ADAS* *Agricultural Community*	*Reduces the level of nutrient originating from diffuse sources.* *Possible long-term reduction in the level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.*
Encourage the use of phosphate-free detergents.	*Environment Agency/ Detergent manufacturers/ General Public.*	*Reduces the level of nutrients in domestic sewage received at STWs.* *Possible long-term reduction in the level of eutrophication.*	*May not have desired effect in terms of reducing/eliminating eutrophication.* *Possible effects of phosphate free alternatives on water quality.*
Do nothing			Continued impacts of eutrophication .

Issue 4d: Routine biological and chemical monitoring has revealed a problem with water quality on the stretch of the Louth Canal downstream of Louth to Alvingham footbridge.

Background

The River Ecosystem (RE) scheme provides, on a National basis, a set of water quality targets which the Agency uses as a basis for setting consents to discharge and in undertaking other water quality planning activities. The stretch below fails to meet its RE target:-

Louth Canal between Louth STW and Alvingham footbridge

This stretch has consistently failed its RE targets for Biochemical Oxygen Demand , ammonia and un-ionised ammonia. Furthermore, the diversity of the invertebrate community within this stretch of watercourse has reduced in favour of pollution tolerant species such that target diversity is not met. This failure was raised in the previous Louth Coastal Catchment Management Plan and is associated with unsatisfactory intermittent discharges from Louth town and the Louth STW discharge. AWS are currently undertaking improvements to the sewerage system in Louth in order to address the problem with intermittent discharges from the town's combined sewer overflows. In addition Louth STW is being assessed for inclusion in AWS's third Asset Management Plan (AMP3).

Options	Responsibilities	Advantages	Disadvantages
Improvements to Louth sewerage system. This work has commenced and is due for completion mid 1998.	*AWS Environment Agency*	*A reduction in intermittent crude sewage discharges to the Louth Canal resulting in improved water quality.*	*Cost*
Seek Improvements to Louth Sewage Treatment Works through AMP3.	*AWS Environment Agency*	*Improved effluent quality leading to improved water quality.*	*Cost*
Do nothing			Continued water quality problems downstream of Louth to Alvingham footbridge.

Issue 4e: Salt water intrusion into East Coast streams can affect water quality.

Background

As freshwater river systems reach the sea there is a risk that saline water will ingress causing changes in water quality. Due to the different densities of saline and freshwaters, saline water can under these circumstances be found creeping along the river bed as it migrates upstream.

A number of watercourses in the Louth Coastal Plan area have over recent years been impacted by saline intrusion resulting in the Agency taking appropriate actions as required. For example, the risk of saline intrusion problems in the Louth Canal has resulted in the coordination of efforts by ourselves the IDBs and AWS to remediate the situation .

A strategy to address the wider issue of saline intrusion within the Plan area does not exist.

Effects

The intrusion of salt water into freshwater systems upsets the ecological balance of a river and can result in fish mortality. In addition to this the quality of the water may be unsuitable for spray irrigation, industrial and potable use.

Options	Responsibilities	Advantages	Disadvantages
Develop a proactive saline intrusion monitoring strategy and emergency and action plans.	*Environment Agency*	*The Agency will improve its management of saline intrusion.*	*Cost*
Evaluate opportunities to make improvements to existing methods of control. Consider options such as improving sea doors, installing bubble curtains etc	*Environment Agency*	*Incidents of saline intrusion will reduce.*	*Cost*
React to incidents of saline intrusion as and when they occur. For example, periods of drought.	Environment Agency	Saline intrusion is managed as and when it occurs.	Environmental stress occurs prior to actions being taken. Cost
Do nothing			Potential for severe water quality problems affecting river life and users.

Issue 4f: The proposals by the Louth Navigation Trust to restore the Louth Navigation are constrained by water resources, water quality, flood defence and environmental concerns.

Background

The Louth Canal was originally created in 1770 to increase trade and improve communications and drainage in and around the Louth area. The opening of the Canal marked the beginning of over 150 years of prosperity and business activity. The lease for maintaining the canal ran out in 1876 and was put out to tender. At this time the railway network was expanding and beginning to have an effect on canal trade, resulting in a very low bid being accepted for the lease. The navigation closed after several years of making a loss in 1924 following the great flood of Louth in 1920.

Restoration of the navigation canal is sought by the Louth Navigation Trust. The Trust are currently involved with a technical appraisal of the projects feasibility. Water resources are limited and should the Trusts plans go ahead water quality may be impacted due to reduced flows leading to algal blooms. Furthermore, pollution from boats, siltation impacting on flora and fauna and the potential for an increased flood risk has been highlighted.

In considering these proposals the needs and interests of all parties and users of the watercourse need to be carefully balanced.

Effects

Potential for underutilisation of the waterway resource by recreational users.

Options	Responsibilities	Advantages	Disadvantages
Produce a feasibility study to assess the impacts, development needs, and opportunities of canal restoration.	*Local Council* *Louth Navigation Trust* *Countryside Commission* *Environment Agency* *Groundwork Lincolnshire.*	*Provide strategy for implementing the improvements.* *Provide a collaborative development package.*	*Funding* *Conflicting issues need to be addressed*
Do nothing			Recreational and commercial opportunities may be lost.

Lock structure - Louth Canal

Conserving the LAND

We will:

- influence the Town and Country Planning Systems to prevent developments in the wrong places;
- implement the Flood and Coastal Defence policy as advised by MAFF and the Welsh Office;
- secure an adequate level of investment in flood defence;
- provide flood plain surveys to local planning authorities;
- discourage development in flood plains;
- work with nature to reduce coastal flooding;
- develop new methods to survey and manage flood defences;
- report regularly on the state of flood defences;
- identify the state and extent of the problem of soil erosion;
- develop a soil erosion alleviation strategy, including guidance on bet practice;
- work with local authorities to identify, and report on the extent of, contaminated land;
- regulate identified 'special' contaminated land sites effectively;
- research into the specific risks and remediation needs of contaminated land;
- measure the effectiveness of steps taken to reduce nitrates in designated nitrate vulnerable zones; and,
- develop methods for monitoring the 'state' and quality of soil with respect to its potential pollution.

Issue 5a: The standard of flood protection provided to the coastal strip between Donna Nook and Saltfleet Haven is uncertain.

Background

Trends over the past 100 years have shown a generally advancing low water line indicating an accreting beach between Donna Nook and Saltfleet. Extensive salt marshes have developed at the back of the beach. The low lying coastal strip landward of the marsh is protected by a clay embankment. The level and condition of the bank can not be stated in any confidence.

Effects

Up to 1000 Ha of high quality agricultural land together with residential properties in the village of North Somercotes would be affected by the failure of these sea defence. Since the level and condition of the bank is uncertain it is not possible to currently determine the level of flood protection provided.

Options	Responsibilities	Advantages	Disadvantages
Carry out investigations to determine existing standards of service and compare with indicative standards. If required seek to promote any necessary improvements in the long term plan, in line with the strategic policy outlined in the Shoreline Management Plan.	*Environment Agency,* *MAFF*	*Any necessary works will be promoted and carried out in a planned and prioritised way.*	*None*
Continue to maintain to existing standard.	Environment Agency	No capital costs. A degree of defence against tidal flooding is maintained.	May not be meeting target indicative standards.
Do nothing	Environment Agency	No cost to the Environment Agency	Standard of protection remains uncertain. Risk of flooding to land and property may be unacceptable.

Issue 5b: The long term capability of Croft Lane Pumping Station and the old Chapel St Leonards pumping stations, to discharge flood waters, is in doubt.

Background

Wainfleet and Chapel St Leonards pumping stations are operated by the Agency to lift low lying drainage waters from the Willoughby High Drain and the Little River Lymn into the North Sea and Steeping River respectively. Pumping plant and associated electrical controls are now approaching the end of their design lives.

Effects

A reduction in reliability at either of these stations will result in increasing maintenance and repair costs. Failure of either station during a flood event will increase the risk of flooding to the urban residential areas of Chapel St Leonards and Wainfleet in addition to several 100 Ha. of high quality agricultural land.

Options	Responsibilities	Advantages	Disadvantages
Carry out investigations to determine the existing condition of pumping plant and equipment. Determine overhaul needs and if uneconomic promote the case for replacement pumping plant Conduct a catchment study to consider the present and future pumping arrangement needs.	*Environment Agency, MAFF*	*Assets are refurbished (or if appropriate replaced) in a planned and prioritised way. Standard of protection to surrounding land and property is maintained.*	*Cost*
Continued maintenance	Environment Agency	A standard of service is provided.	Risk of increasing unreliability which may lead to flooding. Inability to respond to changing catchment characteristics and pumping capacity need.
Do nothing	Environment Agency	No cost to the Agency.	Station failure and consequent flooding of land and property.

Issue 5c: The condition of a length of flood bank along the Waithe Beck is uncertain.

Background

Low lying agricultural land on the Waithe Beck relies on raised earth embankments for flood protection. Erosion of the front face of a 1 km length of bank (between the A16 road at Waithe and the railway line) is giving rise to concern for its structural integrity. If erosion continues that part of the bank will become unstable and lead to a collapse. During a flood event, flooding of the surrounding agricultural land would occur.

Effects

Failure of the bank could result in up to 100 Ha of high grade agricultural land and isolated properties being affected.

Options	Responsibilities	Advantages	Disadvantages
Carry out investigations to determine structural condition of the defence and areas at risk of flooding. If required seek to promote appropriate justified works.	*Environment Agency.* *MAFF*	*Any works necessary will be promoted in a planned and prioritised way to provide a suitable standard of protection* *Potential for environmental improvements.*	None
Continued maintenance	Environment Agency	No additional cost.	Risk of bank failure in the future and consequential flooding of land and property.
Do nothing	Environment Agency	No cost to the Agency	High risk of failure in the near future and consequential flooding of land and property

Issue 5d: **The standard of flood protection provided on the Woldgrift Drain is uncertain.**

Background

The Woldgrift drains a predominantly rural catchment of the Wolds above the market town of Alford. The system relies entirely on gravity discharge to drain waters to sea at Trusthorpe. Gravity discharge is not possible at high tide.

Effects

During periods of high tide no discharge to the sea is possible thus increasing upstream water levels and the risk of flooding.

A culvert conveying the drainage beneath the town centre in Alford is thought to be structurally inadequate. If the culvert were to fail there would be direct flooding implications.

Options	Responsibilities	Advantages	Disadvantages
Carry out investigations to determine the existing standard of defence. If below indicative target standards determine justification for any improvement works. *Assess the current structural condition of the Alford culvert and determine the need for any remedial works.*	*Environment Agency, MAFF*	*Any necessary works identified can be planned and prioritised according to justification to achieve an adequate standard of protection.* *Should work be required there is an opportunity for environmental improvement work.*	*Cost*
Continued maintenance	Environment Agency	Existing standards maintained in the main.	May not be meeting target standards. Failure to identify the potential structural refurbishment need of the culvert may lead to its collapse.
Do nothing	Environment Agency	Cost saving	Reduction in standard of service leading to possible flooding of land and property.

Issue 5e: Under certain conditions windblown sand may leave the beach and be deposited in urban areas.

Background

Beach levels have been raised through the Environment Agency's beach nourishment scheme. As a natural beach it is subject to the impact of tides and wind, reprofiling of the beach results in sand accumulating at the head of the beach. Easterly winds blow this material onto and over the sea defences. The Agency have implemented a strategy involving the erection of fencing in "sensitive" areas to reduce the amount of sand leaving the beach and to carry out works on the beach to move accumulated sand away from the sea defence.

In remote areas it is not proposed to interfere with the natural movement of the sand and to allow hard defences, where they exist, to become covered by the sand so forming a dune.

Effects

Following periods of consistent on-shore easterly winds, sand along the Lincolnshire coast as sand blows into urban areas and onto public highways. There is a possibility that the sand will block drains and accumulate immediately behind the sea defence. Since beach levels have been raised as a result of the Agency's beach nourishment scheme, this natural phenomena has the potential to displace additional sand.

Options	Responsibilities	Advantages	Disadvantages
Continue to implement the Agency's a Sand Management strategy produced to reduce the volumes of sand blowing off the beach by erecting sand baffles and recycling sand accumulations where necessary.	*Environment Agency*	*There is a reduction in the volume of wind blown sand leaving the beach*	*Cost*
Do nothing.			Wind blown sand continues to leave the beach and be deposited in urban areas.

Beach Nourishment

We will:

- provide a high quality waste regulation service;
- develop an overall database of waste arisings and disposals;
- measure the effectiveness of taxation to reduce waste and to encourage its re-use and recycling;
- obtain information on fly-tipping and devise means of combatting it;
- implement the 'producer responsibility' regulations;
- develop life-cycle assessment methodologies for dealing with waste;
- encourage and inspire industry to develop new and improved techniques for the management of special and other industrial wastes;
- ensure achievement of national waste strategy targets for the reduction of waste disposed of to landfill;
- ensure achievement of national targets for the recovery, recycling and composting of municipal waste;
- combat organised crime, at national and international level, involving the illegal trading in waste;
- research into the technical needs of successful waste management, including best practice and best practicable environmental options;
- secure high quality management of radioactive waste in industry;
- ensure that any proposals for solid radioactive waste disposal will provide the necessary high level of protection for man and the environment; and,
- commission research into the potential effects of wastes entering the environment, including the potential effects of radioactive wastes.

Issue 6a: Unauthorised disposal of waste from caravan sites takes place within the Plan area.

Background

The Lincolnshire coast is a popular area for holiday makers. As a result over a number of years static caravan sites have been developed to cater for tourists. There is a positive demand for this type of accommodation, holiday or otherwise. However, such sites are not always managed as they should be in respect of waste disposal.

Effects

The high concentration of static caravan sites along the Lincolnshire coast gives rise to two waste disposal concerns:

a) Caravan sites generate large amounts of putrescible waste which cannot be collected by the normal household waste collection round unless payment is made. These sites should ensure that their waste is properly disposed of in accordance with waste management legislation. However, the Agency is aware of instances where waste originating from these sources has been illegally dumped, causing pollution of the environment and a threat to human health.

b) There have been incidents where waste caravans have been stripped of valuable metals and the remaining carcass disposed of by open burning. As a consequence highly noxious smoke has been released into the atmosphere and the potential for pollution of ground and surface waters has occurred.

The disposal of waste on unlicensed sites can give rise to pollution of the environment, harm to human health and serious detriment to local amenities.

Options	Responsibilities	Advantages	Disadvantages
Increase enforcement activity to encourage correct disposal.	Environment Agency	Successful enforcement acts as a deterrent especially when widely publicised.	Cost and time taken to prepare cases. Not all cases warrant prosecution.
Improve site operators awareness of, and compliance with, current waste management legislation through, for example, advisory mailshots.	*Environment Agency* *Site Operator*	*Spreading of information on waste management practices ensuring better compliance and less enforcement activity.*	*May be hard to judge effectiveness.*
Encourage provision of authorised caravan breaking facilities within the area.	Environment Agency/Planning Authorities	Pollution prevention through regulated breaking and disposal of caravans.	Operation of such facilities dependent on private enterprise.
Campaigns to encourage reporting of illegal waste disposal activities by members of the public.	Environment Agency/East Lindsey District Council	Better public knowledge of waste management legislation and polluting activities.	Hard to implement.
Do nothing			Unauthorised disposal of waste from caravan sites continues to take place.

Issue 6b Landfill gas emissions from Kenwick Landfill site are causing odour problems in the locality.

Background

Kenwick Landfill site is situated on the A16 south of Louth. The site was opened over ten years go for the landfilling of domestic, commercial and industrial waste. Landfill gas, a mixture of methane, carbon dioxide and trace gases, is being produced at the site as a result of the normal anaerobic breakdown of the waste materials.

Effect

Landfill gas contains trace amounts of certain gases which may be odorous. The emission of strong odours from Kenwick Landfill site became evident in 1994, and as a consequence a number of complaints from members of the public have been received since that time. The site operator has already installed an active gas extraction system, whereby gas is pumped from gas vents to a flare stack and burned, and a deodoriser to mask residual smells. Odour assessment is very subjective but the extent to which the smell is detectable outside the site is closely connected to the wind direction and atmospheric conditions at any given time.

Options	Responsibilities	Advantages	Disadvantages
Continue with the Agency's / site operator's strategy to combat odour problems from Kenwick Landfill Site	*Environment Agency/Site Operator (Lincwaste Ltd)*	*Overall reduction in odours.*	*Cost*
i.e :-			
(1) Review gas control measures at the site.	*Environment Agency /Site Operator (Lincwaste Ltd)*	*Ensures optimum gas collection and combustion is maintained.*	*Cost*
(2) Completion of phase I of the site.	*Site Operator (Lincwaste Ltd)*	*Allows greater gas control to be achieved.*	*Cost*
(3) Continue to regulate the landfill operation through the waste management licence.	*Environment Agency*	*Ensures greater control of landfill gas emissions from the site*	*Cost*
Do nothing			Odour problems continue

Addressing CLIMATE CHANGE

We will:

- continue the efficient and effective delivery of Integrated Pollution Control;
- implement the requirements of the EC Directive on Integrated Pollution Prevention and Control;
- implement the relevant requirements of the Control of Major Accident Hazards Directive;
- Develop practical working relationships with fellow regulators, particularly the Health and Safety Executive;
- Develop pollution prevention control tools including projects relating regulation to emission, efficiency and economic benefits;
- encourage the use by industry of BS 7750/ ISO 14001 accreditation;
- encourage registration under the EU Eco-management and Audit regulations;
- pay special attention to the needs of small and medium-sized enterprises;
- maintain and expand the Chemical Release Inventory;
- introduce Operator and Pollution Risk Appraisal;
- play a full and active part in the EU Network for the Implementation and Enforcement of Environmental Law;
- ensure that radioactive releases from nuclear sites which result in exposures to individual members of the public are well within accepted limits;
- ensure that the total potential impact of releases from nuclear sites are environmentally acceptable;
- develop and implement toxicity based consenting methods for releases from complex industrial sites;
- ensure improvements are made to the quality of discharges to estuarine and coastal waters;
- implement the requirements of the EC Urban Waste Water Treatment Directive;
- research into effective means of ensuring that disinfectant and sterilisation techniques are safe for the environment; and,
- develop and implement tools to assess risks, costs, benefits and options in relation to the major industrial pressures on the environment.

Issue 7a: A fuller understanding of coastal processes and their impact on sea defences is required to enable the further development of long term sustainable sea defence strategies.

Background

Coastal processes (wind, tide, wave action etc) are dynamic and require ongoing monitoring through beach/bathymetric, aerial and sea defence survey. Only with regular accurate data sets is it possible to determine whether observed changes in these processes are part of long term trends or short term cyclic changes. A great deal of research has been carried out in some areas, between Mablethorpe and Skegness for example, where the beach nourishment works are being carried out and a good level of understanding of the coastal processes exists. Continued monitoring is essential to enable future reviews of the SMP to be undertaken and sustainable Sea Defence strategies to be produced.

Effects

Without a better understanding of the coastal processes at work, the Agency will not be certain that it is promoting sustainable sea defence policies and appropriately managing existing defences. The SMP requires periodic 5 year reviews. Without good quality up to date data it is impossible to fully understand the coastal processes acting along the shoreline or promote effective and efficient renourishment. The financial implications of this would be profound.

Options	Responsibilities	Advantages	Disadvantages
Continue to undertake shoreline monitoring in a planned and structured way. Continue to build a database containing information covering the entire Anglian coastline. Analyze data to provide guidance in providing strategic direction.	*Environment Agency, MAFF*	*Good quality data is gathered over extensive time periods to improve understanding of natural processes at work along the coast.*	*Cost*
Increase monitoring of coastal processes.	Environment Agency	No real benefit.	Cost - No improved understanding. Cost unnecessary.
Do nothing	Environment Agency	No Cost.	Inability to respond to changing circumstances along the coast. Risk of promoting unsustainable or environmentally damaging works.

Other environmental concerns on the Louth Coastal Plan area relate to:

- Regulating MAJOR INDUSTRIES
- Improving AIR QUALITY

Regulating MAJOR INDUSTRIES

We will:

- continue the efficient and effective delivery of Integrated Pollution Control;
- implement the requirements of the *EC Directive* on *Integrated Pollution Prevention and Control*;
- implement the relevant requirements of the *Control of Major Accident Hazards Directive*;
- Develop practical working relationships with fellow regulators, particularly the Health and Safety Executive;
- Develop pollution prevention control tools including projects relating regulation to emission, efficiency and economic benefits;
- encourage the use by industry of BS 7750/ ISO 14001 accreditation;
- encourage registration under the EU Eco-management and Audit regulations;
- pay special attention to the needs of small and medium-sized enterprises;
- maintain and expand the Chemical Release Inventory;
- introduce Operator and Pollution Risk Appraisal;
- play a full and active part in the EU Network for the Implementation and Enforcement of Environmental Law;
- ensure that radioactive releases from nuclear sites which result in exposures to individual members of the public are well within accepted limits;
- ensure that the total potential impact of releases from nuclear sites are environmentally acceptable;
- develop and implement toxicity based consenting methods for releases from complex industrial sites;
- ensure improvements are made to the quality of discharges to estuarine and coastal waters;
- implement the requirements of the *EC Urban Waste Water Treatment Directive*;
- research into effective means of ensuring that disinfectant and sterilisation techniques are safe for the environment; and,
- develop and implement tools to assess risks, costs, benefits and options in relation to the major industrial pressures on the environment.

Improving AIR QUALITY

We will:

- Help the Government deliver its Air Quality Strategy;
- Ensure emissions from the major industrial processes to the atmosphere are reduced;
- Ensure specific emissions of sulphur dioxide and oxides of nitrogen, which contribute to acid rain, are reduced;
- Discourage the use of solvents in industry, which contribute to the production of ozone, the major photochemical pollutant; and
- Set an example in reducing emissions from vehicles by reducing our own mileage and increasing the use of public transport.

4.0 PROTECTION THROUGH PARTNERSHIP

4.1 Introduction

Using regulatory power set out in legislation, we are able to influence a wide range of activities which impact upon the environment. These may be with respect to discharges to land, air or water and relate to water quality, industrial discharge and water resource concerns. There are however a range of activities such as development and agricultural practices which can potentially impact upon the environment where our powers are not prescriptive. In such instances we rely on working in liaison with others, particularly local authorities, individuals, landowners, businesses and community groups in order to protect and enhance the environment.

4.2 Land Use Planning and LEAPs

Land use is the single most important influence on the environment. Government Planning Guidance highlights the importance of liaison between Local Planning Authorities (LPAs) and the Agency and the relationship between land use and environmental matters.

Control of land use change is primarily the responsibility of LPAs, through implementation of the Town and Country planning acts. Through local development plans, which provide a framework for land use change, and the implementation of development control, local councils decide on the location of new development, the redevelopment of existing areas and changes of use of land or buildings. These decisions can have a profound effect on the environment and it is important that we are able to influence this process. Planning liaison is the link between our functions and local authority planners.

However, whilst the planning system has a significant role in seeking sustainability, it cannot always ensure that an appropriate balance of habitats and features are maintained in the countryside. Many activities which destroy wildlife habitats, such as ploughing meadows and grubbing out woodlands are outside the scope of the planning process. Legislation is proposed which will give protection to ancient hedgerows.

The Environment Agency's participation in the Town and Country planning process is essentially at two levels:

(i) On a day to day basis we act as a consultee in certain types of planning application. We liaise and advise on proposals which may impact on matters relevant to the Agency. This allows our views to be considered by the Council prior to a planning application being decided.

(ii) In the long term, policy and strategy for change in land use is contained in the development plans and other plans prepared by LPAs Development plans are particularly important because they set the framework for development into the future and are the key to the determination of planning applications.

4.3 Local Agenda 21

Agenda 21 is a global action plan for the 21st century that was produced at the Rio Earth Summit in 1992. It brings together economic, environmental and social concerns into a 'blueprint' for a more sustainable way of life for everyone, recognising as well that environmental problems at all levels have their basis in local activities and emphasises the need for local action in the message 'Think Globally, Act Locally'. Local authorities across the world were seen as the focus of promoting and encouraging local community action and were charged with producing a Local Agenda 21.

The process in the UK has taken a variety of forms and names. Many Local Agenda 21 groups have also been involved in the development of local state of the environment reports, such as the Lincolnshire State of the Environment Report (1996) and sustainability indicators to help identify issues of importance to their area. These issues can then be developed into action plans and projects to deliver improvements.

The Environment Agency is obliged under the statutory guidance given by the Secretary of State to assist the Local Agenda 21 process by providing for appropriate consultation with local communities making a full contribution to initiatives under LA21. Also, under the statutory sustainable development guidance given to the Agency from Ministers, the Agency should develop a close and responsive relationship with local communities and this will include LA21 groups, on matters related to our own functions.

In the Louth Plan Area, we are closely involved in the Lincolnshire Environment Forum.

4.4 Planning Guidance

The NRA produced a set of statements in its document "Guidance Notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans". These statements provide a general guide to LPAs on what policies should be included and why they are important. This guidance has been updated and is due to be published shortly. It will incorporate air and waste issues.

4.5 Planning Issues

The planning system generally and the use of planning conditions in particular, must not duplicate the controls imposed by pollution control bodies. These include the Environment Agency and local authorities in their non planning functions. Clarification on this matter is provided in Planning Policy Guidance Note 23.

There are a number of important planning issues of concern within the Plan area which will be addressed and resolved through the adoption of a productive partnership approach between ourselves and LPAs in particular. These are identified below and include guidance which we would like to see adopted by LPAs in the preparation of development plans and in the assessment of planning applications. Attention will be drawn to these statements through our

planning liaison work.

Issue P1 Protection of groundwater resources

The Issue

Groundwater resources are very important and are a major source of high quality public water supply. Both the quantity and quality of groundwater resources must be protected to ensure that future generations continue to benefit from this essential resource.

Groundwater resources require special protection from pollution, since once contaminated, it is often difficult to restore the resource. To ensure sustainable provision of water resources, the precautionary principle should be adopted to avoid unacceptable risk of pollution.

Guidance

Development should not normally be permitted which in the opinion of the local planning authority (LPA), after consultation with the Agency, poses an unacceptable risk of pollution of groundwater resources. Where development is permitted in areas where the groundwater is vulnerable, the LPA should ensure that appropriate pollution control measures are included to prevent an unacceptable risk of pollution of the water resource.

The vulnerability of the aquifer to pollution depends upon many factors, such as the overlying geology and the presence of boreholes. We have mapped the vulnerability of aquifers and identified areas where special protection is required. Maps for groundwater protection have recently been compiled of the Anglian Region, which is acting as a pilot region for their compilation and use. The areas on the new groundwater protection maps are non-statutory and represent areas where groundwaters are at varying degrees of risk from potentially polluting activities and developments. Maps identifying Groundwater Protection Areas have been circulated to all planning authorities.

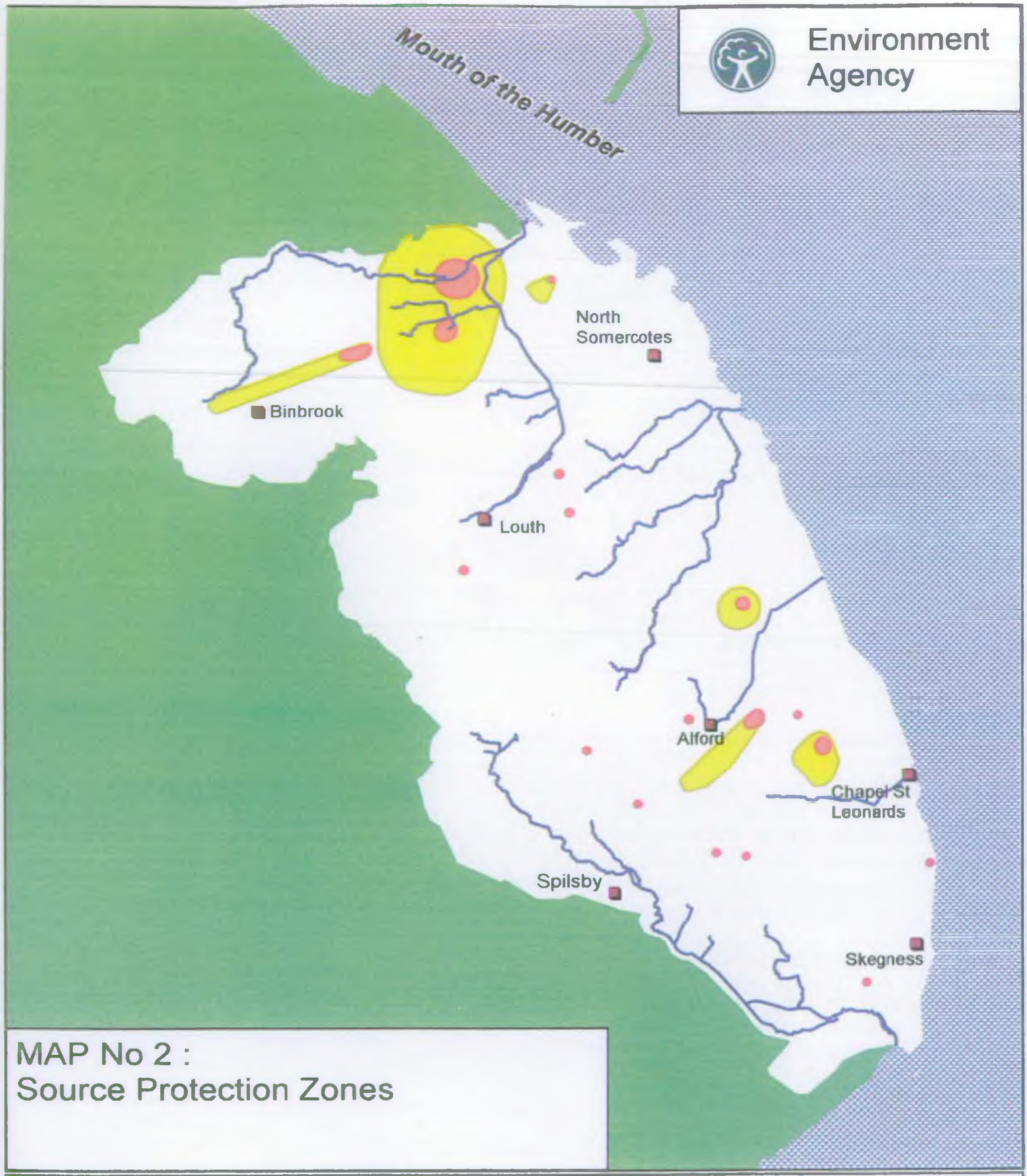
Map No. 2 shows Groundwater Source Protection Zones.

Issue P2 Water Resources

The Issue

Water is an essential resource and is at risk from misuse, being particularly susceptible to the pressures of inappropriate development.

The Environment Agency seeks to ensure a sustainable and cost-effective balance between the amount of water abstracted from rivers and underground sources and the amount to be retained to protect the environment and other interests.



MAP No 2 : Source Protection Zones

KEY:

These maps are based upon the best information available at the time of development. The Agency cannot guarantee absolute accuracy, and it is intended that they will be updated as more information becomes available. Shown on the map are licensed sources of potable groundwater abstracting 90,000m3 per annum or more.
The maps are non-statutory. They are designed to show the varying degrees of risk from potentially polluting activities and developments

Main River
Town
Source Protection Zone I (50 day travel time)
Source Protection Zone II (400 day travel time)

Guidance

The supply of water is an important consideration in planning for new development. The demand for water continues to increase and further development inevitably places additional pressure on existing resources. In order to manage water resources on a sustainable basis, development should be limited to locations where adequate resources already exist, or where new provision can be made without detriment. When assessing potential development, an integrated approach is required, considering the needs of the abstractor, those of the environment and the relationship between surface and groundwater.

In addition, measures to reduce the demand for water, including water efficient devices, should be incorporated into development wherever practicable, particularly in those areas where resource availability is under pressure.

The Agency, in liaison with LPAs is seeking to ensure that:

- development is located in areas where adequate water resources are available;
- demand for water is reduced.

Issue P3 Development in flood risk areas

The Issue

Historically, many settlements in the Plan area and throughout the country, were established close to rivers, since they provided a supply of water, a convenient means of waste disposal and drainage and a means of transport. Coastal settlements often developed around the fishing industry, ports, harbours and since the last century, tourist retreats. Prior to planning controls, many of the settlements expanded into coastal or fluvial floodplains and only in the late 20th Century have policies and guidelines been established which seek to steer development away from such areas. Current concerns over possible climate change and associated sea level rise have reinforced the importance of safeguarding floodplains.

Unless carefully sited and designed, development could itself be at risk from flooding, or could increase the risk of flooding elsewhere. Flooding not only places lives and property in danger, but can also adversely impact upon the environment and associated ecosystems by altering or interfering with natural processes.

Guidance

The protection of floodplains from the physical threats posed by development is dependent on the powers exercised by local planning authorities. However, the Agency is a statutory consultee on development plans and many aspects of development control and one of the Agency's roles is to advise planning authorities on the implications of development proposals on flood risk issues and the environment. The Agency's policy is contained in the Policy and Practice for the Protection of Floodplains.

The Agency, through liaison and cooperation with the LPAs, seeks to prevent:

- the location of developments in the floodplain which would create an unacceptable increase in the risk of flooding;
- developments which would be subject to unacceptable risk of flooding, landslide or erosion;
- developments which would adversely affect existing or proposed flood management or maintenance schemes;
- developments which would require additional public finance for flood defence works;
- developments which would prejudice the capability of the coast to form a natural sea defence;
- developments which would adversely affect the water environment as a result of an increase in surface water run-off.

The Water Resources Act 1991 requires the Environment Agency to undertake surveys to indicate to local authorities, areas where flood problems are likely. Circular 30/92 advises that the results of these surveys should be taken into account by LPAs when preparing development plans. The Agency is currently preparing a priority list of areas to be surveyed.

4.6 Other issues for Partnership

There are a number of other important issues which will be addressed and resolved through the adoption of partnership initiatives between ourselves, local authorities and other interested organisations and individuals. These are identified below and it should be noted that these will be taken forward with the same emphasis and commitment as other issues identified elsewhere in the Plan:

Issue P4 Threat to Biodiversity

The Issue

In June 1992, at the Earth Summit in Rio, the Convention on Biological Diversity was signed by the United Kingdom and over 150 other countries. The UK response to this commitment was launched in January 1994 with 'Biodiversity: The UK Action Plan' and guidance was given on the production of Local Biodiversity Action Plans. The purpose of Local Biodiversity Action Plans is to focus resources to conserve and enhance biodiversity by means of local partnerships, taking account of national and local priorities. The conservation of biodiversity will be a key indicator of the successful implementation of sustainable development in the area.

A Local Biodiversity Action Plan is both a product and a process. It identifies where action needs to be taken to implement targets for habitats and species and it specifies appropriate mechanisms. Such plans also have a key role in monitoring progress of the conservation of biodiversity in the long term.

In keeping with Local Agenda 21, the formulation of Local Biodiversity Action Plans should not be undertaken by a single organisation. Delivering the biodiversity targets will require inputs from Central and local Government, conservation organisations, land managers, members of the public and ourselves.

We are working with a number of organisations to formulate habitat and species action plans at both regional and local levels, for example the Lincolnshire Biodiversity Action Plan. The Agency is developing National Species Action Plans and is the contact point for species such as the otter (*Lutra lutra*) and water vole (*Arvicola terrestris*)which are known to occur within the catchment and the atlantic stream crayfish commonly known as the white clawed (native) crayfish (*Austropotamobius pallipes*) which is believed to be present in this area. Other species we are the contact point for are listed in Section 6.9.4 - Biodiversity Plans.

To date in the Plan area, Local Biodiversity Strategies have been prepared by the Lincolnshire Wildlife Trust (Nature in Lincolnshire - Towards a Biodiversity Strategy).

Native Crayfish (left) and American Signal Crayfish (right)

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PART II

5.0 USES, ACTIVITIES AND PRESSURES

Uses - Contents
5.1 Development and Infrastructure
5.2 Agriculture Forestry
5.3 Industry and Transport
5.4 Effluent Disposal
5.5 Waste Management
5.6 Mineral Extraction
5.7 Water Abstraction
5.8 Land Drainage Flood Defence
5.9 Landscape & Heritage
5.10 The Natural Environment
5.11 Fisheries Commercial and Recreational
5.12 Recreation & Amenity
5.13 Radioactive Substances

The purpose of this section is to identify and summarise the uses, activities and pressures in the Plan area which exert an influence upon the wider environment. This information consolidates the Agency's understanding of the Plan area against which it will consider its future actions.

The information presented in this section is limited to those activities and pressures upon which the Agency has direct or indirect influence or responsibility.

5.1 DEVELOPMENT AND INFRASTRUCTURE

5.1.1 General

The continual development of our cities, towns and countryside, and in particular the urbanisation of greenfield sites has the single most significant influence on the environment. Development may include new building works, changes in land use, development of communications and the construction of new roads, sewers and other services.

Development can result in:

(i) an increased risk and occurrence of flooding as a consequence of changes to surface water drainage and development in the flood plain;
(ii) an increased risk to water quality:
  (a) from effluent discharges to surface water and groundwaters,
  (b) from increased pressure upon the sewerage infrastructure;
(iii) an increased demand for water for industrial use, and for public water supply;
(iv) a risk to flora and habitats;
(v) an increase in the volume of waste produced.

5.1.2 Local Perspective

The area does not have a single major urban centre instead, it has a series of relatively small market towns which have grown to serve numerous scattered villages and holiday centres.

Louth is the major inland town in East Lindsey and its markets and shops are the focus for a great deal of economic and tourist activity. Louth is an important employment centre with growing numbers of businesses locating to the Fairfield Industrial Estate. The holiday industry is the main economic base in Skegness and Mablethorpe; both Skegness and Sutton on Sea have developed rapidly as retirement centres over the last decade.

The Lincolnshire Structure Plan proposes a number of 'defined towns' where the largest proportion of new development, in terms of both housing and for employment, is to be directed. In the Plan area, these 'defined towns' include Louth, Skegness, Alford, Mablethorpe and Spilsby. Areas of new industrial development, including warehousing, retailing and office development are proposed, mainly on the edges of these towns. In addition some development, particularly housing will occur in settlements and villages which have a significant level of facilities, employment and infrastructure services. The Table below shows population predictions for parishes of more than 2,500 inhabitants based on an Agency database and are given as an indication that the development pressures experienced over the past decade look set to continue.

Table 1: Predicted changes in population in the Plan area

PARISH	POP. '1993	POP. (EST.) 2001	POP. (EST.) 2006	% GROWTH 1993 - 2006
Alford	3258	3642	3725	14.3
Chapel St Leonards	3080	3536	3617	17.4
Louth	14917	15037	15383	3.1
Mablethorpe/ Sutton On Sea	10065	10956	11208	11.3
Skegness	17986	19881	20440	13.6

Agriculture is the predominant economic activity within the Louth Plan area. Arable crops and fallow account for the largest percentage of agricultural land use, principal crops being cereals such as wheat and barley. Large scale industry is limited within the Plan area. However, the presence of Conoco (UK) Ltd at Theddlethorpe and Tetney, and Ross Youngs at North Thoresby provide examples of development of this nature.

Tourism is seen as an increasingly important way of sustaining and adding to the district's income and job opportunities as well as supporting local services. With established seaside holiday resorts, there exists already a tourism 'image' to build upon. New holiday areas have been identified in the local plan where potential and opportunity is greatest, particularly for new holiday attractions requiring large areas of land. Static caravans along the coast remain the most popular form of holiday accommodation and there is an increasing demand for holiday and cabin development with touring caravans playing an increasingly important part in the local tourism economy.

5.1.3 Planning context

Detailed objectives for future development are set out by each planning authority in their respective development plans. Regional Planning Guidance issued by Central Government, and giving these plans a common basis, is currently under review. New guidance will reflect a shift in emphasis towards the need for sustainable development and identify the availability of water resources, sewage infrastructure, flood risk and protection of the environment as key factors which may limit development and which should be considered during the writing of development plans.

The current state of the plans for the Councils in the Plan area is shown in Table 2.

Table 2: Status of development plans

PLANNING AUTHORITY	DEVELOPMENT PLAN	STATUS
Lincolnshire County Council	Lincolnshire County Council Structure Plan	Structure Plan: Deposit Draft Jan. '98
East Lindsey District Council	East Lindsey Local Plan	Adopted Aug. '95. Issues Report Spring '98. Review due '99.
West Lindsey District Council	West Lindsey Local Plan	Adopted Plan due early '98.
North East Lincolnshire Council	Unitary-wide Plan	Deposit Draft due for consultation June '98

We are a statutory consultee under planning legislation and in addition advise County and local authorities on development proposals which may have an effect on matters relevant to our interests. The Agency's purpose in this participation is the protection of the water environment and the prevention or mitigation of any adverse effects associated with development and land use change. It must be remembered however that the final decision on planning matters rests with the planning authorities.

A key objective of the LEAP process is to provide the LPAs with a clear picture of the Agency's responsibilities and policies toward development of the catchment.

5.1.4 Transport

Regional transport policies have been revised in the light of important developments in Government policy guidance which have highlighted the contribution of traffic to air pollution and global warming. Policies try to encourage greater use of public transport, walking and cycling facilities, whilst taking measures to manage traffic such that unnecessary traffic is removed from towns and villages, and routes best suited to relieve congestion are improved.

However, car ownership continues to widen due to its benefits to personal freedom and the speed and flexibility that motoring brings to business travel. This is deemed vital to the economy and therefore, appropriate provision for private road travel is recognised as being important.

There is great public concern about the environmental effects of traffic which has led to calls for more demand management and the promotion of public transport, particularly in the towns and cities, but also for more town and village bypasses. These effects include the emission of airborne pollutants including carbon monoxide, oxides of nitrogen, particulate matter, lead and other compounds. Watercourses are also directly affected as a consequence of contaminated surface water runoff from roads and motorways.

Restrictions on public expenditure has meant the establishment of strict priorities for transport spending and the implementation of policies which use the existing road system to the fullest possible extent rather than constructing new roads and at the same time prevent unnecessary growth in traffic.

The DoT (now the DETR) schemes along the only trunk road in East Lindsey, the A16, are at various stages in the development process, from alternative route identification to awaiting the results of a Public Local Inquiry. The following road improvement schemes are planned:

A158 Improvements
Burgh-le-Marsh by-pass
Partney by-pass

A157 Improvements
Legbourne By-pass.

A18 Improvements

A52 Improvements

Map No3 shows the existing road network and major Towns

MAP No 3 :
Towns and Roads

KEY:

Main River

Town

A18 Main Road

5.2 AGRICULTURE AND FORESTRY

5.2.1 Agriculture

5.2.1.1 General

Agriculture is the predominant economic activity and land use in Eastern England. The highly productive potential of the land is often maximised by the use of intensive farming practises which can have detrimental effects on water quality, impact on water resources and affect the wider environment:

- the use of fertilisers influences surface water quality, enriches it with nutrients and encourages its eutrophic state. This can also impact on land drainage by increasing weed growth and on groundwater quality by increasing nitrate levels;

- there is a pollution potential to surface and ground waters from pesticides and other farm related effluents;

- the abstraction of water for irrigation affects water levels;

- maintenance practices undertaken on watercourses, and water levels maintained to ensure effective land drainage, have a marked effect upon flora and fauna;

- soil erosion can impact both on water and air quality - by adding to the silt and nutrient load of watercourses and airborne particulate matter.

Agricultural pollution sources are varied. They include point sources such as those relating to inadequate oil storage, unsatisfactory slurry storage systems and drainage from silage clamps, to the diffuse pollution deriving from the widespread application of fertilisers. The disposal of wastes to land can have benefits where it acts as a soil conditioner and/or fertiliser. The DETR are proposing to designate certain agricultural wastes as controlled; this will bring them into the same control system as for household, industrial and commercial wastes (see Section 5.5).

The Ministry of Agriculture, Fisheries and Food (MAFF) classifies land by grade according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. These limitations affect flexibility of cropping, level of yield, the consistency of yield or the cost of obtaining it. Under this system, land is classified into one of five grades; Grade 1 being of excellent quality, Grade 5 being of very poor quality. Grade 3 comprises good to moderate quality land, being sub divided into grades 3a and 3b.

Grades 1, 2 and 3a agricultural land is described as the best and most versatile agricultural land in Planning Policy Guidance Note 7. Such land is recognised in land use planning terms as a national resource for the future, having special importance.

5.2.1.2 Local Perspective

Agriculture is the predominant economic activity with a total of 96,000 hectares in agricultural use, distributed among 943 agricultural holdings, of which 48% are full-time and 52% are part time. The recent trend indicates a decrease in full-time and an increase in part-time holdings over the 10 years 1985-1995, reflecting the national picture. There has also been a significant decrease in the number of holdings in the area.

Within the Plan area, 360 agricultural holdings are less than 20 hectares, of which 132 are less than 5 hectares. 335 holdings are between 20 and 100 hectares. The general trend indicates a decrease in holdings of less than 100 hectares, and a slight increase in holdings over 100 hectares. 36% of the agricultural land is rented, with the remaining owned. The proportion of rented land has decreased over the last 10 years, mirroring the national trend. However, due to fairly recent changes to agricultural holdings legislation, this trend may slow down or be reversed.

Arable crops and fallow account for the largest percentage of agricultural land use (nearly 81%) although recent data indicates a 4% decline of such crops compared with 10 years ago. 51% of total cropping is accounted for by cereal, predominantly wheat and barley.

Landscape view of the Wolds

Other crops grown include combinable break crops such as oilseed rape, field beans, dry peas and linseed, root crops such as potatoes and sugar beet, and horticultural crops. Trends over the last 10 years show a decrease in the area of winter and spring barley grown and a 31% reduction in potatoes. There has also been a 10% decrease in horticultural crops, a 12% decrease in oilseed rape, and a 4% reduction of sugar beet. These declines have been offset by an 11% rise in wheat.

Common Agricultural Policy (CAP) reform measures introduced in 1992 are largely responsible for the decrease in arable cropping. These measures include the requirement that all but the smallest holdings which intend to grow cereals, oilseed, proteins and linseed must "set aside" land in return for arable area payments. Farmers are encouraged to manage the set aside land in an environmentally beneficial way. In 1995, set-aside land in the Louth Coastal Plan area amounted to 10% of the agricultural area.

14,247 hectares of land in the Plan area is grassland and rough grazing land. This has declined 19% over the last 10 years. The total number of cattle and calves (including dairy animals) has decreased by 7%, but the beef breading herd has increased. The number of sheep in the area has decreased by 26% in the last 10 years whilst the pig herd has increased by 8.5%. The poultry flock has remained approximately static.

(Figures and information provided by Farming & Rural Conservation Agency).

5.2.2 Forestry

5.2.2.1 General

Well managed forestry can often bring significant benefits to the environment. Once established, new woodland and even individual trees can significantly enhance the landscape. This may be particularly important in areas where there has been a recent loss of tree cover. However, in certain circumstances, forestry development and management can cause problems, including potential soil erosion, pollution, increased flooding risks and damage to wildlife habitats.

5.2.2.2 Local Perspective

Little woodland remains in the Wolds. However, an important concentration of woodlands on a heavy boulder clay span the border between the Middle Marsh and the Wolds, these mainly consist of old hazel and ash coppices. Woods in the Outmarsh are virtually non-existent and uncharacteristic.

Tetford Wood is the best example of semi-natural woodland in the Lincolnshire Wolds Natural Area. Nationally important alder carr woodlands can be found scattered along some of the valley bottoms. Herb Paris is a locally rare flower found in some of the woodlands

in the south east that overlap in the Lincolnshire Coast and Marshes Natural Area.

5.2.2.3 Role of Key Players

The Ministry of Agriculture Fisheries and Food (MAFF) plays the leading role in the regulation of the agriculture industry. It comments on statutory development plans including those affecting coastal areas, and also on a range of non-statutory plans and strategies. MAFF is a statutory consultee on development involving significant areas of best and most versatile agricultural land, and is also consulted on the agricultural restoration and aftercare of minerals and waste sites.

MAFF provides farmers with free and confidential advice on pollution prevention which is available from ADAS. Farmers are also encouraged to follow advice published in the Codes of Good Agricultural Practice for the Protection of Water, Air and Soil. These set out, along with other advice, guidelines for dealing with the disposal of agricultural effluents from silage and intensive rearing of livestock. These guidelines should also be used in areas of arable farming where careful timing in the application of nitrates and pesticides is important.

MAFF have played a role in the designation of Nitrate Vulnerable Zones (NVZs), areas of land which will in due course be subject to mandatory controls regarding agricultural inputs of fertilisers etc.

Our role in respect of agriculture is equally wide ranging and includes:

- the prevention of pollution to surface water, and groundwater which we accomplish by the investigation of pollution incidents and by providing advice to farmers about potential pollution sources;
- the protection of groundwater quality by the promotion of water protection zones such as Nitrate Sensitive Areas;
- the regulation of waste matters being spread onto land;
- the licensing of schemes which might impact upon land drainage.

5.3 INDUSTRY

5.3.1 General

Industrial activity can impact upon the environment in many different ways not least because of the waste products they generate. The disposal of industrial waste may be to land, air or water .

- Disposal of waste to land includes not only that to landfill sites but also disposal direct to the land where it can be used as fertiliser or as a soil conditioner for environmental benefit;

- Discharges to water are usually via the foul water sewerage network where effluent is treated prior to discharge into receiving watercourses, but may be via the operators own treatment plants;

- Discharges to the atmosphere take place from chimneys or vents. The impact of industrial emissions to the atmosphere are more far reaching than those to water and to land insofar that our local air quality can be influenced by releases occurring outside the Plan area, that is both nationally and internationally.

5.3.2 Local Perspective

The Plan area is predominately rural with the main industry being agriculture (see section 5.2.1 on agriculture). In the larger conurbations, of Louth, Skegness, Mablethorpe and Alford industrial estates exist. For example, the established Fairfield Industrial Estate in Louth is situated to the north of the town and represents careful strategic planning.

Large scale industry is represented by a small number of companies. In particular:-

(a) Ross Young's Ltd: Here fresh vegetables are delivered by road to the factory at North Thoresby situated just off the main A16 road to Grimsby. On site the vegetables are processed, frozen and packed ready for distribution to retail outlets.

(b) Conoco Ltd at Tetney (Tank Farm): This site is owned by Crude Oil Terminals (Humber) Ltd and operated by Conoco Ltd. The site receives crude oil from tankers moored at a buoy in the River Humber. Crude oil is stored in floating roof storage tanks prior to being piped to Conoco's Humber Refinery situated in South Killingholme.

(c) Conoco (UK) Ltd at Theddlethorpe: The Theddlethorpe Gas Terminal comprises four inter-linked terminals: Viking, Lincolnshire Offshore Gas Gathering System (LOGGS), Pickerill, and the Caistor Murdoch System. The combined plant has the capacity to process 2100 x 10^6 standard cubic feet per day of gas. Gas compression is provided

by the Pickerill terminal. Since the inception of Integrated Pollution Control (Land, Water & Air) significant expenditure (£2,000,000) has taken place to improve discharges/emissions to the environment.

(d) Linpac Ltd: Linpac is the largest packaging company in the United Kingdom. The head office for the company is based in Louth with two operational industrial units in the town, one producing corrugated sheets and the other producing corrugated boxes.

5.3.3 The Role of Key Players

Our role in the regulation of industrial discharges is multi - faceted.

Industrial emissions to the environment are regulated, principally by operating a system called Integrated Pollution Control (IPC) for certain industrial processes under the Environment Protection Act 1990. These include large combustion plant, iron and steel making, mineral industries, the chemical industry, solvent recovery and incineration plants (Part A processes). Conditions set out in IPC Authorisations place a requirement on site operators to manage, supervise and control their own sites and the process they operate, to monitor their releases, to measure their performance against defined parameters and to report to the Agency. The Authorisations themselves set the conditions and release limits with which industrial processes must comply under normal operating conditions. (These cover all emissions to the environment to the land, water and air). Industrial discharges to water outside IPC legislation are regulated by the issue and enforcement of other Permissions (Discharge Consents and Waste Management Licences). We offer advice on the availability or otherwise of water for industrial purpose.

The Environmental Health Departments of District Councils regulate air pollution from industrial premises under Part I of the Environmental Protection Act 1990. These are premises with generally a lesser potential to pollute than those we regulate, for example paint spraying, small foundries and small combustion plant. The processes concerned are known as Part B processes and only the releases to the air are controlled under this Act.

The Agency has wide powers, but will need to work closely with others if environmental improvements are to be achieved. We will need to look at partnerships with national and local government, business, industry, and environmental and conservation groups to maximise our influence in securing environmental improvements. This is particularly important with regard to local air quality, where we must have regard to government strategy and provide advice to the Secretary of State.

5.4 WASTE WATER DISPOSAL

5.4.1 General

Watercourses are 'used' by man to dilute and dispose of liquid waste products. These effluents are principally treated sewage and industrial discharges which have been previously treated to reduce their toxicity to the environment.

Under particular conditions, discharges of untreated effluent also occur. Untreated effluent sources include those discharges from consented emergency and storm water overflows from sewerage systems.

Discharges of surface water from urban and industrial areas and from accidental spillages deriving from a range of domestic, commercial, agricultural and industrial activities cause a significant proportion of the number of pollution incidents. These can cause extreme damage to the environment.

In rural areas many properties are not served by Anglian Water Services Ltd Sewage Treatment Works (STW). In such areas properties make use of small, private and local authority STWs and septic tanks, which discharge to land and/or a watercourse and can have their own impact on ground and surface water quality. Some properties rely on cesspits for sewage disposal, the waste from which is either taken to STWs or spread onto land as fertiliser/soil conditioner. The Agency does not allow discharges from septic tanks to be made direct to watercourses, since they provide insufficient treatment prior to discharge.

5.4.2 Local Perspective

Sewage Effluent

There are 23 Anglian Water Services Ltd sewage treatment works in the Plan area and one long sea outfall at Ingoldmells. These account for the vast majority of all effluent discharged to the river systems within the Plan area.

Some untreated sewage effluent enters our river systems from consented emergency and storm water overflows from sewerage systems due to the occasional failure of pumping systems or when heavy rainfall overloads the capacity of the sewerage infrastructure.

55 sewage treatment works are operated by private owners and local authorities. These include householders, councils and commercial businesses. Septic tanks are widely used in the Plan area, however their suitability is very site specific and dependent upon ground conditions.

Industrial Effluent

There are three main industrial sites within the Plan area - Ross Young's at North Thoresby, Conoco Ltd at Tetney (Tank Farm) and Conoco (UK) Ltd at Theddlethorpe (see also Section 5.3.2).

(a) Ross Young's Ltd: Waste vegetable processing water is treated by the company's treatment plant prior to discharge to the a tributary of the New Dyke.

(b) Conoco Ltd at Tetney (Tank Farm): The process consists of ten crude oil storage tanks, a separated water storage tank for emergency use only and four diesel pumps. Discharges to the water environment from this site are controlled under the terms of an Authorisation issued under Part A of the Environmental Protection Act 1990. Effluent discharged consists of water from off-shore pumping operations and tank roof drainings.

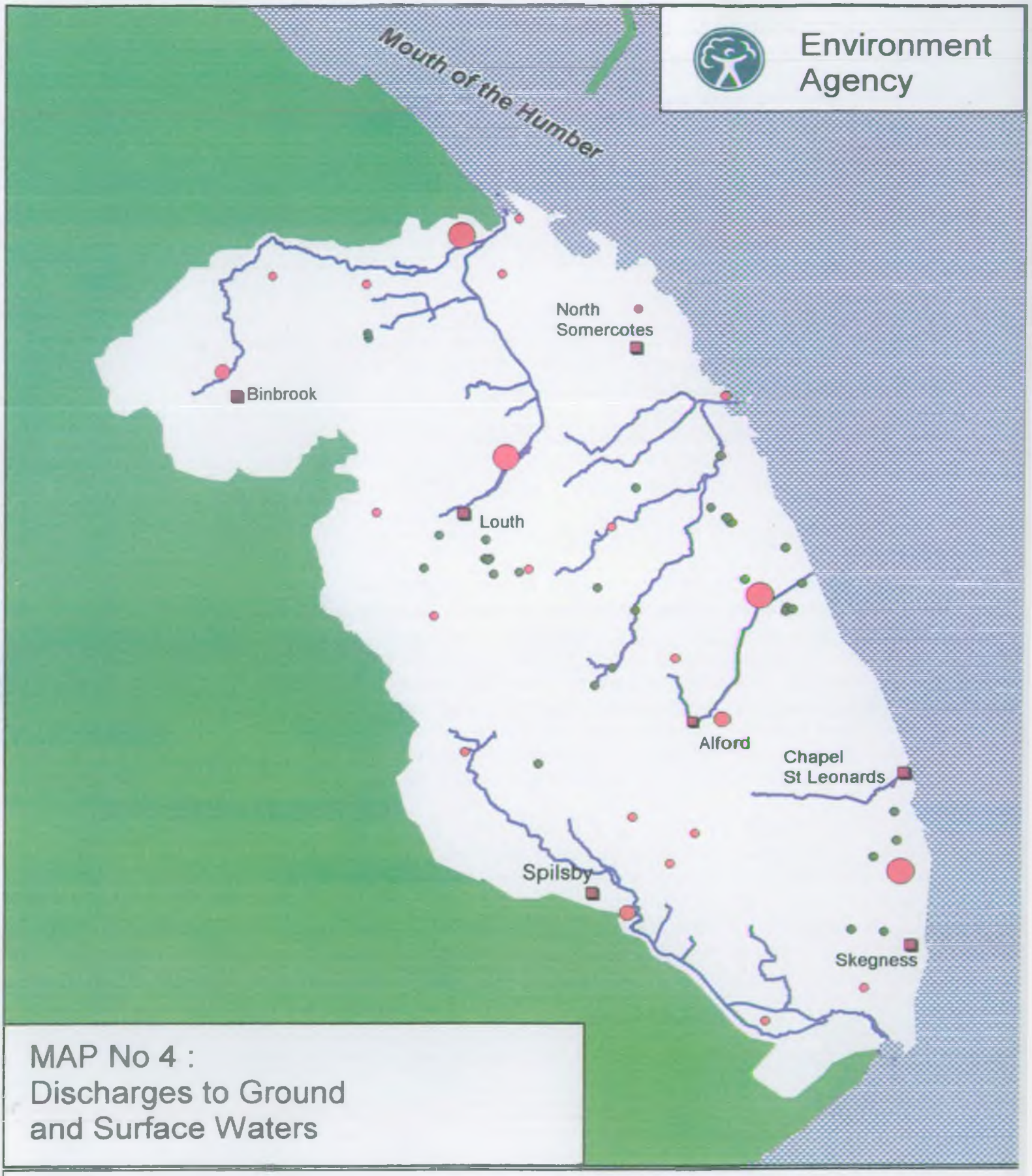
(c) Conoco (UK) Ltd at Theddlethorpe: As previously stated the Theddlethorpe Terminal comprises four interlinked terminals: Viking, LOGGS, Pickerill, and the Caistor Murdoch System. Process effluent from the site originates from the southern North Sea gas field. It is discharged back to the water environment via a long sea outfall pipe. This is controlled by an Authorisation issued by the Environment Agency under Part A of the Environmental Protection Act 1990.

There are a number of industrial areas near most of the main towns, for example, Louth, Alford, Mablethorpe and Skegness. Foul sewage and trade effluent discharges from these industrial areas are treated at Anglian Water Services Ltd sewage treatment works. Surface water run off from industrial areas can have a significant impact on water quality. Developers and industrialists must be aware of this and provide adequate pollution prevention measures for surface water disposal systems.

Trout Farms

There are a number of trout farms in the area none of which pose significant water quality problems during normal flow conditions, but do however, exert an oxygen demand upon the receiving waters. Such sites are monitored and controlled by discharge consent in order to protect water quality.

Map No 4 shows Discharges to Surface and Groundwaters



MAP No 4 : Discharges to Ground and Surface Waters

KEY:

- Main River
- Town
- Anglian Water Services STW (<2 000 PE)
- Anglian Water Services STW (2 000-10 000 PE)
- Anglian Water Services STW (>10 000 PE)
- Other Discharges

5.4.3 The Role of Key Players

We try to maintain and improve water quality in a number of ways which include:

- the regular monitoring of water quality, in both chemical and biological terms,
- by issuing and enforcing permissions - Discharge Consents/Notices, Waste Management Licences and IPC Authorisations (permissions specify limits on the quality and quantity of materials which may be discharged);
- by the regular monitoring of discharges;
- by setting water quality objectives for local Water Quality Management needs;
- through our influence in the planning process.

The Agency encourages site operators, farmers and developers to protect surface water by providing adequate pollution prevention measures, such as bunding oil and chemical tanks, installing oil interceptors (where appropriate) and appropriate storage of silage and slurry. However, many industrial sites have separate drainage systems for foul and surface waters and site operators may discharge material, sometimes unknowingly, to a drain which discharges directly to surface waters. Where a pollution does occur we have powers to alleviate the effects of pollution and to recharge the costs if the polluter can be identified. Prosecution through the courts may be undertaken both of those responsible for isolated pollution events and of those dischargers who repeatedly contravene their discharge conditions.

The *Environment Act 1995* has put a new responsibility on water companies to provide "first time" public sewerage systems for those villages without such, provided the necessary criteria are met. We have two roles in this process: firstly we provide factual information from our records to aid Anglian Water Services in their assessment of applications; and secondly we have a separate independent role as the arbiter in the event of disputes between applicants and AWS, in respect of decisions made.

5.5 WASTE MANAGEMENT

5.5.1 General

The generation of waste is an inevitable consequence of many human activities, arising from sources including the home, industry and agriculture.

Waste disposal has the potential to harm the environment through contamination of air, ground and water in a number of ways:

- the pollution of ground or surface water by leachates (contaminated water) escaping from landfill sites;
- the escape of landfill gases such as methane;
- the contamination of land on which waste management and other industrial activities have taken place;
- nuisances such as litter, odours and vermin.

Landfill sites to which waste is disposed may be licensed to accept one or more categories of waste ranging from inert material (soil, brick, stone) to degradable material (wood) to putrescible waste (household arisings, food processing waste) to Special Wastes (wastes which pose a particular risk to the environment or human health).

In the past, landfill activity followed the 'dilute and disperse' principle. This assumed that any leachate generated was retained in close proximity to the site for sufficient time to allow natural degradation and/or dilution to occur. For such sites, where leachate migration may prove a threat to ground or surface waters, monitoring is undertaken and action taken where necessary. The current philosophy is that new landfill sites, receiving leachate generating wastes, should be constructed to fully contain wastes using either natural or artificial liners thus minimising the risk of groundwater contamination. These sites also have relevant monitoring programmes. When landfilling has been completed, sites are now required to be capped with a low permeability material to further minimise infiltration of rain water.

Land is also used in other associated waste management activities such as recycling operations, waste transfer stations, incinerators and scrap yards. These uses also create a risk of pollution to the environment.

5.5.2 Local Perspective

The types and numbers of waste management facilities present within the area are listed below:

Licensed landfill sites	7
Household waste recycling centres	2
Transfer stations	7
Metal recycling facilities (scrapyards)	5
Storage/recycling plant	1
Pet Crematorium	1
Commercial/industrial waste incinerators	0

A number of these sites have now ceased accepting waste pending surrender of their waste management licences.

Biodegradable Household, Commercial and Industrial Waste

Within the catchment are two major landfill sites, situated on the outskirts of Louth and Skegness, which can accept biodegradable household, commercial and industrial wastes. The lifespan of Middlemarsh Landfill, near Skegness, is estimated at a further sixteen years. Kenwick Landfill, near Louth, is estimated to have another forty years life subject to planning approval for further mineral extraction being obtained.

Construction and Demolition Waste

Of the four licensed facilities within the catchment only one is currently accepting inert construction and demolition waste. Since the introduction of the Landfill Tax in October 1996 disposal of this type of material to landfill has decreased with waste producers diverting their material to schemes exempt from waste management licensing where possible.

Special Waste

On 1 September 1996 the Special Waste Regulations 1996 came into force to implement the European Hazardous Waste Directive. Special Wastes are those defined by the regulations which are dangerous and difficult to handle, and include toxic and hazardous substances.

Middlemarsh Landfill, near Skegness is licensed to accept limited amounts of special waste as defined under the 1996 Regulations. However, material classed as special under previous regulations is not permitted for disposal, and indeed the majority of special waste has to go out of the Plan area and county for disposal.

Recycling

Two designated household waste recycling centres are located within the area at Louth and Skegness providing facilities for the recycling of waste oil, paper, glass, car batteries and scrap metal. Recently householders have been encouraged to recycle their garden waste for use in a composting scheme. Licensed transfer stations and metal recycling facilities also contribute to the recycling of household, commercial and industrial waste within the area. Materials with a value such as ferrous and non ferrous metals have a long history of recycling.

Luxus Ltd operate a thermoplastic recycling plant in Louth which is able to accept thermoplastic industrial waste for granulation prior to reprocessing to form a raw material.

The recently implemented Producer Responsibility Obligations (Packaging Waste) Regulations 1997 also place obligations on businesses of a certain size to recover and recycle specified tonnages of packaging waste. To date three businesses within the area have registered with the Agency, and one firm has applied for accreditation.

Liquid Waste to Land

The spreading of liquid waste on agricultural land for agricultural benefit or ecological improvement is exempt from waste management licensing. Typical waste streams include food processing waste, effluent treatment sludge, and septic tank/cesspit liquor. Due to the potential for this type of material to impact on the environment the types and quantities of waste which can be spread are specified in of the Waste Management Licensing Regulations 1994, and all spreading has to be notified to the Environment Agency.

Although over 200,000 tonnes of liquid waste was spread on agricultural land in 1994 only a small proportion of septic tank/cesspit liquor was spread on land within this catchment.

Sewage Sludge Disposal - Red Leas Farm, North Cockerington, Lincolnshire

Red Leas Farm, North Cockerington, Lincolnshire is owned and controlled by Anglian Water Services Ltd. The farm and its associated land is used for crop production with sewage sludge being utilised as a fertiliser.

The Environment Agency has an important role to play in the control of sewage sludge utilisation on agricultural land. This role includes carrying out audit work to ensure compliance with the Sludge (Use in Agriculture) Regulations 1989 (SI 1989 No 1263). These regulations require the sewage undertaker to keep a register of where sludge is utilised, to sample for heavy metals and to ensure that specified limits for heavy metals are not exceeded. In addition to this the Agency enforces the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil). Regulations 1991 and under the Water Resources Act 1991 the Agency has a duty to protect "controlled waters" from pollution.

Routine monitoring of watercourses local to Red Leas Farm is carried out by Agency staff. This work confirms that sewage sludge applications made on this site are not entering surface water systems and causing pollution.

Landfill Tax

The Landfill Tax was introduced on 1 October 1996 as a levy on the disposal of waste at landfill sites throughout the United Kingdom. A number of wastes are exempt (eg naturally occurring dredgings, mines and quarries waste, dead domestic pets) or attract a lower rate of tax (eg soil, glass, bricks, concrete). The majority of other wastes are taxed at a rate of £7 per tonne.

The aims of the tax are:

- to ensure the environmental impact of landfill is properly reflected by disposal costs
- to achieve more sustainable waste management by encouraging producers to reduce waste arisings, increase recycling, and dispose of less waste to landfill.

To support the environmental aims of the tax a proportion of the revenue can be credited to landfill operators who make contributions to approved environmental bodies for use on environmental schemes.

The types of project that will benefit from this funding include environmental reclamation schemes and the promotion of sustainable waste management practices. For example the setting up of nature reserves on former landfill sites, or school and industry based education programmes on waste management. Such projects must benefit the community or waste management industry as a whole, and not directly benefit individual landfill operators or sites still controlled by waste management licences.

5.5.3 Role of Key Players

Our principal role in protecting land is through waste management licensing. This is achieved through the granting of licences for the deposit, treatment, keeping or disposal of waste and through the supervision of licensed activities to ensure licence conditions are complied with. Various sanctions are available to us to apply against both licence holders who do not fulfil their licence conditions and against those who carry out illegal waste disposal activities. Waste management licences ensure waste disposal sites are controlled during both operational and post-closure phases. For those sites closed post May 1994, the surrender of a Waste Management Licence is only permissable when a site no longer poses a risk of pollution and if it does not pose a risk to human health.

We seek to protect groundwater quality against discharges of dangerous substances by ensuring new sites taking potentially polluting matter are engineered to fully contain and

control leachate generation.

Historically, waste management was primarily concerned with the disposal of waste. Now there is a considerable shift to considering waste reduction, reuse and recovery before disposal. This is reflected in legislation such as that covering producer responsibility for packaging waste which puts the onus for recovering this type of waste on the producer himself.

As a statutory consultee in the planning application process the Environment Agency makes comments and advises on development that impacts on waste management issues.

County Councils as planning authorities influence waste disposal in their area through the Structure, Local and Waste Plans (for which we are consultees). As the Highway Authority, the County Council is also responsible for waste and litter deposited on the highways.

District and Borough Councils are responsible for all domestic refuse collection and street cleansing, as well as keeping clean any land under their control.

Waste disposal operations including the management of sites handling industrial and domestic waste may be undertaken by the private sector. Most waste collection is carried out by private operators, especially the removal of industrial, construction, and demolition waste.

5.6 MINERAL EXTRACTION

5.6.1 General

The extraction of materials such as sand, gravel and limestone from quarries and mines can damage both underground and surface water resources and can indirectly impact on water quality. The damaging effects of mineral extraction are often long term and sometimes permanent. The influence of quarrying upon the water table may extend for a number of miles, impacting on public water supplies from groundwater sources and flows to springs and rivers (and therefore on the natural environment).

During extraction, uncontrolled de-watering can cause suspended solids to be discharged to rivers and the industrial nature of the activity poses other pollution risks such as oil contamination. Land formerly used for mineral extraction is also used in other associated waste management activities such as recycling operations, waste transfer stations, incinerators and scrap yards which carry associated risks. Any lake created by extraction can, if directly connected to the river, seed the river with algal material causing changes in the downstream water quality.

The manner in which site restoration is undertaken can also impact on the environment. Backfilling with low permeability material will decrease the storage capacity of the aquifer,

and leaving the site to open water will cause the loss of resource due to evaporation losses being greater than precipitation gains. Restoration to low level agriculture may require continual pumping which is not a sustainable use of resources. The subsequent use of mineral extraction sites for landfill also poses a significant threat to groundwater quality.

Many disused gravel pits are ultimately developed to create valuable conservation habitats and recreational areas.

5.6.2 Local Perspective

In the Plan area there are two active chalk workings at South Thoresby and Welton Le Marsh, and two inactive chalk workings at North Ormsby and Tetford Hill. There are no workings for sand and gravel or for limestone.

Lincolnshire is the only source of chalk in the East Midlands. A high proportion is used for non-aggregate purposes.

In order to prevent mineral deposits being sterilised directly by other types of development, or by development encroaching so closely upon existing mineral works as to prejudice the working into adjacent areas, some areas of land are identified as Consultation Areas. The implication of this is that Lincolnshire County Council wish to be consulted on any development proposals for such areas which is likely to affect, or be affected by the winning and working of minerals. Within the Plan area, there are three Consultation areas at South Thoresby, Tetford Hill and Welton Le Marsh.

5.6.3 Role of Key Players

All County Councils within the catchment have produced Mineral Plans as required under the Town and County Planning Act 1990, in accordance with Planning Policy Guidance Note 12. As a statutory consultee we make comment upon these Plans to ensure that the flow, level and quality of surface and ground waters are protected.

5.7 THE USE OF WATER - ABSTRACTION

5.7.1 General

Water is abstracted and used by man for a number of uses: to support the Public Water Supply system, for industrial use, for general agriculture (eg. livestock watering and for mixing chemicals), for spray irrigation purposes and to a limited extent directly for domestic use (isolated properties). These demands for water are in direct competition with those of the flora and fauna associated with aquatic ecosystems which are dependant on the flows within watercourses and the groundwater which supports river flows.

Reduced river flows as a consequence of abstraction can also impact on water quality by reducing the ability of rivers to adequately dilute effluent inputs and/or by encouraging the eutrophic state of watercourses. This can also impact upon its use for amenity purposes.

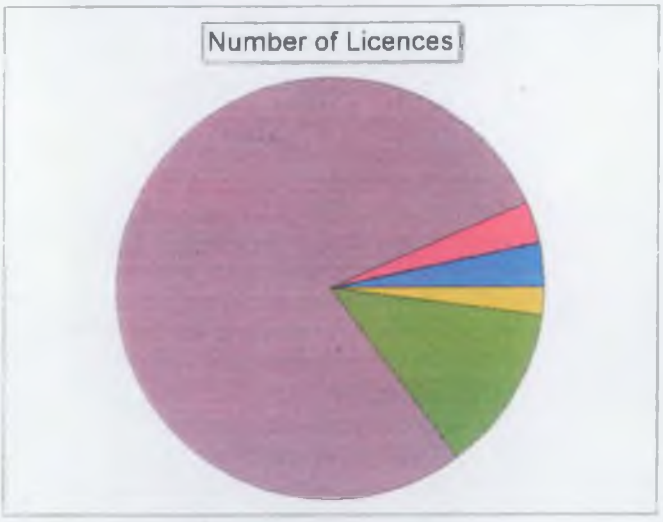
5.7.2 Local Perspective.

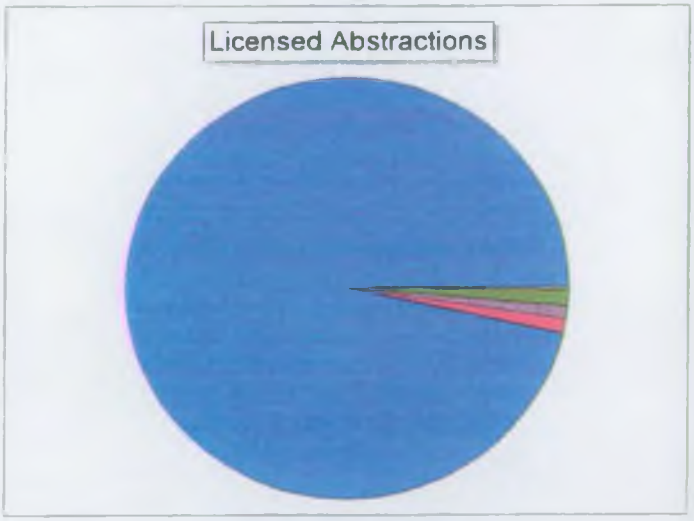
The principal water resources of the Plan area are the Chalk and Spilsby Sandstone aquifers which are an important source of water for public water supplies. The Great Eau river is also an important source of water as river water is transferred from Cloves Bridge (by Anglian Water Services Ltd) to the Louth Canal at Alvingham, via a raw water pipeline. Water is subsequently abstracted from the Louth Canal to fill Covenham reservoir. The reservoir provides some water to the Louth catchment and further north for public supply but is principally for industrial use on the Humber Bank.

River water is the most significant source of water for spray irrigation in the Plan area, particularly the catchments of the Rivers Lymn and Steeping where a number of abstractions are closely concentrated.

Map No. 5 shows major water abstractions

Agricultural and spray irrigation licences account for 92 % of the total number of licences, but water quantity licensed for public water supply abstraction is by far the greatest use within the Plan area (97%).





Number of Licences

Use	No. Licences	% Total
PWS	16	3
Industrial	15	3
Agricultural	371	79
Spray Irrigation	60	13
Other	10	2
TOTAL	472	100

Licensed Abstractions

Use	MLA	% Total
PWS	66,066	97
Industrial	768	1
Agricultural	638	1
Spray Irrigation	853	less than 1
Other	107	less than 1
TOTAL	68,432	100

MAP No 5 : Major Ground & Surface Water Abstractions

KEY:

- Chalk PWS Source
- Sandstone & Chalk PWS Source
- Sandstone PWS Source
- Surface Water Abstraction
- Industrial Abstraction
- Agricultural Abstraction
- Great Eau Transfer
- Main River
- Town

Water is abstracted from both groundwater and surface water sources. Groundwater is that which is abstracted from underlying strata using wells and boreholes. Surface water is that contained in rivers and still-waters such as lakes and reservoirs. Surface water may be stored, for later distribution and abstraction, in storage reservoirs (constructed to meet public supply and agricultural needs) and to a limited degree within drainage systems. Enhanced abstraction may also be facilitated by the transfer of water from one river system to another.

The water we draw upon is not infinitely available, the limiting factor being the rate at which it is replenished by rainfall. It is therefore important to manage this valuable and fragile resource in a sustainable manner. This entails careful management, balancing the varied and competing needs for the water available.

5.7.3 Role of Key Players

Our role with respect to abstraction and the management of finite water resource is to administer the system of licensing abstractions and impoundments and by development of river transfer schemes as appropriate. We have powers to decide whether or not a licence may be granted, the conditions applied to it, and the power to vary licences.

5.8 LAND DRAINAGE AND FLOOD DEFENCE

5.8.1 General

Land drainage and flood defence activities are fundamental to maintaining the economic and social infrastructure of the nation. We are dependant on both to sustain our intensive use of land for food production and to provide land fit for development and habitation.

Fluvial Defences

Over the centuries, in East Anglia in particular, natural river systems have been radically altered to assist in the improvement and reclamation of land, primarily for agricultural purposes. This has taken the form of the construction of embanked channels and lowland drainage systems. Together these have created an artificial environment relatively devoid of wildlife and habitat diversity. Even in the upland parts of river catchments, extensive alterations have taken place to improve land drainage for agricultural purposes and provide flood defences for many rural and urban areas.

The natural process wherein rainfall would reach the river systems either directly or via local drains and groundwater movement is further altered by man's activities:

- Development of housing, roads and industry effectively waterproofs the land thereby increasing the rate at which rainfall reaches the river system - this can lead to an

increased risk of flooding both to the developments themselves and areas downstream;

- Agricultural drainage schemes can have a similar effect.

The maintenance of river systems is essential to prevent flooding of property, risk to life and the continuation of farming practices. In recent years these maintenance regimes have become an increasing source of conflict in finding a balance between the need to protect and enhance the environment whilst maintaining established defence standards.

Sea and Tidal Defences

Much of the land bordering the coast of East Anglia is low lying and protected against flooding by sea defences which have been built and rebuilt over many years by our predecessors. Wind and wave action produced by extreme weather conditions in the North Sea coinciding with high spring tides can produce tidal surges which may overtop or breach sea defences resulting in extensive flooding, severe property damage and loss of life. This occurred in 1953 when over 300 people perished along the East coast.

Sea defences can take many forms ranging from heavily engineered concrete walls through earth banks to sand/shingle beaches or any combination of these. The need to maintain these and to improve them to combat sea level rise results in similar conflicts as described above.

5.8.2 Local perspective

Fluvial Defences

The scale and type of flood protection measures provided reflect the varying topography of the Plan area. The upland watercourses tend to be natural, swift flowing streams with little in the way of major improvement for flood defence or land drainage purposes. Routine maintenance operations tend to be light with an emphasis on removal of obstructions which may otherwise create blockages, encourage erosion and increase the risk of flooding to adjacent land.

As the upland streams flow off the high land, they cross the low lying flat coastal plain on their progression to the sea. All of the plain is below sea level. The streams change noticeably from swift flowing to sluggish typical fen type drains, most embanked and greatly improved for land drainage and flood defence purposes. The annual maintenance regime for these watercourses is much heavier reflecting their artificial nature.

Although the Agency operates two pumping stations in the Plan area, the majority of flows are reliant on favourable tidal conditions to discharge waters under flood conditions. Throughout each period of high tide, waters flowing off the high ground has to be stored within the river channels before being discharged to the sea as tide levels decline.

Washlands and flood storage reservoirs are in operation on the Long Eau, Great Eau and Louth Canal. When these rivers are in flood some of the excess water flows onto these contained areas of land reducing the volume flowing downstream. The effect of this is to prolong the duration of flood flows while reducing the magnitude of the peak levels achieved.

Drainage within the coastal plain is provided by three Internal Drainage Boards. Due to the low lying nature of the plain much of the drainage system is reliant on pumping stations operated by the IDB to raise drainage waters sufficiently to discharge to the sea. Some drainage systems rely on the Agency's main rivers to discharge drainage waters to.

Sea and Tidal Defences

As discussed earlier, the coastal plain is entirely below sea level and is entirely reliant on sea defences to protect against sea flooding. Protection to this vulnerable area is provided by a variety of sea defence types ranging from natural beaches and sand dunes in the north, through heavily engineered concrete defences fronting the most heavily populated areas between Mablethorpe and Skegness, before returning to a more natural form of defence again as the nature reserve at Gibraltar Point is approached.

The type of sea defence which has been provided is in response to the natural processes at play. To the north and south of the Plan area, beach levels are generally accreting or stable. The 20km stretch of coast between Mablethorpe and Skegness however is an eroding coastline with very narrow, steeply graded beaches. This length of coast has suffered from declining beach levels, and hence increasing vulnerability of the sea defences to damage over a number of years. A major project commenced in 1994 to 'nourish' the beaches along this stressed length of coast to replenish sediments lost through natural processes. The initial nourishment phase is due to complete in 1998. Further annual re-nourishment will then be made to maintain the desired standard of sea defence.

5.8.3 Role of Key Players

Our role with respect to flood defences is far reaching. Most obvious among our responsibilities is our power to carry out the maintenance, improvement or construction of flood defence works on Main River and Sea Defences and to provide flood warning systems. We also have regulatory powers to exercise control over other parties' works, affecting watercourses, by means of a consenting process; and enforce Byelaws which prohibit certain actions which would affect flood defence works.

Flood defence works are carried out under the auspices of the Regional Flood Defence Committees (RFDCs), who in turn delegate certain actions to Local Flood Defence Committees (LFDCs).

The Lincolnshire Local Flood Defence Committee are responsible for discharging the Agency's flood defence function within the Plan area in accordance with the duties and

powers as set out in the Water Resources Act 1991. The Committee are responsible for:

- raising and approving the annual flood defence revenue budget and delivering the works identified therein;

- developing a Long Term (10 year) Capital Plan (LTP) which identifies and costs the future needs for improving and replacing flood defences.

Internal Drainage Boards (IDBs), administer drainage districts established within particularly low lying parts of England and Wales where flood protection and land drainage are necessary to sustain both agricultural and developed land use. These districts are often heavily reliant on pumped drainage. IDBs have the same powers in respect to watercourses within their districts as we have with regard to Main River.

Local Authorities have permissive powers under the Land Drainage Act 1991, similar to those of the Agency, which relate to those watercourses not designated Main River and not within an IDB area. In addition they have a number of powers under the Public Health Act 1936 relating to blocked watercourses and their culverting.

Riparian owners, that is to say owners of land on the banks of a watercourse, are entitled to certain rights under common law such as the right to discharge surface water from their land and the right to protect this land against flooding. Such rights however do not absolve them from the need to obtain consent for works which might affect the flow of water in any watercourse.

5.9 LANDSCAPE AND HERITAGE

5.9.1 General

The historic landscape and archaeological assets of the environment include features of the countryside such as hedges, walls, ditches and hay meadows, along with archaeological features which include bridges and deserted villages etc. Some sites protected or managed for their historic interest are also valuable for wildlife and as a result can form important habitats.

Change of land use and development (including farming practices and flood defence works) may result in ground disturbance and alter water table levels. Such change exerts a constant pressure on our landscape and archaeological heritage. In addition to their own intrinsic value rivers, lakes, wetlands and alluvium-covered areas can be important in terms of archaeology because of the types of site preserved and the possibility of anaerobic conditions permitting the preservation of organic materials. Archaeological remains in these environments are possibly the least well documented, probably because, until disturbed, remains preserved in these areas are among the best protected in the country. Water levels may be critical to preserving remains - an increase may result in erosion whilst a decrease may lead to the

destruction of previously water-logged deposits.

5.9.2 Local Perspective

Many archaeological sites in the Eastern Marsh area of the county are buried under earlier marshland deposits, some at a depth of over three metres and are thus well protected. The sites in this area are some of the best preserved in the country. Due to the high water table they have very good organic and environmental preservation. However, any change in the water table (both upward and downward) can upset the delicate anaerobic conditions and lead to the decay of the fragile remains.

Coastal areas adjacent to the marsh not only have similar issues to those stated above but there is also the likelihood of disturbing maritime archaeology sites (eg wrecks, fish traps and salt production sites) and wartime coastal defence works. The archaeological sites in this area show a great deal of unique regional variation.

Within coastal areas adjacent to the marsh there is a chance of disturbing maritime archaeology sites (eg wrecks, fish traps and salt production sites) and wartime coastal defence works. The archaeological sites in this area show a great deal of unique regional variation and require detailed study in order to understand them fully.

The removal or deposition of soil can occur during works within rivers (eg dredging, diverting, riffles etc) . The Agency seeks to carry out such duties without impacting on archaeological sites.

Dawn over the Wolds

In the Plan area identified there are approximately 2100 sites ranging from urban sites in Louth to rural priory sites (eg Markby), Roman Settlements (eg Binbrook), Neolithic and Bronze Age burial mounds, medieval settlement sites, maritime sites and so on. Of these sites approximately 76 are protected as Scheduled Monuments (SMs). These sites have been identified by the Secretary of Culture, Media and Sport as being of national importance and thus worthy of preservation under the 1979 Act. Any proposed works on or adjacent to these SAMs should initiate a consultation both with English Heritage and the County Archaeological Office. The number of sites on the record is however constantly changing as new survey work identifies new features (particularly along the coast), any project in the sphere of interest identified should initiate a search in the Sites and Monuments Record (SMR) with the County Councils Archaeological Section to identify the present state of knowledge. For large projects or projects in an area of particular archaeological sensitivity (as flagged by the SMR search), the Environment Agency has a responsibility to commission an Environmental Impact Assessment to ensure that the works will not have significant impact on as yet undiscovered archaeological remains.

5.9.3 Role of Key Players

We have a duty to have regard to features of archaeological and historic interest and to further the conservation of flora and fauna during all aspects of our work. From an operational perspective we undertake the appropriate consultation procedures. This includes consulting with the County Archaeologist on any scheme which involves the movement of soil or changes in water levels.

MAFF's role in the protection of landscape is addressed through the promotion of their Environment Sensitive Areas scheme, and by its incorporation into various other legislation. Under the ESA scheme, MAFF promote farming methods which protect and enhance wildlife, landscape and historic features. Countryside Stewardship agreements offer similar incentives to farmers.

5.10 THE NATURAL ENVIRONMENT

5.10.1 General

East Anglia is rich in wildlife with over one third of the key species and important habitats identified in the "UK Biodiversity Action Plan" being found here. However over the past decades, dramatic reductions in habitat and species have occurred, making what remains even more precious.

Of significant relevance to the role of the Agency is that element of bio-diversity which is dependent upon the water environment, both within the river corridor and in sites of conservation value which are water dependent. These habitats support a diverse range of plants and animals ranging from those species wholly dependent on open water to species which exploit river corridors and wetlands as valuable refuges.

Pressures upon bio-diversity are wide ranging and include the construction of flood defences, land drainage practises, low river flows exacerbated by the abstractive demand for water, and the influence of human activities on water quality.

The whole of England has divided up into Natural Areas as devised by English Nature. Their borders do not follow administrative boundaries, but are defined by their wildlife, natural features, land use and human history.

5.10.2 Local Perspective

Within the Plan area there are two distinct Natural Areas:-

(a) The Lincolnshire Coast and Marshes

This Natural Area is a generally flat coastal plain that is largely under arable cultivation. Despite this, there are habitats rich in wildlife including meadow and pasture grasslands, saltmarsh, sand dunes, brackish lagoons, rivers, drains, blow wells and woodland. In the past, large areas of saltmarsh and wet marsh were reclaimed for cultivation. Since the war, more and more grasslands have increasingly been ploughed up for arable farming which has significantly reduced the wildlife value of the area. Within the plain there are three distinct areas: the gently undulating Middle Marsh, the reclaimed Outmarsh and the coastal margin.

(b) Lincolnshire Wolds

This Natural Area has a rolling landscape that rises up to 150 metres above sea level and is largely under arable cultivation. Despite this, there are habitats rich in wildlife including chalk grasslands, rivers, streams and woodlands. As for the Lincolnshire Coast and Marshes, since the war, more and more grassland has been ploughed up for arable farming which has significantly reduced the wildlife value of the area.

5.10.3 The Role of Key Players

We have a duty when exercising all our functions to promote and further the conservation of flora and fauna. In formulating our proposals or considering proposals from other parties, we must take into account:

- the protection of areas formally designated as being of particularly high conservation value, eg. Ramsar sites, Special Areas of Conservation (SAC), 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 Agency work or consent is likely to impact on the sites above.

Department of the Environment, Transport and the Regions (formerly DoE) have ultimate responsibility for the national conservation policies of the Agency.

English Nature are the statutory body responsible for nature conservation and the designation of SSSI's in England.

Countryside Commission are the statutory body responsible for the conservation of landscape and promoting access to the countryside in England.

English Heritage are the statutory body responsible for matters of archaeological interest and historic buildings.

Non-Governmental Conservation Organisations, the voluntary sector, for example, the Royal Society for Nature Conservation (The Wildlife Trust Partnership), the Royal Society for the Protection of Birds and the National Trust are extremely important and influential.

Local Authorities have a remit to ensure that conservation interests are taken into full account and expressed in local and regional plans.

Ministry of Agriculture, Fisheries and Food (MAFF) promote a package of measures which aim to encourage farmers to undertake a range of positive actions designed to conserve and enhance the rural environment and its natural resources.

5.11 FISHERIES

5.11.1 General

The water environment can be said to be "used" by fish as a habitat. Fish use the coastal waters and river systems for food and shelter and are managed by man for both commercial and recreational purposes. Fish populations are affected both by the quality and the quantity of water, and by the physical suitability and structure of the aquatic ecosystem. The presence of a thriving fish stock is therefore one of the best possible indicators of a satisfactory water environment.

5.11.2 Commercial use of the fishery

Extensive use is made of the fisheries within Great Britain for commercial gain. This includes fish farming activities - the rearing of Rainbow Trout for human consumption and for sporting use, commercial eel fishing, shellfish harvesting, and marine fishing.

Fish farming can make a significant contribution to the rural economy, but is subject to

stringent water abstraction and discharge controls. Protection is needed from any deterioration in water quality and quantity which could damage or impair the health of farms and stock and cause commercial damage.

5.11.2.1 Local Perspective

There are a number of important commercial trout farms within the Plan area, two of which are situated on the upper Great Eau with the remaining third farm on the upper Long Eau. A major constraint on the development of more fish farms is the limited supply of both spring and surface water suitable for such farms. These farms are of national importance and supply a large proportion of fish for both table and recreation uses.

Ornamental carp farming/rearing is practised within the Plan area at Maltby on the upper reaches of the River Lud on the site of an old trout farm. Carp are more tolerant of poor water quality and quantity.

Many local waters are leased to commercial eel fishermen who make a living from capturing and selling live eels for the table. Most of the rivers within the Plan area are fished by eel fishermen who lease the fishing rights from the Agency.

5.11.3 Recreational use of the fishery

Angling is said to be the most popular recreational activity, in terms of participating numbers, within Britain. It is undertaken both for relaxation purposes and as a sport as coarse and game fishing.

Angling is practised on freshwater rivers, lakes and reservoirs and to a limited degree in coastal waters. It is practised on privately owned, syndicated waters and on club waters, managed by Angling Associations.

The majority of anglers are interested in the pursuit of coarse fish, such as bream, carp, roach, perch, pike and tench. Fly fishing for trout is perhaps the most widespread and distinctive specialist category. Competitive match fishing is widely practised, although for the most part angling is non competitive in nature.

5.11.3.1 Local perspective

The River Steeping is the largest recreational fishery within the Plan area. It rises as the River Lymn in the Wolds and drains a predominantly sandstone catchment located to the west of the Wold Chalk escarpment. Limited trout angling is practised on the River Lymn with the bulk of recreational angling taking place further downstream on the River Steeping and the Wainfleet Relief Channel. The main species sought on the River Steeping are roach, bream, tench, and pike.

There are a small number of other recreational river trout fisheries within the Plan area, these being restricted to the upper Great and Long Eau, the Waithe Beck and River Lud.

There are a large number of small stillwater coarse fisheries within the Plan area. The east coast remains a popular holiday destination with many tourists visiting the area during the summer. Stillwater recreational angling contributes greatly to the local economy during the holiday season.

5.11.4 Role of Key Players

The Agency has responsibility for salmon and freshwater fisheries in England and Wales. We have a statutory duty to maintain, improve and develop such fisheries. We make Byelaws regulating salmon and freshwater fisheries under the Water Resources Act 1991. These have to be confirmed by the Minister of Agriculture, Fisheries and Food or the Secretary of State for Wales before they can take effect. Ministers are also responsible for approving changes to fishing licence duties in cases where these attract formal objections.

Fishery enforcement is carried out by our team of enforcement officers and honorary bailiffs, who monitor rod licences and fish movements.

5.12 RECREATION AND AMENITY

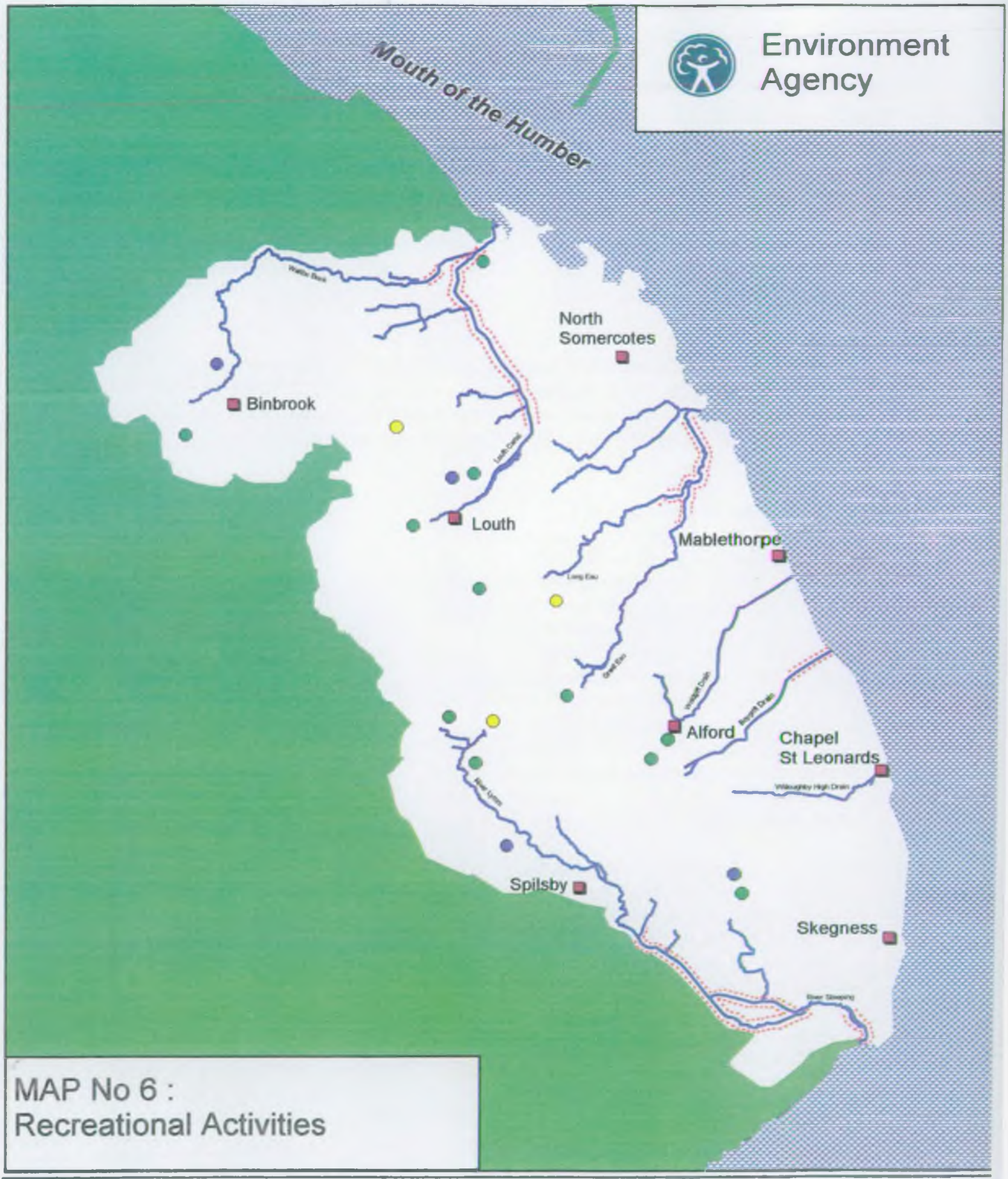
5.12.1 General

As the role of the Agency in recreation and amenity is constrained by its remit, this use will focus upon those activities associated with our operational and regulatory duties. The range of activities included in this section include those such as walking, horse riding and tourism on sites of interest within the water environment and on land owned by ourselves as well as those activities traditionally thought of as sports or outdoor pursuits.

The increase in personal leisure time has increased peoples participation in, and expectations of this amenity. At the same time the countryside and river corridors are being used more intensively by developers and farmers with constraints and limitations upon access becoming more and more evident. The conflicts which can arise from the different demands between different user groups and those of landowners and tenants, makes management of recreational and amenity needs difficult.

5.12.2 Local perspective

The majority of non angling recreation is limited to the east coastal strip and the Area of Outstanding Natural Beauty situated in the Wolds. Other areas for recreational activities include the network of public footpaths, bridle routes, picnic areas and nature reserves.



MAP No 6 : Recreational Activities

KEY:

- Main River
- Town
- Popular Angling Stretches
- Recreational Walks
- Bridle Routes
- Cycle Routes

Walking, Cycling, & Horse riding.
The Plan area contains a wide variety of recreational walks, cycle routes and bridle ways. Recreational walking sites are located at Louth, Burgh le Marsh, Alford, and Tetford at the source of the river Lymn. There are also a number of cycle routes and bridle ways situated towards the edge of the Wolds escarpment which are mostly used during peak holiday periods by tourists visiting the east coast.

Birdwatching
There are a number of important breeding and over wintering reserve sites including the Sea Bank Clay Pits, Donna Nook, Saltfleetby and Theddlethorpe Dunes, and Gibraltar Point all of which provide important habitat for a wide range of birds and constitute a vital element to the east coast migration route. These sites are very popular with bird watchers all year round.

Yachts moored at Gibraltar Point

Navigation Canoeing and Sailing
There is currently no navigation or canoeing although investigations are underway to assess the potential of this area on the Louth Canal. (See issue 4f). Recreational sailing activities take place on the Anglian Water Services Ltd. owned site at Covenham Reservoir near Louth with other sailing activities taking place at various sites along the east coast.

5.12.3 Role of Key Players

We have an important role to play in partnership with others in developing policies, management techniques and in the provision of facilities which will achieve a sustainable and integrated approach to the use of waters and land for recreation.
In addition to ourselves, there are many other bodies and organisations which have a role to play in improving the uses of recreation and amenity. Local Authorities, the Countryside Commission and the Sports Council all have important duties in this respect.
Map No. 6 shows recreational activities

5.13 RADIOACTIVE SUBSTANCES

5.13.1 General

Radioactive substances are present in the environment as a result of both natural processes and of man's activities. The uncontrolled and incautious use of these substances can pose both immediate and long term hazards.

The range of premises using radioactivity is large and includes hospitals, universities, research establishments and many different commercial industries, amongst them the various components of the nuclear industry. The types of waste are equally diverse. They include wastes with very low levels of radioactivity from industry and commerce and wastes with intermediate and high levels of radioactivity generated by the nuclear industry. The approach of the Agency is an integrated one, considering releases to the environment as a whole.

The usage and disposal of radioactivity is grouped by The Radioactive Substances Act '93 into three categories:

* Section 7 covers the registration of premises where radioactive sources may be held and used;

* Section 10 covers the registration of mobile sources, where the Operator is permitted to take radioactive sources around in the course of his work (viz measuring devices for road laying and agricultural machinery);

* Section 13 covers the disposal of radioactive sources, whether to air, the aquatic environment, landfill, or specified depositories.

5.13.2 Local Perspective

Within the area covered by this Plan, the Agency regulates eleven Section 7 registrations, seven Section 10 registrations and two Section 13 registrations. Exemption orders made under the Act permit the holding and disposal of radioactivity where the usage is widespread and the quantities involved are of such low magnitude as not to present any risk to the public or the environment.

5.13.3 The Role of Key Players

Our role in respect of the categories identified above is as follows:

Section 7 We are concerned to ensure that the holding is properly recorded and supervised, and that correct procedures are in place for ensuring the safe replacement/disposal at the end of the useful life of the sources;

Section 10 We are concerned to ensure that the holding, transportation, and storage when not in use, is properly recorded and controlled, and that correct procedures are in place for ensuring the safe replacement/disposal at the end of the useful life of the sources;

Section 13 We are concerned to ensure that proper assessments of the impact on the environment are carried out to ensure that the disposal may be carried out in such a way as to prevent harm to humans or to the environment, and that the disposals conform to the approved methods.

The National Radiological Board also play a role in radiation protection for the public. The Nuclear Installation Inspectorate part of the Health and Safety Executive have responsibility for safety at nuclear power stations.

6.0 STATE OF THE ENVIRONMENT

State of the Environment - Contents	
6.1	The quality of surface water
6.2	Groundwater quality
6.3	The adequacy of water resources
6.4	Flood Defence
6.5	Land
6.6	Performance of Waste Management Facilities
6.7	Radio-activity
6.8	Air Quality
6.9	Wildlife
6.10	Fisheries

This section of the report sets out a range of environmental indicators that are used to measure the health of the environment in terms of the Air, Water, Land and Wildlife. It identifies the prescribed standards for these which will enable the well being of our natural resources to be maintained and where possible enhanced. It also sets out the level of monitoring undertaken by ourselves and summarises the current state of the environment in terms of each indicator.

We are using this approach to provide data to others, such as local authorities with whom we work closely and to inform others about environmental matters. Supporting data is available within the appendices.

6.1 SURFACE WATER QUALITY

General

Our aim for surface water quality across England and Wales is to achieve a continuing overall improvement in the quality of rivers, estuaries and coastal waters, through the control and prevention of pollution.

6.1.1 Chemical Water Quality

6.1.1.1 Monitoring

Much of our effort to maintain and improve water quality is based upon data gathered as part of our ongoing routine monitoring. We collect samples from a network of sites throughout the Plan area for statutory and classification purposes. We also take samples to fulfil operational needs, for example following pollution incidents or for special surveys. Samples from sediments are also collected, mainly for the Dangerous Substances (76/464/EEC and associated 'daughter') Directive.

6.1.1.2 Targets

We set Water Quality Objectives (WQO) to provide a consistent basis for planning and managing water quality.

WQOs establish a defined level of protection for aquatic life and other uses. Achieving the specific water quality standards associated with these objectives will help sustain the use of rivers for recreation, fisheries and wildlife, and protect the interests of abstractors. WQOs also provide a basis for setting consents to discharge effluents into rivers, and guide decisions on the Agency's other actions to control and prevent pollution.

WQOs originate from a variety of sources, eg. EC Directives, National and Local Schemes. Many EC Directive WQOs are statutory. The Department of the Environment (DoE), now part of the Department of the Environment, Transport and the Regions (DETR), has published proposals for a National Scheme of Statutory Water Quality Objectives (SWQOs) for classified river stretches. However, until these are formally established they will be applied on a non-statutory basis. Criteria used to define which river stretches are classified include river flow, position of tributaries and discharges.

The Water Quality Objectives (WQO) scheme

The DoE/DETR proposed WQO Scheme for freshwater reflects a variety of different river uses. The River Ecosystem (RE) Scheme comprises five classes which reflect the chemical quality requirements of communities of plants and animals occurring in our rivers. The standards defining these classes reflect differing degrees of pollution by organic matter and other common pollutants which impact upon flora and fauna (in the future, the RE Scheme

will be augmented by schemes proposed for other recognised uses including: abstraction for drinking water supply; agricultural abstraction; industrial abstraction; special ecosystems; and watersports).

Table 3: Descriptions of the River Ecosystem Classes

Class RE1	Water of very good quality suitable for all fish species
Class RE2	Water of good quality suitable for all fish species
Class RE3	Water of fair quality suitable for high class coarse fish populations
Class RE4	Water of fair quality suitable for coarse fish populations
Class RE5	Water of poor quality that is likely to limit coarse fish populations
Unclassified	Water of bad quality in which fish are unlikely to be present or insufficient data available by which to classify water quality

Chemical standards have been derived for each of these classes and details of these standards are given in ***Appendix 5.***

The long-term WQOs for the Plan area are given in **Appendix 6.** These have been set according to the current and potential future uses of the watercourses in the Plan area, and represent what we perceive as realistic and sustainable targets for the future. For those watercourses which are classified, these objectives will form the basis for future SWQOs.

It is important that long-term objectives reflect the likely uses of the watercourses in the area and a public view on the potential uses for specific watercourses would be valued.

Statutory Water Quality Standards under EC Directives

The EC Dangerous Substances Directive (76/464/EEC) - to monitor Dangerous Substances in watercourses downstream of known discharge points **(Appendix 7)**.

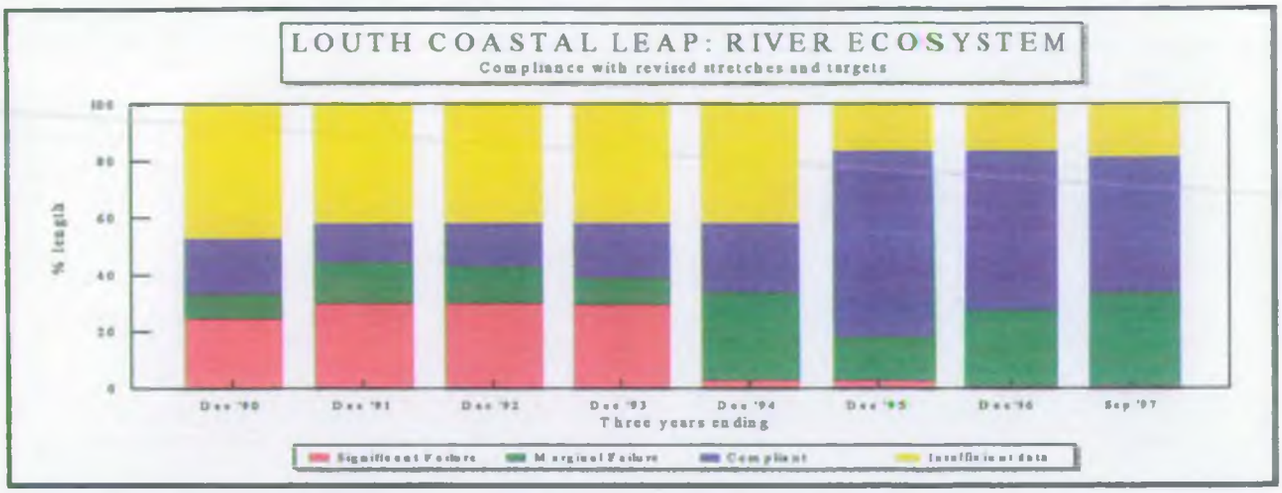
The EC Surface Water Abstraction Directive (75/440/EEC) - to monitor the quality of water abstracted for Public Water Supply

EC Freshwater Fish Directive (78/659/EEC) - to monitor the presence of substances detrimental to fish populations **(Appendix 8)** .

EC Bathing Waters Directive (76/160/EEC) - to monitor the quality of bathing waters **(Appendix 9).**

6.1.1.3 Current status/trends

Compliance against the WQO scheme



Compliance with these objectives is assessed using routine monitoring results from a rolling three year period. Stretches are described as compliant or showing significant or marginal failure.

Significant influences on water quality are effluent quality and the available water resource for diluting effluent. A review of RE compliance over the last eight years has generally shown a steady improvement as illustrated above.

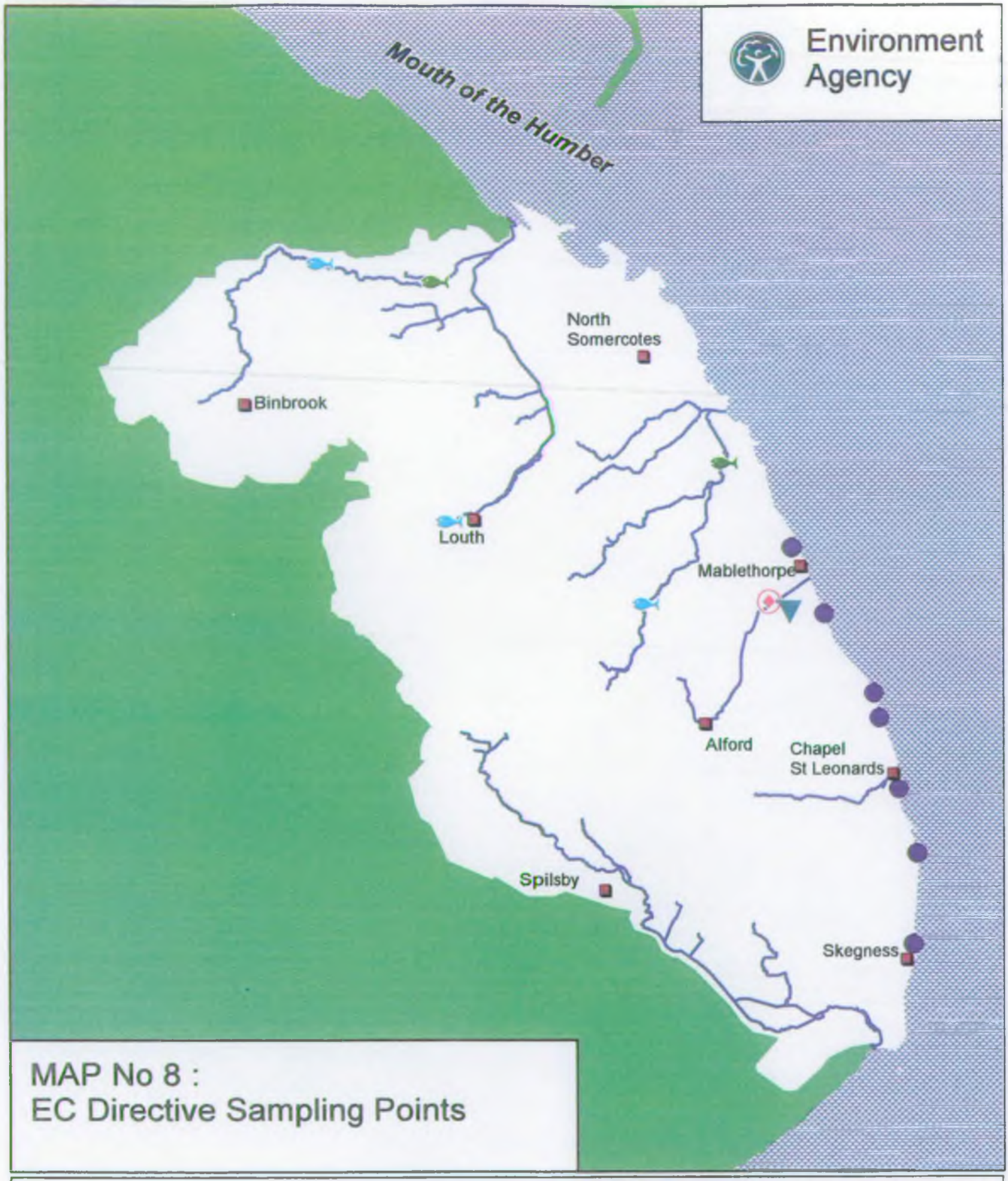
There are some stretches with insufficient data due to a recent review of stretches, targets and sampling points. Sampling will be instigated for these.

Map No. 7 shows River Ecosystem Targets and compliance

This shows compliance with the proposed Long Term Objectives for the period ending September 1996, along with proposed Long and Short Term Objectives.

It is important to realise that this is a national scheme and thus is designed to reflect the natural quality of a range of rivers from fast flowing upland rivers, through high quality lowland rivers to the slow flowing managed rivers typical of Eastern England. Thus the particularly demanding requirements for dissolved oxygen of the highest (RE1) class may not be achievable in the slower flowing rivers found in this Plan area due to natural in-stream biological processes.


Mouth of the Humber
Environment Agency
RE2
RE3
RE2
RE3
RE2
RE3
RE3
North Somercotes
RE3
RE3
RE3
Binbrook
RE3
RE2
RE3
RE2
RE2
Louth
RE2
RE3
RE4
RE2
RE2
Mablethorpe
RE2
RE3
RE4
RE1
RE3
RE3
RE4
Alford
Chapel St Leonards
RE3
RE2
RE3
Spilsby
Skegness
RE2
RE3
MAP No 7 :
River Ecosystem Compliance and Targets
KEY:
Compliance with River Ecosystem Targets
(3 yrs data to September 1997)
Compliant
Marginal Failure
Significant Failure
New Sample Point (insufficient data)
RE2 Long Term RE Target
RE3 Short Term RE Target



MAP No 8 : EC Directive Sampling Points

KEY:

- Surface Water Abstraction
- Bathing Water
- Freshwater Fisheries (Salmonid)
- Freshwater Fisheries (Cyprinid)
- Dangerous Substances- List 1

Please note: All the sample points shown above currently achieve the relevant Directive standard (March 1998).

See also Appendices 7,8 & 9.

Shortfalls against WQO Scheme

Shortfalls exist where stretches are identified as having failed significantly or marginally. Details of significant failures for the three years ending September 1997 are given below:-

Louth Canal between Louth STW and Alvingham footbridge

Significant failure for Biochemical Oxygen Demand (BOD), ammonia and un-ionised ammonia. This links to Issue 4d within the Plan and AMP investment Appendix 4.

Where we are statistically uncertain of whether a failure really exists we describe it as a marginal failure. Where such failures are recorded the situation will continue to be monitored and reviewed. Additional monitoring may be introduced to improve our understanding of the situation. See **Appendix 10** for details of marginal failures - currently not available.

Short-term Objectives set under the WQO Scheme

In preparation for SWQOs, for some river stretches in this document long-term objectives are supplemented by short-term objectives. These are adopted where water quality fails to meet the long-term objective, where further investigation may be required to assess the nature of the problem or where there are no immediate solutions.

In these cases a target date for achieving the long-term objective may be set. Costs of schemes to meet long-term WQOs will be considered against the likely benefits. This should ensure excessive costs are not incurred by dischargers and improvements are effectively targeted. More details of our proposals for short-term objectives are outlined in **Appendices 3** and **6**.

Compliance against SWQOs under EC Directives

Compliance is assessed against the relevant standards, at designated sites, and reported to the DETR on a calendar year basis.

Map No. 8 shows EC Directive Sampling Points. All sites currently comply.

Dangerous Substances Directive - the one sample point designated in the Plan area under this Directive currently compliant.

Freshwater Fish Directive - historically a failure was recorded in the Plan area against standards for this Directive. Details are shown in **Table 4.**

Table 4: Freshwater Fish Directive failures

River	Designation	Failures (1992- 1995)
GREAT EAU, CALCEBY - LONG EAU	SALMONID	DISSOLVED OXYGEN 1992

The reason for this failure was investigated. It was identified to be associated with low flows.

Surface Water Abstraction Directive - there is one abstraction point used for public water supply within the Plan area at Covenham. Compliance has not always been achieved, however, the one failure indicated below, was associated with analytical problems which have since been resolved. Details are shown in **Table 5.**

Table 5: Surface Water Abstraction Directive failures

Location	Failures (1992-1995)
COVENHAM	PHENOLS 1994 (ANALYTICAL DIFFICULTIES)

Bathing Water Directive - The Environment Agency has specific duties in relation to Bathing Waters. The quality of bathing waters in England and Wales is monitored against standards laid down in the Bathing Water Regulations (SI 1991/1597), which give effect to the EC Bathing Water Directive 76/160/EEC which imposes statutory objectives on Bathing Waters. Waters covered by its provisions are identified by the DETR.

Monitoring is carried out by the Environment Agency and reported to the DETR, who assess compliance on a calendar year basis. The bathing season in England and Wales is taken to be from 15 May to 30 September: Bathing Water sampling begins two weeks before the start of the season and continues throughout the season. A number of parameters are monitored (see **Appendix 9**) including the main microbiological indicators. These parameters parameters are sampled/assessed in all 20 samples throughout the year apart from pH, dissolved oxygen, salmonella and enteroviruses (only sampled when a Bathing Water has failed the Directive in the previous year), each of which are sampled twice in the season.

There are seven identified Bathing Waters in the Plan area. They have all complied with the Directive for some time although historically there have been failures. Details are shown in Table 6.

Table 6: Bathing Water Directive failures

Location	Year (s) of failure
CHAPEL ST LEONARDS	1987
INGOLDMELLS	1987
MABLETHORPE	1987,1989

See Appendix 9A for information on Blue Flag and Seaside Award schemes.

6.1.2 Biological Water Quality (Freshwater Invertebrates)

6.1.2.1 General

The monitoring of biological life within watercourses gives us an indication of both their conservation value and of the quality of river water. Such monitoring complements our chemical analysis of river water.

Biological assessment is based upon the monitoring of aquatic macroinvertebrates living in rivers. They do not move far and respond to everything contained in the water. They can be affected by pollutants which occur intermittently or in very low concentrations. If the water is polluted, even for only a few minutes then some or all of them may die. Recovery of the community may take several months. This means that biology provides evidence of pollution which may have been missed by the routine spot-checks which form the basis of the chemical monitoring.

6.1.2.2 Monitoring

For our General Quality Assessment (GQA) surveys (see **Appendix 1**), each chemical point, representing one or more river stretches was matched with a unique biology sampling point where possible. Biological samples are collected twice from each site in a year (Spring and Autumn). Biological samples are also taken at other sampling sites.

6.1.2.3 Targets

Some animals are more susceptible than others to pollution and the presence of sensitive organisms is a sign that water quality is good. This is taken into account by the Biological Monitoring Working Party (BMWP) scheme. A family (or taxon) of macroinvertebrates sensitive to organic pollution scores more highly (10 points) than one which tolerates pollution (1 point). The BMWP score for a sample is the sum of the points for each family found in a sample. The Average Score per Taxon (ASPT) is calculated by dividing the BMWP score by the number of scoring taxa present.

A national Biological GQA classification system has been developed. Since rivers vary in size, flow, geology and topography, the macroinvertebrates present vary even when pollution is absent. It is, therefore, useful to describe the biology as a shortfall from that expected in the absence of pollution. A computer system called RIVPACS (River InVertebrate Prediction And Classification System) is used to predict the macroinvertebrates which should be found in a clean river. For each site RIVPACS is used to predict the number of taxa and the ASPT. The biological quality is then expressed as the ratio of the prediction and actual scores. Such a ratio is called an Ecological Quality Index (EQI). The Biological GQA grades are based on the EQI values in **Table 7** below.

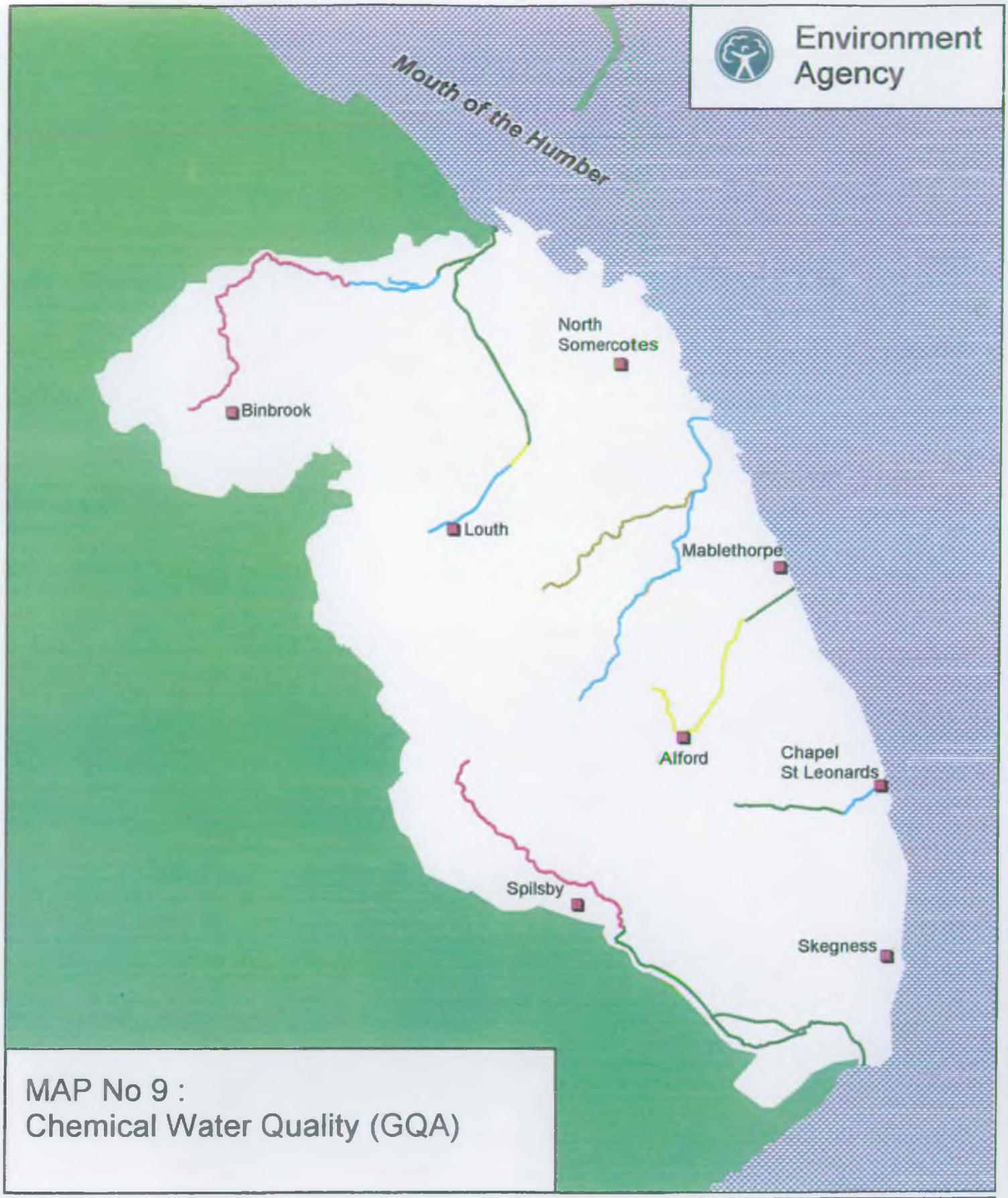
Table 7: Biological GQA Grades

Biological GQA Grades		
Grade	**EQI for ASPT**	**EQI for Taxa**
a	1.0	0.85
b	0.90	0.70
c	0.77	0.55
d	0.65	0.45
e	0.50	0.30
f	-	-

This system enables the Agency to describe water quality in a nationally consistent manner and assess whether changes in quality are statistically significant.

The biological data also enables an assessment of the conservation value of a river stretch. Macroinvertebrate communities which have a high diversity of species and/or rarity value are considered to be of conservation importance. A methodology has been devised to summarise this information for presentation in the form of a Community Conservation Index.

Anglian Region also has use-related targets for assessing biological quality - Lincoln Quality Index (LQI). Ranges of BMWP score and ASPTs have been assigned a rank of 1 to 7 based on whether the habitat for macroinvertebrates is considered to be rich or poor. The LQI is the average of the two ranks. The LQI system, ranges from A++ (Excellent) to I (Very Poor). Biological sampling sites have been assigned an LQI target based on the identified use of the river stretch. LQI scores are compared against this target and a failure is identified where a site persistently fails or significantly fails to meet its target. The Agency responds to failures by carrying out further investigation to identify the cause of the failure.


Environment Agency
Mouth of the Humber
North Somercotes
Binbrook
Louth
Mablethorpe
Alford
Chapel St Leonards
Spilsby
Skegness
MAP No 9 :
Chemical Water Quality (GQA)
KEY:
General Quality Assessment (Chemistry)
1996 Data
A Excellent
B Good
C Moderate
D Fair
E Poor
F Bad
Town

MAP No 10 : Biological Water Quality (GQA)

KEY:

General Quality Assessment (Biology) 1996 Data

- A Very Good
- B Good
- C Fairly Good
- D Fair
- E Poor
- F Bad

Town

6.1.2.4 Current Status

Water quality within the Plan area is generally good to fair. In essence many of the water quality issues referred to in the National Rivers Authority's Catchment Management Plan for this area were related to low flows and drought conditions. These have to some extent been eleviated by a mixture of work prompted by ourselves and undertaken by the major dischargers and other partner organisations and the return of more favourable flow conditions. There are however, persisting issues relating to drought and saline intrusion.

Maps Nos 9& 10 Show the Chemical and Biological quality of watercourses

Table 8: Freshwater macroinvertebrate species of high conservation status.

The Plan area includes many flowing and stillwater systems, several supporting rich and diverse macroinvertebrate communities. Some of the rarer species, found during monitoring by the Agency, are detailed below;

SPECIES	*STATUS*	*LOCATION*	*COMMENTS*
Noterus crassicornis (Lesser Diving Beetle)	Nationally notable	Lower Long Eau.	Relict fen species, brachypterous (short-winged, flightless) & consequently restricted in distribution.
Hydraena nigrita (Scavenger beetle)	Nationally notable	Laceby Beck.	
Crenobia alpina (Flatworm)	Regionally highly notable	Tributaries of Great Eau (*eg.* Belleau Springs), upper Burlands Beck (Claxby Springs).	Only able to inhabit water of relatively low annual mean temperature. Consequently common in upland areas of U.K, but restricted to heavily shaded spring waters in Lincolnshire & East Anglia.

Brachycercus harrisella (Mayfly)	Regionally highly notable	R.Lymn/Steeping.	Inhabits narrow range of habitats (clean, moderately fast to.sluggish small rivers, sandy substratum).
Caenis pseudorivulorum (Mayfly)	Status uncertain (recently discovered immigrant species)	R.Lymn/Steeping.	Similar habitat requirements to *Brachycercus*.
Wormaldia subnigra (Caseless caddisfly)	Regionally notable	Upper Waithe Beck.	Generally associated with clean water in upland areas. Very few appropriate habitats in Lincolnshire & East Anglia.
Nemurella picteti (Stonefly)	Regionally notable	Lower Waithe Beck (tributaries near Tetney Blow Wells).	Nationally common species, but tends to be associated with clean, cool waters in upland areas. Restricted distribution in Lincolnshire & East Anglia.
Beraeodes minutus (Cased caddisfly)	Regionally notable	R.Lymn.	Nationally uncommon species, requiring clean water.
Niphargus aquilex (Subterranean shrimp)	Regionally notable	Laceby Beck	Subterranean species, found near spring sources of surface waters.
Sialis fuliginosa (Alderfly)	Local (restricted distribution in Region)	Upper Waithe Beck.	Nationally uncommon species, associated with relatively clean, moderately fast-flowing waters.

The Plan area includes a number of protected locally or nationally important wetland sites, including Saltfleetby/Theddlethorpe Dunes, a National Nature Reserve (NNR) & Site of Special Scientific Interest (SSSI), Gibraltar Point NNR/SSSI and Tetney Blow Wells SSSI. These, and the many other reserves in the area, support highly diverse and unusual communities of macroinvertebrates, including a number of rarities.

Such sites also support unusual and important communities of plants and vertebrates, such as the natterjack toad (*Bufo calamita*) at Saltfleetby/Theddlethorpe Dunes, a nationally protected species.

Shortfalls in Biological Quality

(i) Louth Canal downstream of Louth Sewage Treatment Works.
(ii) The Middle section of the Great Eau has shown a shortfall although this is not reflected in the GQA system. Non routine biological work has highlighted a deterioration in biological quality due to general enrichment.
(iii) Saline ingress is experienced in a number of coastal streams, for example, the Anderby Main Drain and the Willoughby High Drain.
(iv) The middle section of the Waithe Beck near Binbrook has particularly suffered due to low flows and siltation.

6.1.2.5 Trends

Concomitant with regional and national trends, water quality in the Plan area, indicated by resident macroinvertebrate communities, has generally improved since the early 1990's.

Such improvements have been offset to some degree, however, by damage to biological communities in many watercourses due to drought. Such damage is demonstrable in the Waithe Beck where low flows have lead to significant habitat modifications and concurrent changes in the macroinvertebrate fauna. Coastal drain systems, such as the Anderby Main Drain and Orby Drain, have likewise deteriorated, due to reduced dilution and greater upstream penetration of influent salt water, during periods of low flow.

Available data.

An extensive database is held by the Northern Area of Anglian Region, including full species lists for 107 sites in the Plan area, sampled up to three times per year. Data is available from early 1986 to the present, and as paper records back to the 1970's. This data is also held by the Regional Environment Scientist at the regional office, and can be used with the RIVPACS system for prediction and classification. Biological GQA data (classes related to river stretches) are available from this source. Sample analysis is undertaken in conjunction with rigorous quality assurance procedures.

6.1.3 Chemical and Biological Water Quality - summary

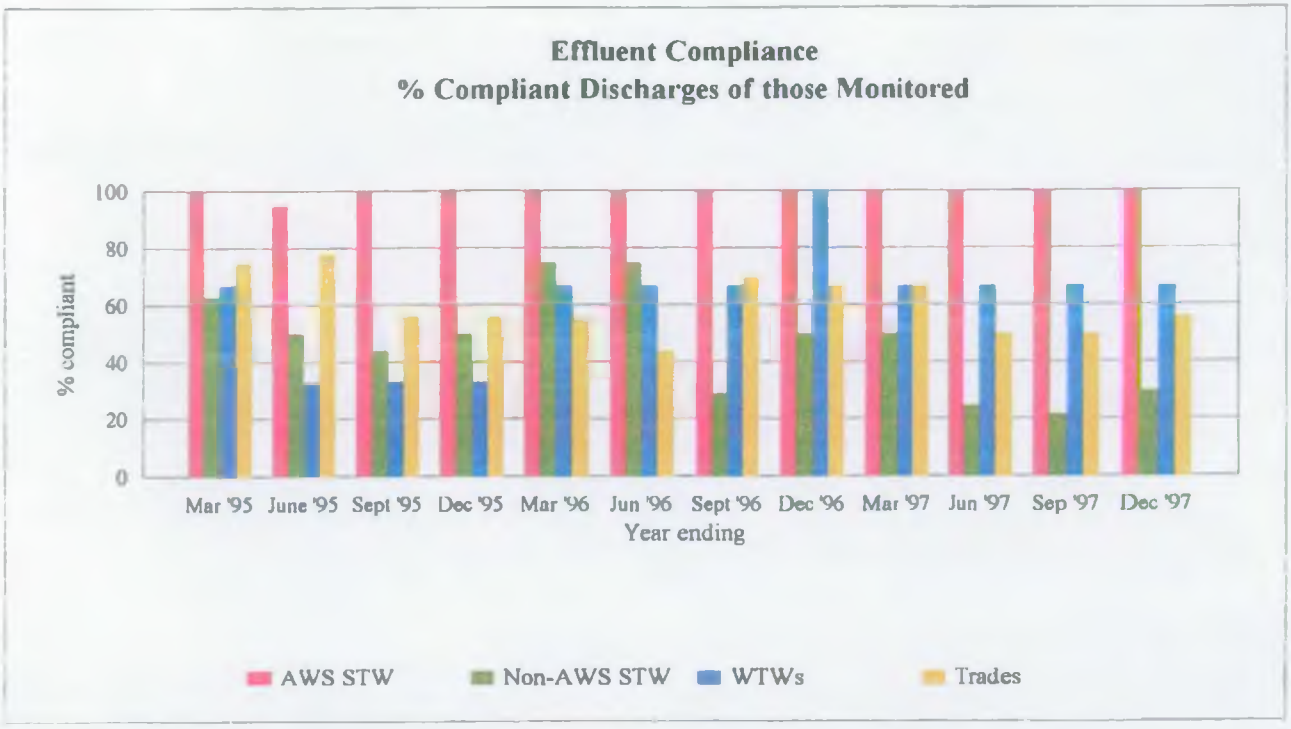
Table 9: Watercourses in the Plan area with chemical and/or biological shortfalls

WATERCOURSE	CHEMICAL	BIOLOGICAL
Louth Canal, Louth STW...Alvingham Footbridge (Issue X)	Significant BOD, un-ionised ammonia and ammonia failure	Target failed - Macroinvertebrate Diversity Shortfall.
Middle Section of the Great Eau (Claythorpe - Withern)	Compliant	Enrichment impacting on the macroinvertebrate community.
Lower end of Coastal watercourses e.g. Anderby Main Drain & Willoughby High Drain	No chemical monitoring. Compliant	Macroinvertebrate Diversity shortfall
Middle Section of the Waithe Beck	Marginal Dissolved Oxygen failure	Low flows and siltation particularly affect the macroinvertebrate community

Other Indicators of Water Quality Status/Trends

Other indicators of water quality include (i) the Performance of Discharges against Consent Conditions and (ii) reported pollution incidents.

Discharge Performance Compliance of monitored discharges in the Plan area, for the year ending December 1997, is summarised opposite.



Note: There are a few points that are important to note. Firstly, direct comparisons should not be made between different types of discharge. This is because different types of standards, with varying legal definitions of compliance, are applied to different types of discharge. Secondly, because the number of discharges monitored is small, big changes in the statistics may be due to one or two discharges moving from compliance to non-compliance, or vice versa, from one reporting period to the next.

We are currently targeting categories of discharge showing poor compliance.

Overperforming STWs

Currently, some AWS Sewage Treatment Works (STWs) in the Plan area are operating to a better standard than that required by their Discharge Consent (in terms of volume discharged and/or quality of effluent). This occurs, for example, due to the provision in the consent for growth/development. Examples of such STWs include Binbrook, Mablethorpe, and Tetford (see Issue 4a)

Smaller STWs and Septic Tanks

Small villages in rural areas have traditionally relied upon septic tanks as a means of foul sewage disposal for individual properties. The overflow from such tanks is designed to drain

into the soil via a below-ground soakaway. In poorly drained areas with clay soils, or where the water table is high, common practice has been to drain the tanks to the nearest watercourse. Consequently, localised pollution and public health problems have occurred - see issue 4b.

Where such watercourses run through the centre of villages, pollution and smell nuisance has resulted in some cases in the watercourses being culverted.

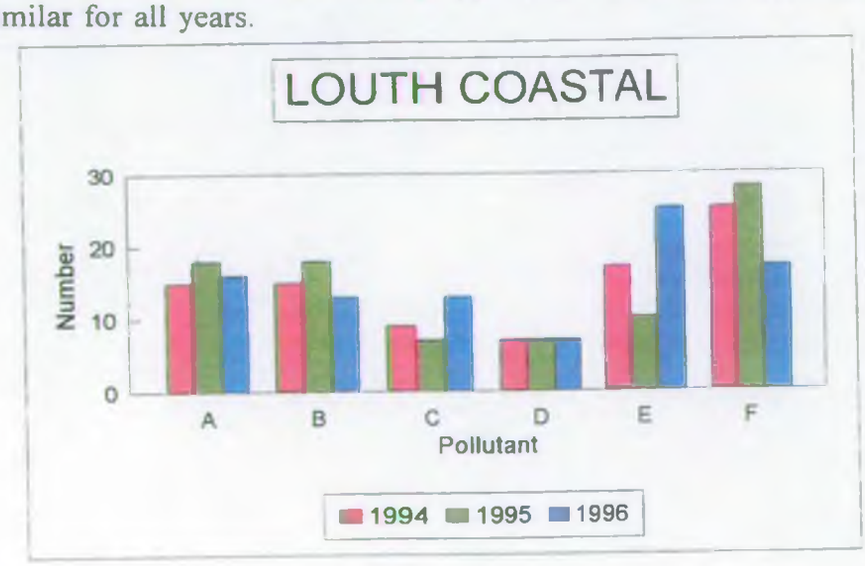
Intermittent Discharges from Sewerage systems

Intermittent discharges from emergency and storm overflows occur from time to time from AWS sewerage systems, this facility is necessary in order to prevent flooding due to breakdown at a sewage pumping station or during high rainfall events.

There are however a number of unsatisfactory discharges of this nature within the Plan area which cause localised pollution and have been identified for improvement by AWS as part of the Second Asset Management Plan (AMP2) process (see **Appendix 4**).

Water Pollution Incidents

In England and Wales there were 35,891 reported pollution incidents in 1995, of these 23,463 were substantiated. The National trend suggests an increase of over 27% since 1990, but this has been influenced by increased public awareness and the introduction of a freephone emergency hotline. This trend is reflected in the figures for the Plan area which show a 18% increase between 1991 and 1996. Within the Plan area most incidents are attributed to 'Others'. These are incidents that can not be easily assigned to one of the recognised categories. A breakdown of incidents by type of pollution since 1994 is shown below, the trend is similar for all years.



Key:

A	Oils	B	Sewage	C	Chemicals
D	Organic Wastes	E	Others	F	No Pollution

6.1.4 Other water quality issues

6.1.4.1 Eutrophication

Eutrophication is the enrichment of water by nutrients, causing an accelerated growth of algae and higher forms of plant life to produce an undesirable disturbance to the balance of organisms present in the water and the quality of the water concerned. The key nutrient controlling eutrophication in freshwater is phosphate. The principal sources of this are sewage effluent discharges from STWs and surface water run-off from agricultural land. The slow moving nature of watercourses in parts of the Plan area also plays a major role (**Issue 4c** and **Appendix 2**) .

Under the Urban Waste Water Treatment Directive (UWWTD), waters identified as eutrophic can be designated as Sensitive Areas [Eutrophic] (SAs[E]). This means that nutrient controls are required for direct and indirect discharges, unless it can be shown that this will have no effect on eutrophication. The UWWTD only applies to discharges from STWs serving a population greater than 10,000; known as qualifying discharges. The Louth Canal has been designated as a SA[E]. **See Issue 4c.**

6.1.4.2 Pesticides

The predominant landuse in the Plan area is agricultural. Consequently there is wide spread application of pesticides to land. However, pesticide concentrations in ground and surface water in the Plan area are not considered to be a significant problem.

6.1.4.3 Nitrates

General

Nitrate is a chemical of concern in the aquatic environment because of its contribution to eutrophication in estuaries and its presence in drinking water where it exceeds the maximum admissible limit for drinking water.

As 75% of all groundwater abstracted in England and Wales is for public water supply, it is important to minimise nitrate leaching into aquifers. Agricultural activities are the principal source of nitrate leaching into groundwaters both from the mechanical action of ploughing, particularly of grassland areas and from the use of fertilizers, both inorganic and organic.

A pilot scheme of 10 Nitrate Sensitive Areas (NSAs) was introduced in 1990 in order to test the effectiveness of agricultural measures taken to reduce nitrate leaching, for which annual payments were made to help restrict or change specific farming practices. In 1995 the pilot NSA scheme was subsequently re-launched to form a unified scheme of 32 areas.

All of the NSAs also fall within the Nitrate Vulnerable Zones (NVZs) which were designated in 1996 for the purposes of the *EC Nitrates Directive (91/676/EEC)*. These NVZs each

require an action plan, in addition to general advice which, for England and Wales, is provided by way of the Code of Good Agricultural Practice for the Protection of Water, published by MAFF.

Monitoring

In the Plan area all drinking water is supplied by Anglian Water Services Ltd (AWS). AWS routinely monitor water entering public supply to ensure that it meets the EC Drinking water limit for nitrate. This data is passed to our national groundwater centre. In time such data will be accessible at all offices.

We monitor groundwater quality by analysing samples taken from boreholes on the groundwater quality monitoring network. Nitrate concentrations are measured as part of a basic suite of analysis. Nitrate is usually measured as Total Oxidisable Nitrogen (TON).

The EC limit for nitrate in drinking water is 50 mg/l is equivalent to 11.3 mg/l TON. Surface waters are also monitored for nitrate concentrations. Data of high nitrate sources is available on request from our Area office in Lincoln.

Targets

The Water Supply (Water Quality) Regulations (SI 1989 No 1147) sets out a maximum limit of 50 milligrammes per litre for drinking water.

Current status

There are sixteen public water supply abstractions from the chalk and the Spilsby Sandstone aquifers in the Louth Coastal area. All the abstractions are operated by (AWS). These major aquifers are a very important resource and must be protected.

The Plan area includes a significant section of the North Lincolnshire Wolds Nitrate Vulnerable Zone (NVZ) . The NVZ has been designated to reduce nitrate concentrations in surface waters in the River Ancholme catchment and groundwater in the chalk. It is part of the groundwater catchment which falls within the Plan area. When the NVZs come into force, farmers within these zones will have a statutory obligation to comply with action programmes (Statutory Instrument for the Action Programme for Nitrate Vulnerable Zones (England & Wales) Regulations 1998) based on the Code of Good Agricultural Practice for the Protection of Water. This means, for example, that fertiliser applications must be determined by the crop needs, timing in relation to crop growth, soils conditions etc. Since the action programme contains limits which are applied on an annual basis, in order for the measures to be implemented by December 1999 they must have been in force for the previous twelve months. Consequently the action programme measures must take effect from 19 December 1998. The Environment Agency, the farming community and other interested bodies have been consulted on the development of action programmes.

The EC Urban Waste Water Treatment Directive requires cessation of disposal of sewage sludge to sea. There has been a steady increase in disposal of sewage sludge to agricultural land. It is likely that this will rise significantly when the ban on disposal to sea comes into force in 1998. Full implementation of the UWWTD in 2005 will generate increased quantity of sewage sludge resulting in further increases of land spreading.

6.2 GROUNDWATER

6.2.1 General

A groundwater protection policy for England and Wales was published in 1992 by the former National Rivers Authority. Groundwater can be particularly vulnerable to pollution and if pollution occurs, remediation of groundwater can be extremely difficult to achieve. Vulnerability of groundwater is dependant on the nature of overlying soils, the geology and the depth to the water table.

About a third of the public water supply in England and Wales is derived from groundwaters and thus it is essential to protect this resource in a sustainable manner. Under Section 85 of the *Water Resources Act 1991* it is an offence to pollute groundwater. The *EC Groundwater Directive (80/68/EEC)* also requires that specific protection measures are taken for two categories of substances: (List I) which should be prevented from entering groundwater, and those (List II) which could have a harmful effect. In addition, for each potable groundwater source, source protection zones are in the process of being defined. There are three levels of protection forming approximately three concentric zones around sources. These are intended to guide planning and development around each source in order to minimise future risks of groundwater contamination at individual sites of abstraction.

6.2.2 Monitoring

Background groundwater quality is monitored as part of our groundwater quality monitoring network. In addition to data from our monitoring, data from public water supply boreholes will in time also be utilised. Where there are known pollution problems special investigations are carried out using a higher density of monitoring boreholes.

In Northern area, groundwater quality monitoring is focused on the major aquifers, the chalk and limestone. A recent review modified the monitoring so that there is a higher density of sampling locations on the aquifer outcrops compared to the confined part of the aquifer. This is so that there is more monitoring of groundwater quality where the aquifers are more vulnerable to pollution.

Monitoring frequency depends on the nature of the aquifer and is usually in the range of two, in the confined part of the aquifer, to four times per year for boreholes on the aquifer outcrops. The substances typically analysed are major anions and cations including chloride and Total Oxidisable Nitrogen (TON). In future, it is anticipated, samples will be analysed for an extended suite of determinands so that the land use of the catchment of the borehole is reflected more closely in the monitoring carried out.

We have 15 current sample points for groundwater quality monitoring in the LEAP Plan area. 3 of the boreholes monitor the Spilsby Sandstone aquifer, the remainder monitor the Chalk.

6.2.3 Targets

Groundwater water quality objectives (WQOs) are still under development and at present the only criteria normally applied is suitability for use as drinking water. It is difficult to establish WQOs for groundwater because it is naturally variable depending on the geology and hydrochemistry. Our network has been principally designed to observe long-term trends in groundwater chemistry.

6.2.4 Current status

The major aquifers in the Plan area are the Chalk, and Spilsby Sandstone. Both aquifers outcrop to the west of the catchment and are increasingly confined by Drift deposits to the east. Based on data from our groundwater quality monitoring network, in general, water in the Chalk is of a quality suitable for potable supply and other general uses. Elevated chloride concentrations are detected in the eastern part of the catchment, where saline intrusion is known to occur.

There are 16 public water supply abstractions in the Plan area and numerous licensed and unlicensed domestic sources. Some of these domestic sources are used as potable supplies for dwellings.

6.3 THE ADEQUACY OF WATER RESOURCES

6.3.1 General

Water is abstracted for use in public water supply, general agriculture, spray irrigation and industrial purposes. Apart from a few exceptions, all abstraction of water whether from ground or surface waters is required to be licensed by the Agency to ensure a balanced and sustainable use of resources.

6.3.2 Monitoring

The main categories of hydrometric data gathered are rainfall, river flow, river levels, tidal levels, groundwater levels and meteorological data. River gauging stations provide information on water levels and flows, and groundwater observation boreholes on groundwater levels. These systems are progressively becoming automated and linked with telemetry. The gauging network provides long-term water resource information which is used to assess water resource trends, in addition to the immediate value for drought and flood warning.

6.3.3 Targets

There are no established targets for water resource management. The main objective in managing water resources is to ensure a balance between the needs of the environment and those of abstractors.

The hydrometric network provides us with data on the state of the water resource to aid its management. See Map 11. In certain hydrological catchments, the water resources are fully committed with the volume of licensed abstraction being equal to or greater than that deemed available for that purpose. In these areas no further abstraction licences will be granted. In areas where there is resource available, we will consider applications for abstraction and if the applicant can demonstrate that there would be no detriment to the environment or on other water users then the licence may be granted subject to conditions we may choose to impose.

Historically we have used "Minimum Residual Flows" to define levels below which abstractions are constrained. To enable us to manage the limited resources in a sustainable and consistent manner we need to further the development and the concept of River Flow Objectives (RFOs); these define target flow regimes for a range of high, medium and low flow scenarios, to which water resource management should aim in order to meet defined environmental objectives. These targets will take account of natural occurrences such as the periodic drying of some stretches of river.

The flow regime recommended by these studies will have an important impact on all Agency functions, allowing local environmental demands to be more accurately quantified. This in turn will improve groundwater balance calculations by refining the amount currently allocated for the environment. In addition the information when available will allow improved biological targets to be developed for each catchment and will assist in the setting of water

quality consents to discharge.

6.3.4 Current Status

6.3.4.1 Water Resources

The principal water resources of the Plan area are the Chalk and Spilsby Sandstone aquifers which provide water for public water supplies. The Great Eau river and the Louth Canal are an important source of surface water for use in filling Covenham Reservoir, which provides water for public supply and industrial use. See Map number 4.

Surface Water.

Of the seven sub catchments in the Louth Plan area, the Lymn catchment in the south, drains a predominantly sandstone catchment which lies to the west of the chalk escarpment and discharges to the sea south of Skegness. The other six catchments consist of upper chalk catchments including springfed tributaries and clay lower catchments where both gravity and pumped drainage occurs.

The surface water resources of the River Lud/Louth Canal and the Rivers Great Eau and Long Eau have been substantially developed for public water supply. The system involves the reservoir at Covenham which is filled by surface water abstraction from the Louth Canal. The river intake for the reservoir is fed by water from the River Lud, the Waithe Beck (involving some backflow up the Canal by use of Tetney weir). River water can also be transferred from the Great Eau river at Cloves Bridge (by Anglian Water Services Ltd) to the Louth Canal at Alvingham, via a raw water pipeline. Water is subsequently reabstracted from the Louth Canal to fill Covenham Reservoir. The transfer from the Great Eau generally only occurs in drought years when the resources of the Louth Canal are insufficient for filling Covenham. The reservoir provides some water to the Louth catchment, but strategically the reservoir supplies water further north for public supply and is principally for industrial use on the Humber Bank. The abstraction licence for filling Covenham contains conditions relating to level on the Louth Canal and a minimum residual flow at Tetney weir. Saline water leaks through the sea doors downstream of Tetney weir and under certain conditions saline water can migrate upstream of Tetney weir. There is presently some difficulty with obtaining satisfactory operation of Tetney weir which the Environment Agency and Anglian Water Services Ltd are progressing.

Summer water abstraction for spray irrigation is important across the catchment particularly in the River Lymn/Steeping catchment where there is a concentration of abstractors. During summer and especially in dry summers demand for water for irrigation leads to very low flows and concern for the river environment **(Issue 2C)**.

Groundwater.

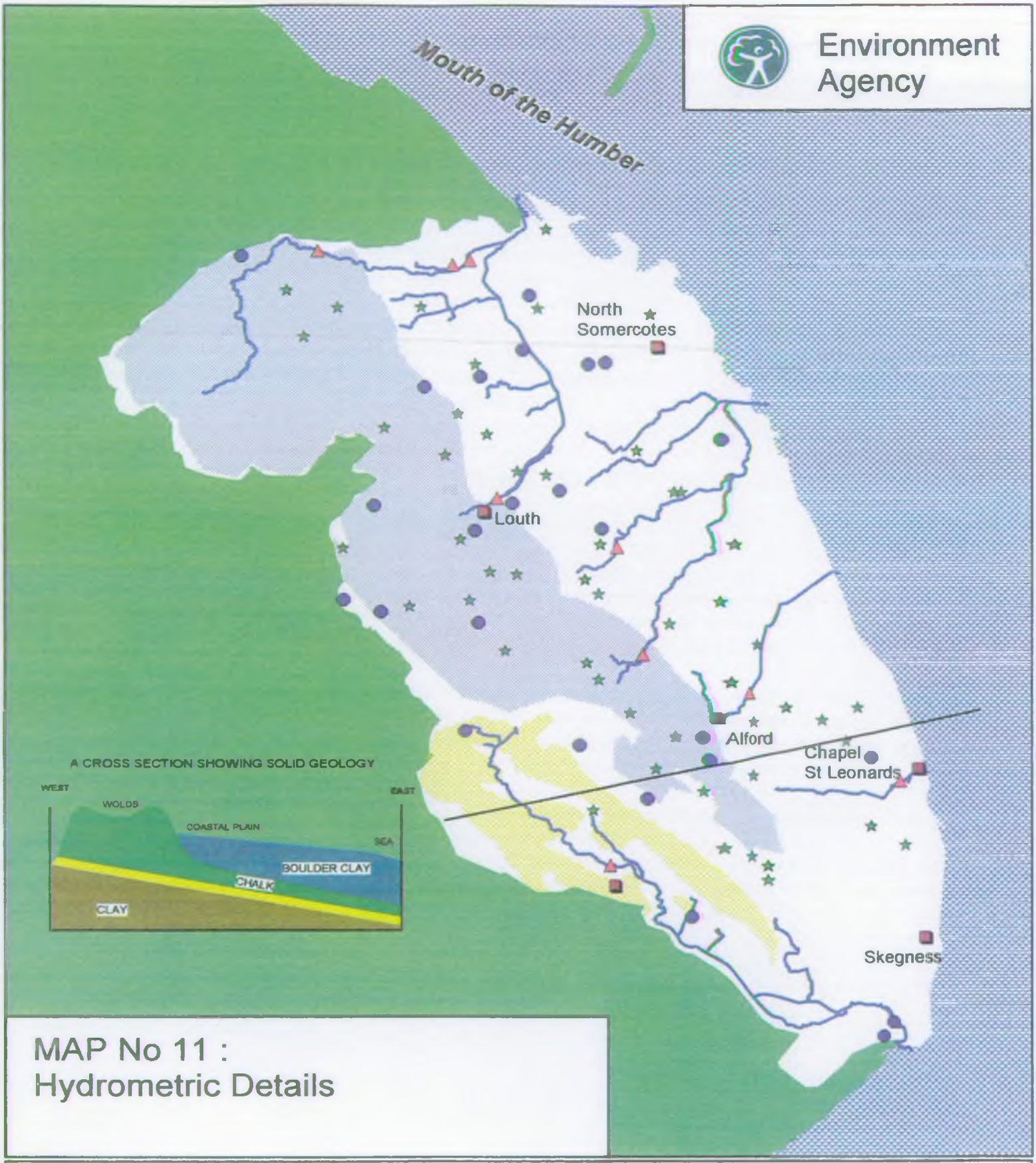
The principal aquifer is the Chalk which outcrops over much of the western catchment. The Chalk dips gently eastwards and in the central and eastern parts of the catchment it is confined/covered principally by boulder clay and alluvium. To the north of Louth, rainfall recharging the chalk moves eastwards with some spring discharge to the Waithe Beck. To the south of Louth, the outcrop Chalk is dislocated from the area to the east by the buried cliffline which once marked the coast. (See Map number 10 and geological cross section.) As a consequence virtually all the Chalk water recharge discharges via springs to the surface water system. Groundwater abstracted from the Chalk to the east and south east of Louth is derived from the Chalk outcrop north of Louth. Anglian Water Services Ltd abstract water from 6 chalk sources in the catchment and substantial quantities of water from the Chalk in the Grimsby catchment to the north. There is concern that abstraction from the Chalk aquifer as a whole is leading to depleted spring flows **(Issue 2d)**.

Below the Chalk lies the Spilsby Sandstone which is present across the catchment but only outcrops along a narrow area in the Lymn valley. The gradient of the sandstone is principally west to east and the sandstone is recharged from vertical leakage from the overlying chalk. All the water directly recharging the sandstone is discharged via springs to the surface water system. There is historical saline intrusion in the Skegness to Welton-le- Marsh area. Some industrial abstractors in Skegness are close to the areas of saline water present in the aquifer.

Anglian Water Services Ltd abstract from ten sources in the Spilsby sandstone, seven of which are located in the south of the Plan area. Overall, public water supply accounts for 97% of the water licensed in the catchment. Water abstracted is used to meet demand within the area including the peak summer demands of the east coast holiday resorts.

There are considerable fluctuations in groundwater levels in chalk and sandstone observation wells that do not reflect the seasonality of recharge and there is a need to further understand the groundwater flow processes that occur and the relationship with springs and river flows across the area to manage water resources in a sustainable manner. **(Issue 1c)**.

Map No 11 shows Hydrometric details



MAP No 11 : Hydrometric Details

KEY:

- Main River
- Town
- Chalk Outcrop
- Spilsby Sandstone Outcrop
- Principal Groundwater Level Monitoring Site
- Raingauge
- Fluvial Gauging Station

6.3.4.2 Abstraction

Abstraction of both surface and groundwater resources are dominated by the need for water to fulfil the needs of public water supply. Existing licensed levels of abstraction are shown on Table 10.

Table 10: Abstraction Details (TCMA)

Use	Gen. Agric.		Spray Irr.		PWS		Industrial		Others	
	S	G	S	G	S	G	S	G	S	G
No. of lic.	0	371	51	9	1	15	0	15	9	1
Total Quant. tcma	0	638	691	162	41,446	24,620	0	768	106	1
% of total S	0		2		98		0		<1	
% of total G		2		<1		94		3		<1
% of total	1		<!		97		1		<1	

S - Surface Water Abstraction
G - Groundwater abstraction
Others - this is primarily amenity use

Total Licensed Surface Water abstraction - 42243 tcma
Total Licensed Groundwater Abstraction - 26189 tcma
Total Surface + Groundwater Licensed abstraction - 68432 tcma

Trends in Demand

The Agency expects all abstractors, not just water companies, to demonstrate real progress in demand management, water conservation and efficient use before it will give serious consideration to applications for additional water.

Water Demand Management

The Agency will take steps to secure the proper management of water taken from sources of supply including:-

* requiring water companies to identify and where possible, quantify the economic and environmental benefits of leakage control and metering so that they can be incorporated into the planning and financial considerations of altemative supply and demand management options.
* promoting water use efficiency by industry, commerce, agriculture and in the home:
* making best use of available water resources before developing new schemes:
* favouring new water resources schemes which meet the widest interests and improve the environment:
* taking account of the potential impact of climate change.

The Agency will promote "best practice" and will work with others in specifying technical approaches or standard methodologies in relation to water resources issues of relevance to the Agency.

The Agency will seek to educate consumers of the opportunities and benefits of water conservation and to influence their behaviour to further the objectives of water conservation and demand management.

Public Water Supplies.

Anglian Waters' 1994 forecasts for growth in demand for public water supplies were very low. Across its supply area, Anglian Water promotes metering to its customers and is achieving increasing metering penetration across its customer base. Metering has some effect in managing the increase in demand for water.

The national water demand forecast by the NRA in 1994 was for growth of less than 1% per annum to 2015. The Environment Agency promotes water demand management, leakage control and efficient use by water companies, making sustainable use of existing resources whilst making plans for the possible long term need to develop new sustainable resources. Licence applications from water companies will be subject to scrutiny of zonal leakage levels as water companies are now expected to reach mandatory leakage targets.

To quantify water use and to enable economic value to influence demand, the Agency advocates the extension of selective metering to:-

* all non-domestic users:
* domestic users in drier company areas;
* for all high use external domestic purposes, particularly garden watering.

The Agency is of the view that achieving the right balance between water resources and demand should be based on economic principles. In some instances this will lead to the need for new water resources schemes and in others to greater attention being given to water conservation and demand management. We anticipate that measures would be taken to manage water demand in the Louth Coastal Plan area. The Agency will not be the promoter or developer of new water resources schemes, but will encourage development of new water resources schemes in appropriate circumstances.

Water companies believe that planning for restrictions on water use (eg hosepipe bans) is becoming unacceptable to its customers and as a consequence the impact of this may well be built into future plans along with the potential impact of climate change.

At the time of writing Water Companies are compiling their third Asset Management Plans (AMP3) for submission to OFWAT in connection with the 5 year periodic review of water charges. Any changes to water industry price limits introduced by OFWAT will be effective from April 2000.

Public water supplies are met within the Plan area predominantly by water abstraction from the Chalk and Sandstone aquifers. Covenham Reservoir can also supply water within the Plan area. Issue 1b refers to the balance between current abstraction and the licensed quantity for local public supplies. Current licensed quantities may be sufficient to meet forecast demand for water, but much will depend upon demand management initiatives.

Agricultural demand.

Within the Plan area there is no scope for additional abstraction of water during summer. The Environment Agency promotes the development and construction of storage reservoirs to be filled under winter abstraction licence and the water used from the storage during summer. The growth in demand for spray irrigation is predicted to be in excess of 1% growth per annum. Future demand for water will have to be met through the development of winter storage reservoirs. Issues 1a and 2c refer to the agricultural demand for water.

Industrial demand.

Given the current availability of water, there is little scope for industry to expand if larger quantities of water are required; Issue 1a highlights the matter.

6.3.5 The Quality and Availability of Data

Rainfall, river flow and groundwater level data from our hydrometric network across the Plan area can be made available.

Some refurbishment of existing river gauging stations is required to improve the accuracy of flow measurements and the effectiveness of flood forecasting. This is being addressed via improvements to the Anglian Region Telemetry System (ARTS) which collate data for operational and planning use.

6.4 FLOOD DEFENCE

6.4.1 General

Flood defences are constructed to provide effective defence for people and property against flooding from rivers and the sea. Flooding from the sea and tidal waters is usually threatened as a consequence of extreme climatic conditions, such as the coincidence of low atmospheric conditions - which raise tide levels, and high winds. Fluvial flooding is likely to result from intense rainfall or when the discharge to tidal waters is restricted by the tidal cycle.

The standard of flood defence provided depends 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. The Agency exercises a general supervision over all matters relating to flood defence in England and Wales and has prescribed responsibilities for land drainage and flood defence along with Internal Drainage Boards, Local Authorities and Coastal Authorities.

6.4.2 Monitoring

We undertake the general monitoring of those flood defences for which we are responsible as part of our ongoing and operational procedures. In addition to this as part of our statutory duties we have to carry out surveys to identify flood risk areas.

A system is currently being developed which identifies current standards of flood defence and areas at risk of flooding and the costs of maintaining defences and benefits which accrue. Known as the Standards of Service Survey this will provide a series of cost to benefit ratios which will help target available resources in the most cost effective way.

Our hydrometric network of rain gauges and river flow gauging stations, supplemented by telemetry outstations, continuously monitor river levels and flows at key sites. Together with access to the Meteorological Office 'STORM' rain radar system, these provide us with the ability to predict fluvial flooding events. Information from the Met. Office Storm Tide Warning Service gives advance warning of possible tidal flooding. An existing shortfall in flood warning data has been identified in the area and will be addressed by the extension of our telemetry system.

The monitoring of tidal levels in the long-term will allow the Agency to make a judgement as to the scale and extent of sea level rise through global warming if such a phenomenon exists. In the event of sea level rise seawalls and other coastal defences will have to be raised and improved to ensure that present standards are maintained.

Flood Defence Planning

The long term capital and maintenance programmes of the Agency are developed within the framework of Shoreline Management Plans (SMPs) and our own Regional Flood Defence Target Standards.

SMPs provide the framework for sustainable coastal defence policies along coastlines and set objectives for the future management of the shoreline. One such has been developed for the Lincolnshire coast. We will use this document as a basis for developing our flood defence strategy for this coastline.

The Anglian Region Flood Defence Target Standards sets out target standards of flood protection expressed as a flood return period. For example a flood with a return period of 1 in 100 years has a 1% chance of occurring in any one year.

6.4.3 Targets

Notional target standards of protection for tidal and fluvial defences are developed from our Standards of Service Targets and 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 11.

Table 11: Flood Defence Standards of Service

FLOOD DEFENCE - STANDARDS OF SERVICE		
LAND USE BAND	TARGET STANDARD OF PROTECTION (RETURN PERIOD)	
	FLUVIAL	TIDAL
High density urban containing significant amount of both residential and non-residential property	1:50 - 1:100	1:100 - 1:200
Medium density urban. Lower density than above, may also include some agricultural land.	1:25 - 1:100	1:50 - 1:200
Low density or rural communities with limited number of properties at risk. Highly productive agricultural land.	1:5 - 1:50	1:10 - 1:100
General arable farming with isolated properties. Medium productivity agricultural land.	1:1.25 - 1:10	1:2.5 - 1:20
Predominantly extensive grass with very few properties at risk. Low productivity agricultural land.	<1:2.5	<1:5

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 we assess the economics of providing defences, depending on the land use it will protect.

Flood Warning Targets

We have a target to issue notice of flooding to property, 2 hours prior to it occurring. More generally we aim to disseminate information as quickly, accurately and comprehensively as possible. Flood warning dissemination plans have been produced for all identified flood risk areas and these will be continuously reviewed in the light of experience in operation. Generally within any Plan area warnings will be issued in the following ways:

- By regular media broadcasts on radio and TV inc. Teletext;
- In certain cases by automatic voice messaging (telephone);
- In certain cases via Flood Wardens;
- By loud hailer or siren.

6.4.4 Current Status

The greatest risks to life and property from flooding within this Plan area is posed by tidal inundation along the coastline. The low lying coastal strip is below sea level and relies on a combination of natural and man made sea defences for its security. A strategic approach to planning sea defence and coastal works has been promoted through MAFF by the production of Shoreline Management Plans (SMP). An objective of this approach is to more fully understand the coastal processes at work within identified coastal cells. A good level of understanding has already been achieved through previous studies and surveys dating back over many years. However continued work is required to enable future reviews of the SMP to take place and to assist in meeting future sea defence needs. The Agency is currently carrying out works between Mablethorpe and Skegness to ensure continuity of target standards of flood protection through its Lincshore Beach Nourishment Programme. The final length of beach to receive the initial nourishment will be completed by autumn 1998. Following re-instatement of healthy beach levels there is a tendency under certain wind conditions for sand to blow off the beach into areas behind the sea defences. A strategy has been put in place to minimise this occurrence and discourage losses of sand from the beach area by wind blow.

There is some uncertainty regarding the precise standard of flood protection for extreme events for the length of coast between Donna Nook and Saltfleet Haven. A survey to record defence level and structural condition is required to enable analysis of the defence performance under extreme storm conditions and confirmation or otherwise that target standards are being met.

The planned replacement or refurbishment of assets has been included in the Lincolnshire Flood Defence Committee's Capital Development Programme. These include certain electrical and mechanical components at the Old Chapel Pumping Station and Croft Pumping Station at Wainfleet. The main culvert passing under Alford has been identified as requiring

refurbishment together with a re-assessment of the overall standard of flood protection provided on the Woldgrift Drain. Ongoing erosions of a 1km length of flood bank on the Waithe Beck may lead to a threat to the stability of the bank. Further assessment is needed before the risk can be determined.

Map No. 12 shows the existing standards of protection against both tidal and fluvial flooding.

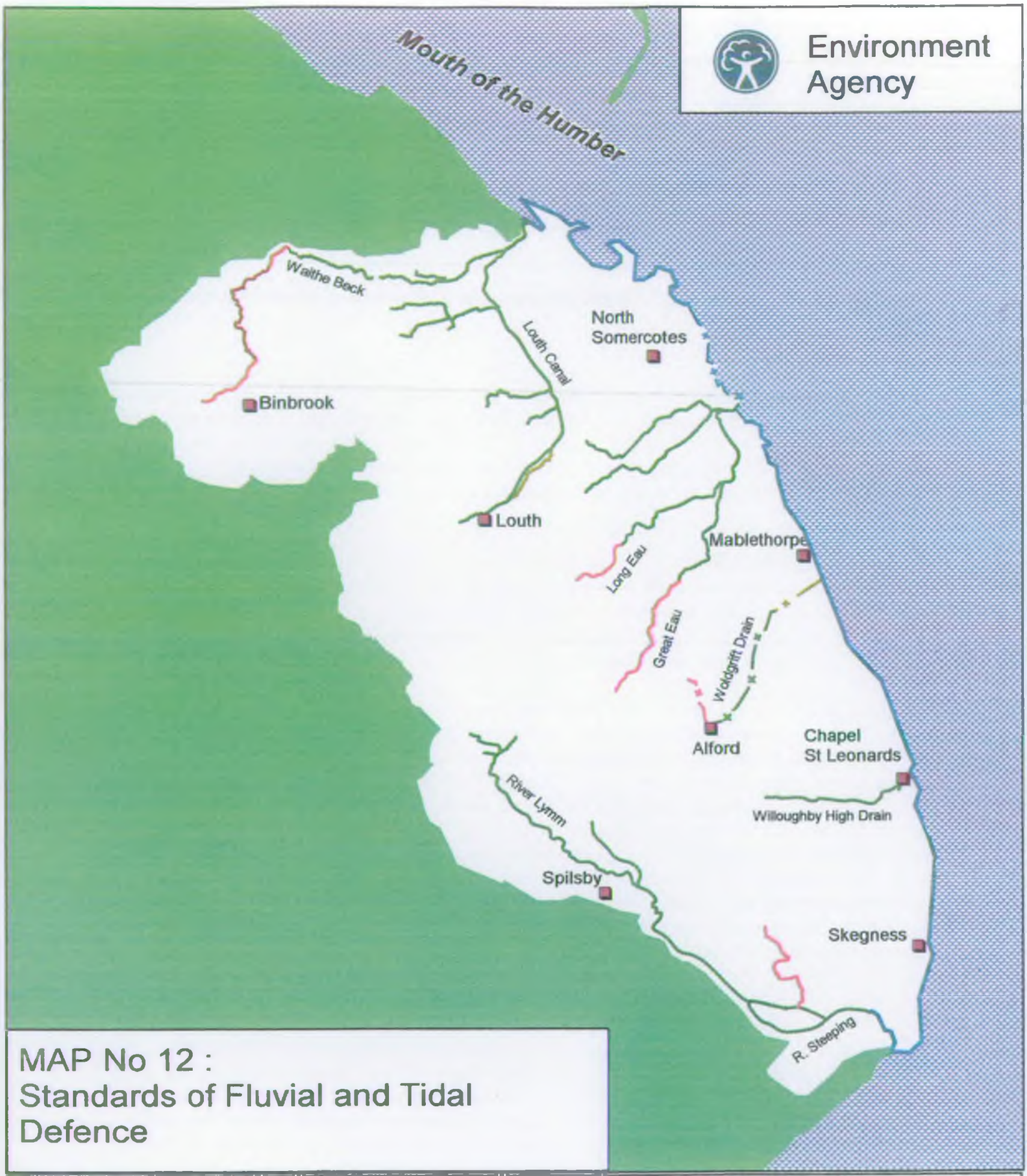
6.4.4.1 Coastal Erosion

The Lincolnshire coastline has been adjusting its shape and position continually since the last Ice Age. Prior to the 13th century the coastline was some 2km east of its position today and was protected by a series of low lying islands. Following a series of major floods these islands were overwhelmed and sand and gravel was washed back onto a now open coastline. Over several centuries the wave and tidal conditions have continued to alter the shape of the coastline.

To the north of Mablethorpe a sandbank system provides protection to the coast and supplies a sediment which maintain a wide shallow sandy beach. The sandbanks reduce the wave energy reaching the coast and therefore reduce the longshore transport of sediments which would otherwise leave this zone. The Shoreline Management Plan (SMP) suggests that long term, the shoreline is advancing along this length of coast.

The wide sandy beach together with large sand dunes at the head of the beach provides the sea defence to the north of Mablethorpe. However as a soft defence sand dunes and the beach is subject to movement following periods of storm. During extreme storms the dunes can be severely eroded producing sheer cliff faces which further encourage increased rates of erosion. Over a period of time this would reduce the size of the dunes and reduce the standard of flood protection they provide. The Agency has introduced a strategy to maintain and repair the sand dunes by carrying out kidding operations on an annual programme. This work involves the use of naturally occurring materials consisting of suitable trimmings from hedge maintenance operations, kids, which are dug into the beach in front of the damaged sand dune. The kids trap wind blown sand crossing the beach and assist the natural process of dune building. The kid fields are fenced to protect them from other beach users.

In the 19th century sea defences were erected between Skegness and Mablethorpe which fixed the landward limit of the shoreline. The open nature of this length of coast results in aggressive wave action which transports sediments in a southerly direction. The net longshore potential to transport sand along this coast exceeds the feed coming in at Mablethorpe. This results in erosion of the beaches resulting in a narrow steep beach with shallow depths of sand. Underlying the sand is a clay strata which is easily eroded once exposed by shifting sands under storm conditions. Although the sands may return when conditions moderate, the clay is lost forever and results in a further lowering of beach levels.



MAP No 12 : Standards of Fluvial and Tidal Defence

KEY:

Standards of Flood Defence Return Period (years):

- <11 yrs
- 11-20yrs
- 21-50yrs
- 51-100yrs
- >100yrs
- Uncertain
- Town

The lowered beach levels expose the hard sea defences to ever greater potential for damage from wave action. This may be through undermining of the defence foundations through beach lowering or structural damage following wave impact during periods of storm. The consequential risk of breach and resulting flooding was considered unacceptably high. In 1994 the Agency embarked on a 50 year strategy to rebuild these eroded beaches to an acceptable level which would secure target standards of flood protection along this coastline. The work is completed in 2 phases. The first phase is programmed for completion in the autumn of 1998 and consists of placing approximately 6 million cubic metres of sand on the upper beach adjacent to the sea defence. The beach will operate as a natural beach and respond to varying tidal conditions, accordingly by changing its shape and profile in response to the prevailing conditions. As discussed earlier it is recognised that insufficient sediment is entering this length of coast from Mablethorpe to balance the volumes which are lost to the south of Skegness. Annual re-nourishment over the remaining 45 years of the strategy life will therefore be required to maintain the system in balance. Phase 2 of the strategy will meet this requirement and is programmed to commence in 1999.

The coastline between Skegness and Gibraltar Point is almost a mirror image of that to the north of Mablethorpe. Sandbanks, albeit smaller and more mobile than those to the north of Mablethorpe, exist off Gibraltar Point and the SMP suggests that long term, the shoreline is advancing. The sea defences to the south of Skegness consist of large sand dunes and a wide sandy beach. There is however an intermediate area between the advancing shoreline at Gibraltar Point and the retreating shoreline to the north of Skegness. This area is located at Lagoon Walk which operates as a groyne holding stable beach levels to the north. Volatile changes in beach level can occur in front and to the south of the Walk. Urgent works were carried out by the Agency in 1997 to protect the southern tip of Lagoon Walk by constructing a rock roundhead. In addition to protecting the structural integrity of Lagoon Walk it also fixes the limits of any future beach erosion to the south. A second phase of the scheme is currently under consideration which will safeguard the area to the rear of South Bracing from wave wash and spray during extreme events.

6.4.5 Trends

The predicted gradual rise in sea level resulting from global warming will mean that at some point in the future it will become necessary to raise sea and tidal defences.

In recent years rainfall rates have been below average and few major flooding events have occurred.

Increasing environmental awareness has been influencing the manner in which flood defence works have been constructed and maintained and it is likely that this influence will increase rather than diminish in future.

6.4.6 Quality and Availability of Data

Hydrometric data, rainfall and river flow records are generally quite good with a fairly comprehensive network of stations established across the Plan area, some of which have been in existence in excess of 50 years.

Many flood records have been lost during the frequent reorganisations within the water industry prior to the establishment of the now defunct National Rivers Authority. However the current and expanding telemetry network should provide a reliable data source for the future.

6.5 LAND

6.5.1 Derelict and Contaminated land

6.5.1.1 General

Derelict and contaminated land is that defined as any land which appears to a local authority to be in such a condition, because of the substances it contains, that it could cause, or may already be causing water pollution or significant harm. This interpretation is subject to guidance by the Secretary of State. Some sites may become designated as "special sites" and these will become the responsibility of the Agency. None as yet have been designated, as the Regulations that will bring the primary legislation into effect have not (at the time of writing) been finalised nor passed by Parliament.

Landfill sites that closed before 1994 when the new Waste Management Regulations came into force (which made the operator of a site responsible for it after it has closed) may fall within the "Special Site" definition.

Because of the potential for harm that these landfill sites might pose, local planning authorities must consult with ourselves on any development proposed within 250m of any landfill site.

6.5.1.2 Targets

The Environment Agency has specific duties under the Environment Act 1995 with respect to contaminated land. Our aim is to secure, with others, the remediation of contaminated land.

6.5.1.3 Current Status (Contaminated Land)

In Lincolnshire sites exist which have been contaminated by past industrial uses. Such sites may present a hazard to the environment and there is now often a growing requirement for

their reclamation and redevelopment.

At present there is no reliable information on the number of sites which may be contaminated. Identification and remediation of contaminated sites has normally been linked to redevelopment schemes largely driven by economic factors.

The new requirements of the Environment Act 1995, including the inspection and identification of contaminated land, will be carried out and enforced primarily by the local authorities. However, the Agency will support local authorities with site specific guidance and technical research, and be the regulator for "special sites".

6.6 PERFORMANCE OF WASTE MANAGEMENT FACILITIES

6.6.1 General

Waste disposal is the returning of unwanted materials into the environment. If carefully managed, the substances that comprise wastes can be safely dispersed and returned to the environment. If waste disposal is badly managed, wastes and substances derived from them may give rise to environmental pollution, which can be serious and long lasting. Adequate, well managed treatment and disposal facilities are required to cope with wastes produced.

Different types of waste management facilities include, landfill, transfer stations, civic amenity sites, treatment plants, incinerators scrap yards and recycling process plants. Planning permission will normally be required for the development of a waste management facility. The siting of waste recovery and disposal facilities is decided through the land use planning system by the local planning authorities.

Waste directly affects the environment when it is disposed. Waste sites may affect ground and surface water, they may also affect air quality and result in land contamination, if they are not managed and regulated effectively.

We are required under Section 42 of the Environmental Protection Act 1990 to supervise licensed waste management activities. We regulate waste management facilities which are developed and operated to prevent pollution of the environment, harm to human health, and serious detriment to the local amenity.

6.6.2 Monitoring

The licence conditions for landfill sites requires the site operator to monitor for landfill gas, leachate levels and the quality of groundwater and surface water both within and in the near vicinity of the site. Other indicators include air quality, noise, dust, smell, and litter depending on the characteristics of each site. Licence conditions are established for other types of waste management facility such as Transfer Sites depending upon the risk that each operation poses.

The monitoring of waste management facilities is a statutory duty and guidance is set out by the Department of the Environment (now the DETR) as part of Waste Management Paper No.4. Monitoring frequency is established by this guidance and site visits are dependant on the type of waste deposited and risk of each facility.

Compliance with licence conditions is checked by regular inspections and environmental monitoring, in addition to which we audit the monitoring carried out by operators.

6.6.3 Targets

The objective of the waste management licensing system is to provide a separate control system and ensure that waste management facilities:

- do not cause pollution of the environment;
- do not cause harm to human health;
- do not become seriously detrimental to the amenities of the locality.

In assessing pollution we have to consider the impacts of emissions on global climate change and on local air, water, soil flora and fauna.

The government's policy framework for the management of waste identifies ways in which waste can be managed in a more sustainable way, and sets targets for achieving that aim.

The Strategy is based on three key objectives:

- to reduce the amount of waste that society produces - waste minimisation;
- to make the best use of the waste produced - recycle and re-use;
- to choose waste management practices which minimise the risks of immediate and future environmental pollution and harm to human health.

The Government's Producer Responsibility initiative will be a key tool for promoting the recovery of value from waste. It is designed to ensure that industry assumes an increased share of the responsibility for the waste arising from the disposal of its products. The most advanced producer responsibility scheme is found in the packaging industry for which the Government have set a target to recover 50-65% of packaging waste by 2001. A number of other industries have been invited to set recovery targets.

There are no Plan area wide targets for waste management facilities. Targets are site specific and are determined as part of their licence conditions. The licence conditions for landfill sites may for example set trigger levels for groundwater quality.

In general, groundwater quality is measured before a site is engineered, and ongoing monitoring checks that background quality is not diminished. Leachate indicators that are monitored in groundwater include ammonium, chloride, carbon and pH. The detection of substances above "trigger levels" indicates the possible need for remedial action. Minimum standards have been established by the Waste Management Paper No 4 for the open and closed phases of site operation. Discharge conditions on surface water disposal from site may also form part of a waste management licence and may require a Water Quality consent under the Water Resources Act 1991. Landfill gas is monitored for three main parameters; methane, carbon dioxide and oxygen and once again criteria have been met for maximum concentration of gas at the boundary of the site.

6.6.4 Current Status

Waste Management

In 1994 Lincolnshire County Council undertook a survey of waste arisings in the county. Due to the way in which the statistics were collected information is only available on a county or district basis. The majority of the Plan area falls within East Lindsey, and accounts for approximately two thirds of the district council area, incorporating two of the three major population centres.

Map No 13 shows Liscensed Waste Management Facilities

Waste Arisings

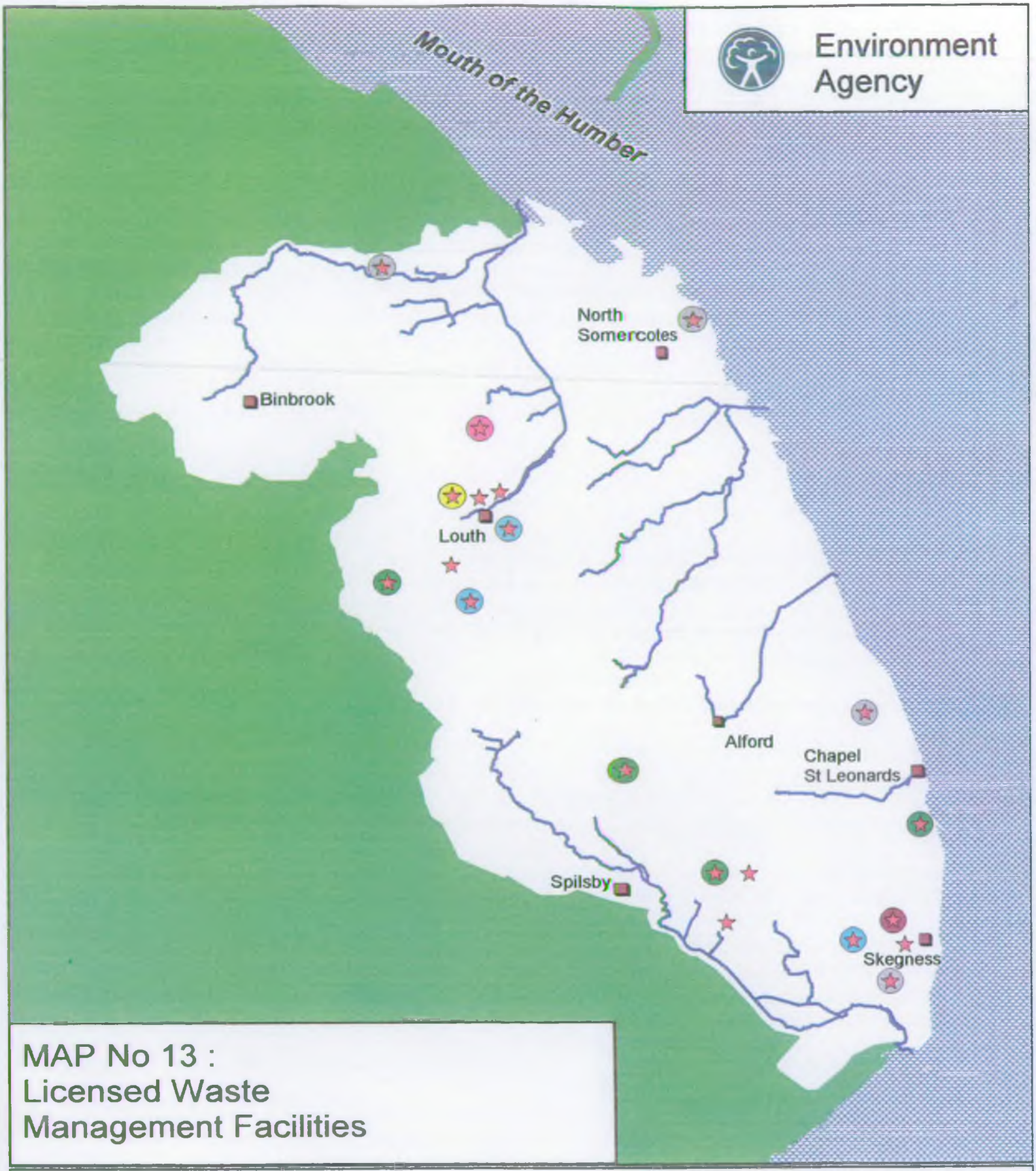
The 1994 survey revealed that more waste was brought into the county than was exported, although the chief imports are along the A1 corridor rather than into this catchment.

In 1995/96 the total quantity of controlled waste disposed of in the county was approximately 1.2 million tonnes, of which 127000 tonnes was disposed of in the East Lindsey District.

Lincolnshire is expected to experience high levels of both industrial and population growth, and associated with this will be a corresponding increase in waste arisings. However, it is anticipated that actual disposal to landfill is expected to decline as the effect of the Landfill Tax and Packaging Waste Regulations take effect.

Former Landfill Sites

The Environment Agency has records of 72 sites in the catchment where wastes have been deposited in the past. Records are poor for many of the sites but it is likely that 57 of these sites have received non inert wastes. Historically landfill sites were located near most villages to serve the local area, and would have been much smaller in size and dealt with different types of household waste than current domestic waste landfill sites do today. The Agency is unaware of any pollution problems arising from any of these former landfill sites.



MAP No 13 : Licensed Waste Management Facilities

KEY:

- Main River
- Town

Waste Management Licences:

- Civic Amenity Centre
- Pet Crematorium
- Transfer Station
- Recycling Plant (Plastic)
- Inactive Landfill
- Active Landfill
- Scrapyard

Landfill Gas

Landfill gas is a mixture of flammable and asphyxiating gases produced by natural microbial activity wherever biodegradable material is disposed of in a landfill site. The main constituents of landfill gas are odourless but they are usually found mixed with other gases, some of which may cause odours.

At Kenwick Landfill, near Louth, the venting of landfill gas to atmosphere has given rise to smell problems over the last few years. A number of improvement measures have been implemented by Lincwaste Ltd, the site operator, whilst research to find the most appropriate solution to the problem has been underway. See issue 6b.

6.7 RADIOACTIVITY

6.7.1 General

The Environment Agency has to ensure that the authorised discharges of radioactive waste to the environment deliver compliance with the requirements of radiological protection criteria in general and with dose limits for the public in particular. The greatest source of radiation to the public in England and Wales is actually that which arises from the natural background eg. Radon. Background radiation is not however the only source of radiation to which the population is routinely exposed. Medical (X-rays) and occupational exposures both add to the average dose rates, as does residual fallout from the atmosphere testing of nuclear weapons. Collectively these anthropogenic exposures add about another 0.3 or 0.4 milli-Sieverts per year. Radioactive discharges from nuclear sites account for only about 0.0004 milli-Sieverts per year to the average member of the public. Discharges of radioactive materials to the environment are very carefully controlled.

6.7.2 Targets

The International Commission for Radiological Protection set dose standards which the UK Government have implemented through the National Radiological Protection Board. The current limit for exposure of the public from all man-made sources of radioactivity (other than medical exposure) is 1 milli-Sievert per year which, although very much less than the background rate, is considered to reflect the low-level of acceptable additional risk for members of the public. It is also important to note that, because man can be exposed simultaneously to both internal and external radiation, the dose received is assessed by adding together both internal and external radiation exposures.

In the context of radioactivity, the guiding principle in minimising risk from exposure to radioactivity is to ensure the levels of activity used are "as low as reasonably achievable (ALARA)" and the use is justified in relation to the benefit conferred. Because radioactivity can be measured accurately in very low concentrations, the standards to be achieved are high.

6.7.3 Monitoring

Authorised users of radioactive material, for example industrial, research or medical users are not monitored by the Agency. We have the authority to request the monitoring of the usage/disposal of waste from such authorised processes, however, the majority of authorisations use radioactive materials in small doses with relatively short half-lives which provides a low dose risk to the public. Therefore monitoring to scrutinise the majority of these disposal pathways is not seen as necessary by us. Operators are liable to compliance inspections by our staff.

6.7.4 Current Status

Radioactive materials are used for a variety of purposes within the Plan area, including in the farming industry as measuring devices in harvesting machinery. The regulation of radioactive substances in certificated and authorised uses remains a high priority aspect of our work and there are currently no concerns with respect to this activity.

6.8 AIR QUALITY

6.8.1 General

Atmospheric pollution, resulting from man's activity on earth, is a local, national and global concern affecting the health of us all and the environment in general. Air pollution can occur from a number of sources and may be in the form of gas or particulate matter. The dispersion and dilution of pollutants depends on wind direction and climatic conditions and it does not respect administrative or hydrological boundaries.

Air pollution can aggravate respiratory problems such as asthma and bronchitis. It can also contribute to the deterioration of historic buildings by chemical erosion caused by acid rain and it is believed to be accelerating changes in the climate, reducing the atmosphere's natural protection against harmful radiation and increasing sea levels.

The main sources of sulphur dioxide and nitrogen oxides (the most important gases contributing to acid rain) are emissions from road transport, power stations, industry and the burning of fossil fuels for domestic purposes.

Emissions from road transport have a wide variety of environmental effects. Geographically, direct effects are normally limited to the main area near the road, however many motor vehicle pollutants react to form secondary pollutants which can cause photochemical smog.

Other atmospheric pollution such as methane gas is generated from agricultural activity, natural gas production and distribution, and from refuse and sewage disposal. Chlorofluorocarbons (CFC's) used in refrigerators, solvents and aerosol can propellants, and

halons used in firefighting chemicals are powerful ozone depleting gases. These are now being phased out as more environmentally friendly alternatives become more readily available.

Under the Environmental Protection Act 1990 (EPA '90) responsibilities for the control and monitoring of air pollution is placed upon local authorities and the Agency.

Whilst our role is limited to regulating those industrial processes identified under Part A of EPA '90 and subject to Integrated Pollution Control (IPC) legislation, that of local authorities is wider, involving emissions to air from smaller and less polluting industrial sources which are subject to Local Authorities Air Pollution Control (LAAPC) legislation, and emissions to air from diffuse and other sources regulated under other legislation such as the Clean Air Acts.

All processes subject to IPC and LAAPC are required to meet the objective that the best available techniques not entailing excessive cost (BATNEEC) are used to prevent pollution occurring. For IPC authorised sites, where this is not possible, processes must minimise their release and render them harmless having regard for the best practicable environmental option (BPEO) available (in respect of those substances which may be released to the air, water or land). In this context, consideration of BATNEEC and BPEO are, primarily, site specific.

6.8.2 Monitoring

The DoE (now the DETR) and some local authorities have a network of monitoring sites which we have access to and make use of.

Conditions set out in IPC authorisations include provisions requiring operators to monitor their releases to the atmosphere and other media, and to measure their performance against defined parameters and to report to ourselves. This information is placed on public registers.

We undertake routine and unannounced inspections of prescribed processes to ensure that the authorisation conditions are complied with, checking releases using our own contractors. The IPC function of the Agency is quality assured to ISO 9001 standards.

6.8.3 Targets

The Government has published its National Air Quality Strategy, and both ourselves and local authorities are key players. The strategy has involved the setting of air quality standards which are based on the best available scientific and medical knowledge and experience. Accordingly the Government has set a range of air quality standards having received advice from its own Expert Panel on Air Quality Standards and the World Health Organisation amongst others.

Standards for setting objectives are set with regard to scientific and medical evidence on the effects of the particular pollutant on health, or in the appropriate context, on the wider environment, as minimum or zero risk levels. Costs and benefits, and matters of current

technical feasibility, come into play at the later stage, in setting objectives and timescales.

No release into any environmental medium may be authorised which would cause a breach of a statutory Environmental Quality Standard (EQS). EQS for air are set for: Benzene, 1,3-Butadiene, Lead, Nitrogen Dioxide, Ozone, Suspended Particles, Sulphur Dioxide and Carbon Monoxide.

Table 12 shows the range of Government standards, set in respect of a number of pollutants, for which we have produced pollution concentration maps. These maps appear on the following pages as indicators of air quality in this area.

Table 12: Summary of Proposed Objectives

Pollutant	Standard		Objective - to be achieved by 2005
	Concentration	**Measured as**	
Benzene	5 ppb ($16.2\mu g/m^3$)	running annual mean	**5 ppb**
1,3-Butadiene	1 ppb ($2.24\mu g/m^3$)	running annual mean	**1 ppb**
Carbon monoxide	10 ppm[a]	running 8-hour mean	**10 ppm**
Lead	0.5 $\mu g/m^3$ ($500ng/m^3$)	annual mean	**0.5 $\mu g/m^3$**
Nitrogen dioxide	150 ppb[a]	1-hour mean	**150 ppb, hourly mean***
	21 ppb ($40\mu g/m^3$)	annual mean	**21 ppb, annual mean***
Fine particles (PM_{10})	50 $\mu g/m^3$	running 24-hour mean	**50 $\mu g.m^3$ measured as the 99th percentile***
Sulphur dioxide	100 ppb ($267\mu g/m^3$)	15 minute mean	**100 ppb measured as the 99.9th percentile***

ppm = parts per million; ppb = parts per billion; $\mu g/m^3$ = micrograms per cubic metre
* = these objectives are to be regarded as provisional.

Figure in brackets are for comparison with pollution concentration maps.
[a] No data currently available to generate pollution prevention maps.

Air Quality Planning

The Government's strategy will place duties on Local Authorities to assess local air quality and, where it is shown to be necessary, according to nationally agreed criteria, prepare local air quality management plans for operation in defined areas, where targets are unlikely to be met. Such plans may place constraints on industrial emissions, may involve traffic management or involve other initiatives.

We will play our part by contributing to such local plans and by ensuring that industry, regulated by ourselves, is adequately controlled.

6.8.4 Current Status

Air quality within the UK has been improving in recent years and these improvements are set to continue over the next decade. The new systems for dealing with industrial pollution introduced by the Environmental Protection Act 1990, new vehicle standards, and other measures aimed at mitigating the environmental effects of traffic are addressing the reduction of emissions. The UK confidently expects to meet its existing international commitments for reductions in emissions of volatile organic compounds and oxides of nitrogen and sulphur dioxide.

There remain, however, important challenges and uncertainties. For example, the recurrence of ozone episodes, particularly in summertime, and the recent publication of research into the effect on public mortality of the wintertime smog episode of December 1991 in central London have again raised public concern about air quality.

The Contribution to Air Pollution from Different Sectors

Table 13 shows the relative contribution of different sectors to total national emissions of the pollutants covered in this strategy (ozone is not emitted directly - the pollutants which lead to its formation, nitrogen oxides and volatile organic compounds, are given). It must be remembered that these figures do not necessarily reflect the relative contribution of these sectors to any particular area, including pollution 'hot-spots' or problem areas. There is a great deal of variation between urban and rural areas, and between residential, commercial and industrial areas.

Table 13: Industrial emissions in the United Kingdom

Pollutant	Total UK Emissions in 1995 (kilotonnes)	Industrial Emissions (kilotonnes)	Industry as % of total
Benzene	35	6.9	20
1,3-Butadiene	9.6	1.2	13
Carbon monoxide	5478	667	12
Lead	1492[1]	276[1]	18
NO_x	2293	852	37
Particles	232	135	59
Sulphur dioxide	2365	2112	89
NMVOCs	2257	1195	53
[1] tonnes			

NB Ozone is a secondary pollutant formed from nitrogen oxides NO_x and non-methane volatile organic compounds NMVOCs.

The following Maps (**Map Nos. 14 to 20**) show for those pollutants given in **Table 13,** the levels of pollution concentration along with the relevant Air Quality Standard. They are based on data published in the Agency's State of the Environment Report 1997 -provided by AEA Technology using quality assured data from archives of information held by AEA's National Environmental Technology Centre. The maps presented have been extracted from maps calculated for the DETR. They have been derived from maps calculated to provide estimates of air quality for the whole of the UK, zoomed in to show the Louth Coastal Plan area.

MAP No 14 : Fine Particles Distribution 1994

KEY:

Estimated Annual Mean Background Concentrations (ug/m3)

- Below 12.5
- 12.5-15
- 15-17.5
- 17.5-20
- 20-22.5
- Above 22.5

Primary Sources:
Vehicle emissions & Industry

Standard:
Expert panel for Air Quality
Standard=50ug/m3
running 24 hour mean

Environment Agency

MAP No 15 : Benzene Distribution 1994

KEY:

Estimated Annual Mean Background Concentrations (ug/m3)

- Below 1.5
- 1.5-2.0
- 2.0-2.5
- 2.5-3.0
- 3.0-3.5
- 3.5-4.0
- 4.0-5.0
- >5.0

Primary Sources:
Petrol Stations/Vehicles

Standard:
Expert panel for Air Quality
Standard=16.2ug/m3
running annual mean

MAP No 16 : Ozone Distribution 1994

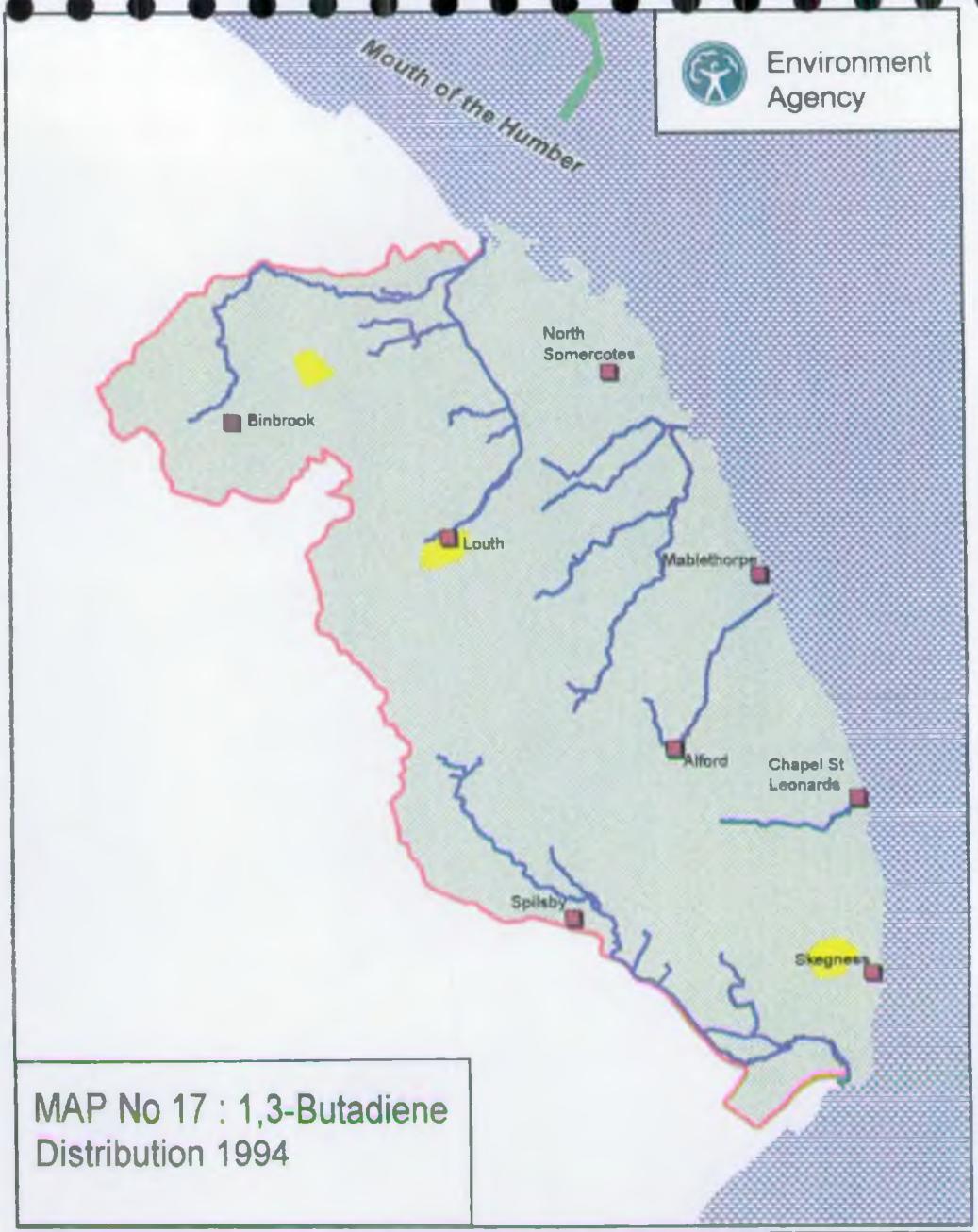
KEY:

Estimated number of days where Ozone 8hr mean >=50ppb, 1990-1994 Data

<5	15-20	40-50
5-10	20-30	>50
10-15	30-40	

Primary Sources:
None
Ozone is a secondary pollutant formed by the reaction between NOx and VOC's.

Standard:
50ppb running 8hr mean



MAP No 17 : 1,3-Butadiene Distribution 1994

KEY:

Estimated Annual Mean Background Concentrations (ug/m3)

- Below 0.1
- 0.1-0.2
- 0.2-0.4
- 0.4-0.6
- 0.6-0.8
- Above 0.8

Primary Sources:
Vehicle emissions

Standard:
Natural Air Quality Standard/ Expert panel for Air Quality Standard=2 24ug/m3 running annual mean

MAP No 18 : Lead Distribution 1994

KEY:

Estimated Annual Mean Background Concentrations (ng/m3)

- Below 10
- 10-20
- 20-40
- 40-80
- 80-100
- Above 100

Primary Sources:
Vehicle emissions

Standard:
Expert panel for Air Quality
Standard=500ng/m3
annual mean

MAP No 19 : Sulphur Dioxide Distribution 1994

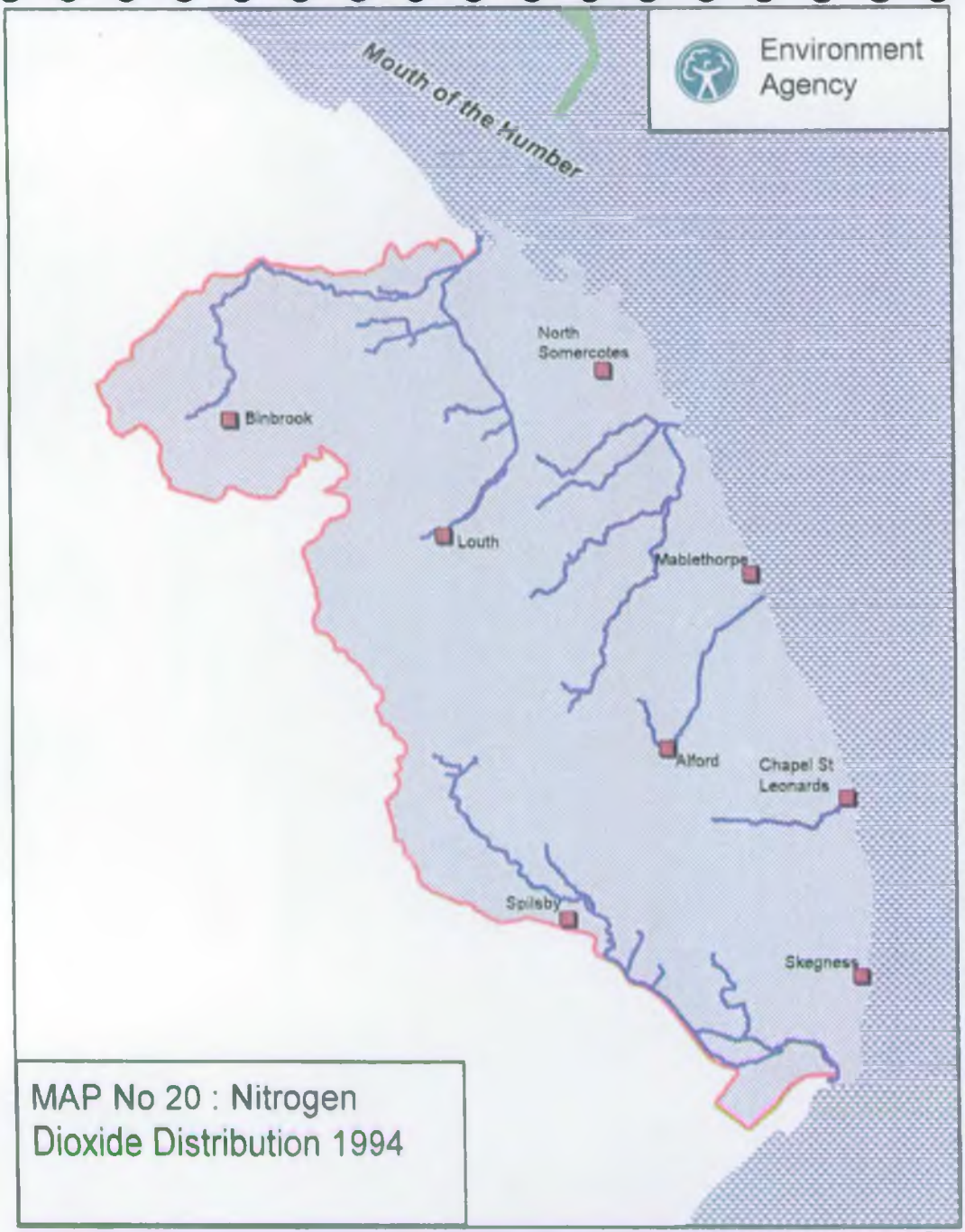
KEY:

Estimated Annual Mean Background Concentrations (ug/m3)

- Below 3
- 3-6
- 6-12
- 12-18
- 18-24
- Above 24

Primary Sources:
Industry, mainly combustion processes

Standard:
Guideline:
World Health Organisation=50ug/m3 annual mean
Expert Panel for Air Quality Standard=267ng/m3 @ 20 deg C 15 minute mean.



MAP No 20 : Nitrogen Dioxide Distribution 1994

KEY:

Estimated Annual Mean Background Concentrations (ug/m3)

- Below 10
- 10-20
- 20-30
- 30-40
- 40-50
- Above 50

Primary Sources:
Vehicle emissions and industry

Standard:
Expert Panel for Air Quality
Standard=40ug/m3 @ 20 deg.C

6.9 WILDLIFE

6.9.1 General

We have a duty under the Environment Act 1995 to have regard to conservation with respect to all of our pollution control and waste management functions, and to further conservation with regard to all our other activities (flood defence works etc.). Our conservation duties are particularly relevant in achieving the objective of sustainable development, which we are committed to following the Government's adoption of Agenda 21.

We are committed to working with English Nature and the Wildlife Trusts towards producing Local Biodiversity Action Plans at regional and local levels. Biodiversity Action Plans are currently being prepared to target species and habitats that are under threat. A number of these species/habitats are related to the aquatic environment which is of particular concern to the Agency and this will be reflected in the production of subsequent revisions of LEAPs.

Presently within Anglian Region the species that are being targeted include; otter, water vole, and crayfish along with the Chalk Stream Habitats.

6.9.2 Monitoring

River Corridor Surveys (RCS) are undertaken by ourselves to assess the ecological quality of the rivers. These surveys consider the botanical species in the river, on the banks and within the adjacent 50 metre corridor, in addition to the bird species. Surveys have been completed for every 500 metre section of Main River in Anglian Region. Future surveying will target more vulnerable rivers and therefore some sub-catchments will be assessed more frequently.

River Habitats Surveys (RHS) are currently being undertaken to complement the RCS. These classify the environmental condition of rivers with regard to physical features such as riffles, pools, wet shelves, cliffs and other habitat features to determine their habitat value to wildlife.

Both the RCS and RHS are aimed at identifying degraded as well as important stretches of river in order to protect valuable features/wildlife and identify opportunities to rehabilitate and enhance degraded habitats.

6.9.3 Targets

Our principal aim with respect to conservation is to conserve and enhance wildlife and landscape in association with inland and coastal waters, through our operational, regulatory and monitoring activities.

The River Corridor Survey methodology employs a classification system which categorises a river's conservation resource into three classes of High, Average and Low River Corridor plant species diversity.

Map Nos. 21 and 22 show River Corridor and River Channel Plant Species Diversity.

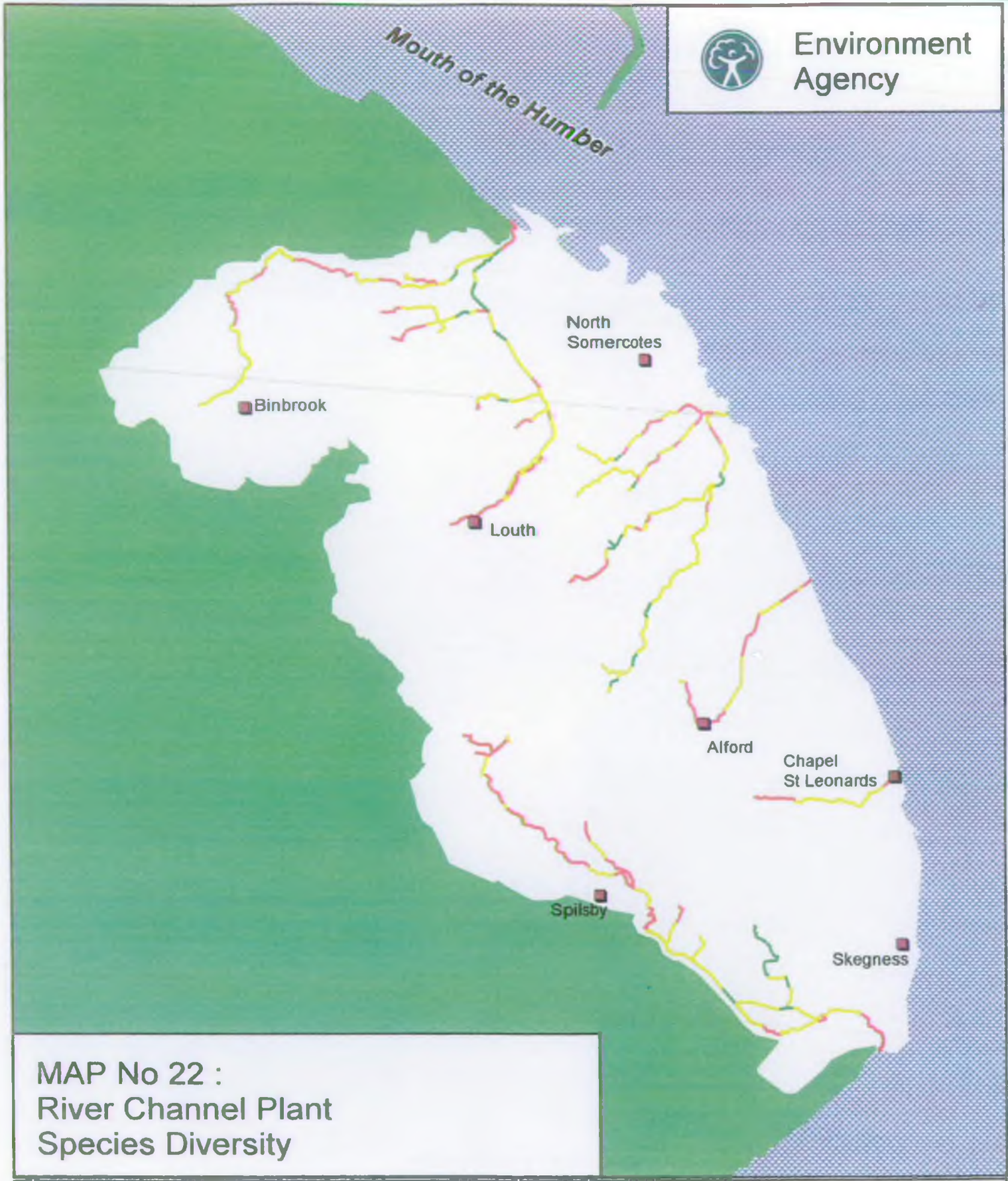
MAP No 21 : River Corridor Species Diversity

KEY:

DIVERSITY:

- <50 (Low Diversity)
- 51-89 (Average Diversity)
- >90 (High Diversity)

- Main River
- Town



MAP No 22 : River Channel Plant Species Diversity

KEY:

AQUATIC SPECIES DIVERSITY:

- <10 (Low Diversity)
- 10-19 (Average Diversity)
- >20 (High Diversity)
- Main River
- Town

Although targets for individual river stretches have not been established, the classification system is used in the decision making process to target resources for habitat improvements to the most needed stretches. Following the development of Local Bio-diversity Action Plans by English Nature and local Wildlife Trusts we will integrate appropriate targets into future LEAP documents.

Specific areas of concern in the area have been previously discussed in the Issues Section including, the lack of habitat diversity caused by past river management practices and low flows, and the almost complete absence of fenland habitat.

6.9.4 Current Status

A large area of the Plan coastline comprises important and rare habitats, including the Humber Flats, Marshes & Coast Ramsar & Special Protection Area (SPA). This site, leased from the Ministry of Defence and the County Council and managed by the RSPB and Lincolnshire Trust, has been designated for its internationally important wetlands and rare bird species, including little terns, golden plovers and hen harriers, it also holds Britain's most south-easterly breeding grey seal colony. To the south of this site is Saltfleetby-Theddlethorpe Dunes SSSI which is important for its coastal and freshwater marshes and breeding birds; it is also the most north-easterly breeding site in Britain for the natterjack toad. Gibraltar Point is a candidate Special Area of Conservation (cSAC), as designated under the Habitats Directive, SPA, Ramsar, SSSI and National Nature Reserve (NNR). Gibraltar Point is important for its dunes, lagoons, saltmarsh and other coastal habitats, as well as for its associated invertebrates, breeding and migratory birds.

The geomorphology of the dunes and submerged forest along the coastline are of importance. Areas of accretion along the north and south of the coastline provide the areas of the greatest conservation value with their extensive intertidal zones and developing dune systems.

The coastline and its adjacent Out Marsh and Middle Marsh form part of the Lincolnshire Coast and Marshes Natural Area. This Natural Area is a generally flat coastal plain that is largely under arable cultivation. A high proportion of the neutral grassland remaining in Lincolnshire is found in the Out Marsh. Wet grasslands near the coast support large numbers of wildfowl and coastal birds such as lapwing, snipe and redshank. Freshwater meadow and pasture habitats adjacent to these sites have been declining due to drainage and conversion to arable land.

Freshwater habitats along the coast and its adjacent marsh area include slow flowing streams, drainage ditches, blow wells and disused sea bank clay pits all supporting a wide diversity of wildlife. However, over two hundred years of training and maintaining watercourses for drainage, the needs of flood defence and in the case of the Louth Canal for navigation have left plant diversity along river corridors generally low with only five 500m sections surveyed for the 1995 River Corridor Survey returning populations with 90 or more species.
To the west of the Middle Marsh the Plan area rises into the Lincolnshire Wolds Natural Area. Glacial meltwater channels have carved away parts of a thin chalk layer with its

capping of glacial deposits to leave steep valleys exposing Spilsby Sandstone and Kimmeridge Clay.This variety in solid geology has left soil types with differing acidities and calcarious, acidic and neutral grassland can all be found in this part of the Plan area.

River headwaters and chalk streams constitute the main aquatic and riparian habitats in the Wolds area of the Plan. Small areas of marsh and spring line flushes occur in the steep river valleys. None of the river sections surveyed for the 1995 River Corridor Survey (RCS) were recorded as having a high species diversity (90+ species) in the Wolds head waters. Important alder carr and other woods on the valley bottoms are highlighted in the RCS, however, and demonstrated by the high diversity of woodland species on the upper River Lymn and Waithe Beck. The most extensive woodland in the Plan area is to be found where the Wolds overlap the Coast and Marsh Natural Area particularly on the clay soils between Willoughby and Louth.

In this Plan area otters and water voles are present with both being national priority species for Biodiversity Action Plans.

Biodiversity Plans

Local Biodiversity Audits are being prepared for the area by local Wildlife Trusts and Local Councils. Following these Audits, Local Action Plans will be produced and implemented to protect and enhance the biodiversity resource of the area. Nationally we have been given responsibility as a contact point for the following 12 species, and Chalk Rivers Habitat.

water vole	*Arvicola terrestris*	Present
otter	*Lutra lutra*	Present
vendace	*Coregonus alba*	Not Present
atlantic stream crayfish	*Austropotamobius pallipes*	Thought to be present
southern damselfly	*Coenagrion mercuriale*	Not Present
depressed river mussel	*Pseudanodonta complanta*	Not present
shining rams horn snail	*Segmentina nitida*	Not present
snail	*Anisus vorticulus*	Not present
glutinous snail	*Myxas glutinosa*	Not present
freshwater pea mussel	*Pisidium tenuilineutum*	Present
river jelly lichen	*Collema dichotomum*	No record
ribbon leaved plantain	*Alisma gramineum*	Not present

Local biodiversity plans will also consider species that have been identified as being local priorities such as palmate newts, brown trout, the great crested grebe and curlew.

Mammals and birds tend, by their nature, to have a higher profile in the public eye when it comes to protecting and conserving species. In this catchment otters and water voles are national priority species with a high profile and local priority species include kingfishers and

snipe. Action to protect and conserve individual species such as otters involving the restoration of habitat can often benefit to a wider range of species such as dragonflies, damselflies and water shrews.

6.9.5 Trends

Many of the Plan areas various habitats have been adversely impacted upon during the last 60 years. Climate change, urban expansion and development, needs of the leisure and recreation industry, changes in agricultural practises and modern land drainage techniques have all contributed to an overall decrease in the areas biodiversity.

In recent years perceptions and attitudes have changed towards a more sympathetic approach with a growth in concern for environmental issues. The Agency, working together with MAFF, English Nature, the Wildlife Trust, the Countryside Commission, and the general public, aim to promote a wider appreciation for the environment and continue to conserve and enhance wildlife and landscape habitats in and around inland and coastal waters.

Map No 23 shows SSSIs, Nature Reserves and Areas of Outstanding Natural Beauty

MAP No 23 : Nature Reserves, SSSIs, AONB

KEY:

- Main River
- Site of Special Scientific Importance (SSSI)
- Boundary of Larger SSSIs
- Nature Reserves
- Wolds Area of Outstanding Natural Beauty

For a full list of the sites shown above see Appendix 11.

6.10 FRESHWATER FISHERIES

6.10.1 General

The Environment Agency has a specific duty to assess the state of, and safeguard, freshwater fisheries and the waters which they inhabit. Under Section 6 of the Environment Act 1995 we have a duty to maintain, develop and improve fisheries.

6.10.2 Monitoring

We monitor the state of fisheries by sampling freshwater fish populations on a regular basis. A programme of population surveys assesses the fisheries in certain rivers, on a five yearly basis, in terms of fish biomass (the weight of fish found for a given area of water surveyed), species richness, (the number of fish species found for a given area of water surveyed) and age structure. This is part of the National Fisheries Classification system which allows fisheries throughout England and Wales to be compared in a standard way, taking into account broad habitat types.

We also carry out chemical water quality monitoring, on a monthly basis, in association with the EC Freshwater Fish Directive (78/659/EEC). See Section 6.1.1.3 pages 95,99 & 100.

6.10.3 Targets

Our principal aim with respect to fisheries is to maintain, improve and develop fisheries.

The national fisheries classification system grades fish population according to:

a) Biomass
b) Species richness

with categories for both from A to F. The system takes into account the relative habitat value of the rivers including its gradient and width (see **Appendix 12**)

Certain species of fish in the Plan area are listed in the *EC Habitats Directive (92/43/EEC)* (examples, spined loach, allis shad, twaite shad, salmon, brook, river & sea lamprey, bullhead) and require special protection. Any damage to their resting places or breeding sites is illegal.

6.10.4 Current Status

Map Nos. 24 and 25 show Fish Species Richness and Biomass in the Plan area.

River Lymn/Steeping

The River Lymn rises in the Wolds and drains a predominantly sandstone catchment located to the west of the Wolds Chalk escarpment, and eventually discharges to the sea south of Skegness as the River Steeping.

At present the River Lymn and Steeping support a fish population with a mean biomass of **26.9gm^{-2}**, which results in a fishery status: Class A.

Brown trout are present in the upper river section at four main river sites. Historically the upper reaches of the Lymn have been dominated by native brown trout, however during 1993 a decline in their importance was noted. This observation has been attributed to recent drought events when conditions have been unfavourable to species such as trout and dace. This effect will be due in part to a reduction in water flow adversely impacting on spawning gravels and holding pools. A return to more typical river flows should reverse this situation and an improvement in the associated fish assemblage should become apparent.

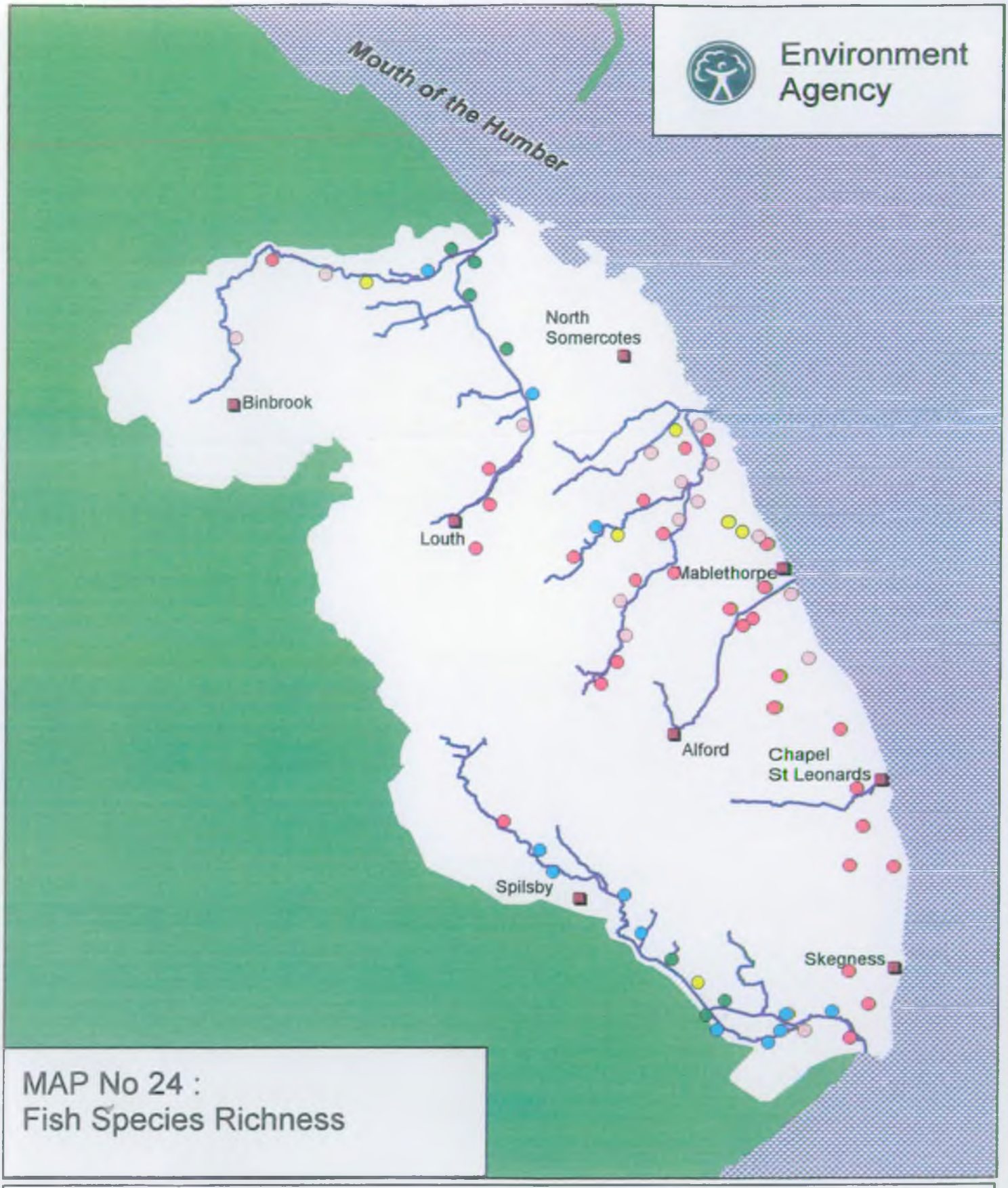
Species richness scores were generally good reflecting the diverse fish community.

Brook lamprey were recorded during the 1996 investigation. This species is confined to the upper river sections of the Lymn where a suitable habitat is found. As the river character changes from upper stream to lowland water carrier, so does the fish assemblage.

Species found in the lowland river section include: the spined loach, this fish is usually associated with a river that has a fine sand and mud substratum. The occurrence of spined loach at four sites is notable as the species is not common in the British Isles being found only in suitable silty drains in the East. Sites where spined loach were detected remained similar to previous 1993 findings. The spined loach is rare in the British Isles, and Lincolnshire supports a stronghold for this species. The spined loach is listed under the European Habitats Directive.

Long and Great Eau System

The Great Eau rises in the Wolds as a series of small spring fed streams and can be regarded as a chalk stream. The upper reaches are characterised by typical riffle and pool habitat, inhabited by brown trout, rainbow trout (escapees from local fish farms) and associated fish species. Angling for trout is carried out on a small scale in the upper reaches. Further downstream, the river has been extensively engineered and lacks diverse instream habitat. This lower section contains the expected coarse fish species, including common bream, roach and pike and related angling activities are popular in the section between Theddlethorpe and Cloves Bridge.



MAP No 24 :
Fish Species Richness

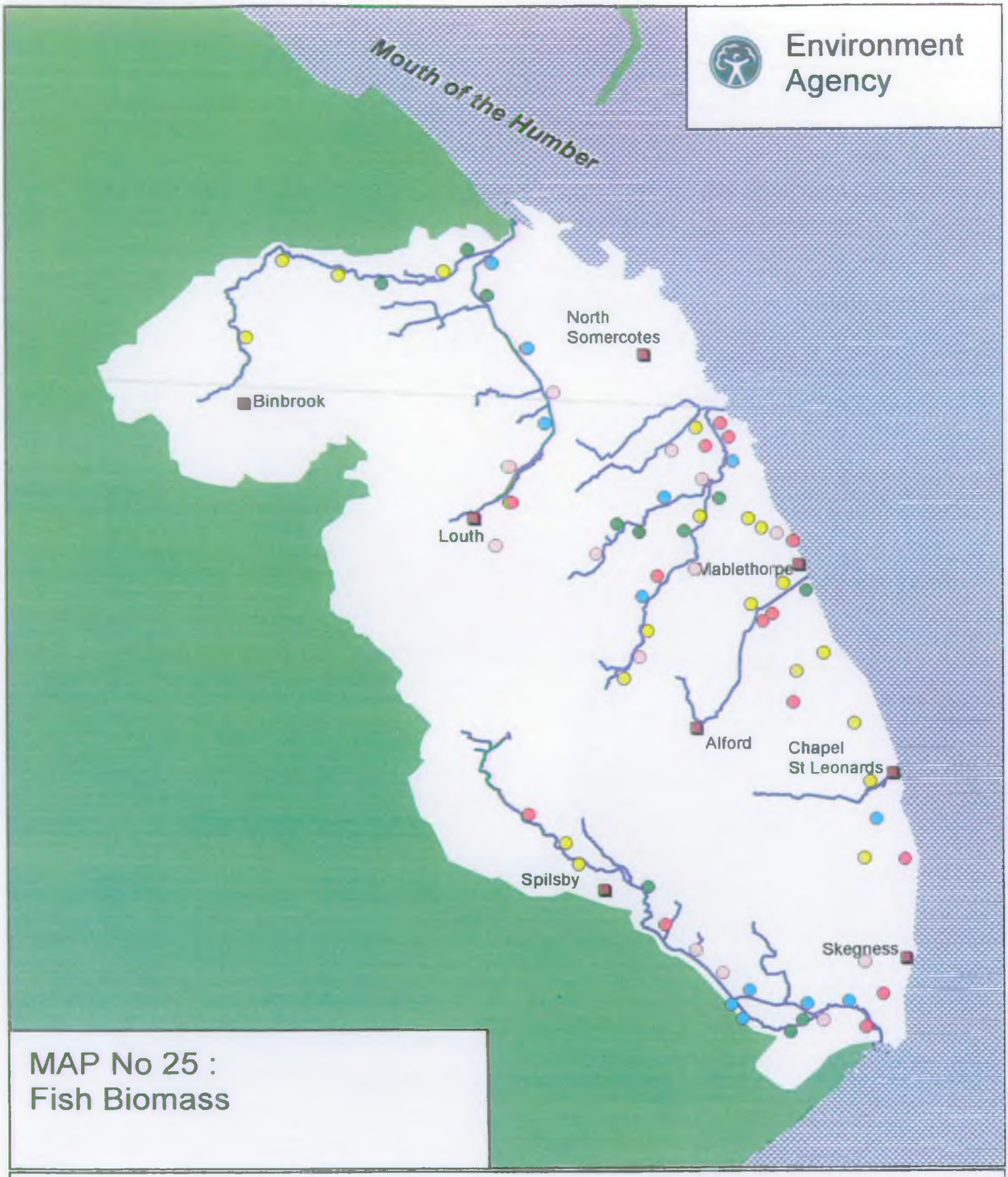
KEY:

Fish Species Richness:

A
B
C
D
E
F

Town
Main River

For full description of Fish Species Richness Classification see Appendix 12



MAP No 25 : Fish Biomass

KEY:

Fish Biomass Classification:

- A
- B
- C
- D
- E
- F

Town

Main River

For full description of Fish Biomass Classification see Appendix 12

The Long Eau has its origin in the chalk catchment and the clay lower catchments include the Greyfleet Drain, South Dyke and Mablethorpe Cut. In the clay catchment area, a variety of both gravity and pumped drainage occurs.

Overall, following a survey in 1995 a mean fish biomass of **19.3 gm-²** was recorded which results in the fishery being categorised as Class B. However, it is near to a level that places it in Class A (20gm -²) and therefore can be considered to be above average in terms of fish biomass. Common bream were dominant in terms of weight (26.8 %) and roach were the dominant species in terms of numbers (5647 representing 48.4 %).

The Mablethorpe Cut Drain has in the past suffered from salt water infiltration which has resulted in a very low freshwater population. Results from the current survey indicate this continues to be the situation at present. A mean fish biomass of 9.5 gm-² was recorded throughout the Mablethorpe Cut section. This represents an improvement on the result obtained from the previous survey in 1989 (4.3 gm-²).

Both the Greyfleet Drain and South Dyke drain were found to contain poor fish biomass (1.2 gm -²) and density estimates. In recent years these drains have been affected by low flows and salt water intrusion through inefficient seals on sea doors. This phenomenon has been reflected in the fish community as Euryhaline (saline tolerant) species such as flounder and sprat were detected during this 1992 survey.

Recent environmental conditions have not been favourable towards salmonid species in this part of the country. The high average summer temperatures, coupled with high light levels and the low rainfall have all combined to erode the hold these species have on the upper river reaches. However, they have not disappeared and it is expected that when we return to more typical conditions once again, these species will dominate with vigour in the river areas best suited to their biological adaptations.

River Lud and Louth Canal

The Louth Canal System rises in the Wolds as a series of small spring fed streams. The River Lud and Waithe Beck form the upper river sources. These upper reaches are characterised by riffle and pool type habitat inhabited by brown trout and the associated invertebrate fauna typical of a trout zone. The small size of the stream limits the value of this fishery for recreational fishing. No organised angling activity is believed to be undertaken for trout.

The lower river section has been extensively engineered and consequently riverine habitat is poor. Throughout the lower river the fish population is dominated by coarse fish species and a popular recreational fishery is sustained to the benefit of both local and visiting anglers. The area around Tetney is particularly popular, some river sections being controlled by the Witham and District Joint Anglers Federation.

The Waithe Beck has its source deep in the Lincolnshire Wolds. The headwaters include the Orford Beck which joins the Waithe Beck near Hatcliffe.

The upper river reaches are characterised by natural and semi natural chalk stream habitat. Chalk Stream habitat has recently been recognised as having national importance in terms of biodiversity. The presence of such waters in Lincolnshire raises the local importance of a system in need of special protection from adverse influences that would otherwise serve to derogate status.

A total of 20 fish species were caught throughout the System in the 1995 survey.

Overall a mean fish biomass of **22.8 gm-2** was recorded which results in the fishery being categorised Class A (>20 gm-2).

Minor Coastal Drains and Rivers

The East Coast catchment is characterised by numerous smaller rivers and drains, many of these have been extensively engineered and as a result instream habitat is restricted and poor.

The open aspect of many of these waters makes them susceptible to excessive plant growth during hot dry periods. Surrounding land use is extensively arable and as a consequence nutrient loadings to land are consequently high.

Throughout the area 15 species of fish were recorded, in the 1995 survey, from the minor east coast drains. Roach were the dominant species in terms of weight. In terms of species richness all sites were poor which may reflect the degraded habitat.

Some waters support a moderate biomass of coarse fish species. Examples include the Trusthorpe Pump Drain, Woldgrift Drain, Willoughby High Drain and Ingoldmells Main Drain.

7.0 REGULATORY FRAMEWORK

This section summarises the Regulatory Framework under which the Agency and others operate for the uses and activities set out in Section 5.0. It also sets out in general terms the roles and responsibilities of relevant organisations where appropriate.

7.1 Development and Land Use Planning

The control of development is the responsibility of local government under the Town and Country Planning process. It is the Government's intention that development will be led by Plans which set out policies against which the Planning Authorities consider development proposals. Guidance for future development is contained in Regional Planning Guidance, County Structure Plans, Unitary Plans, Minerals & Waste Local Plans and District Local Plans. Regional Planning Guidance and Structure Plans set out the framework for development and Local Plans provide the details.

The Department of the Environment Transport and the Regions (DETR) issue Planning Policy Guidance notes (PPGs) to provide advice to Local Planning Authorities (LPAs) on key areas of interest. The advice contained in PPGs is an important material consideration for LPAs in the preparation of Development Plans and the determination of individual planning applications. The principal PPGs relevant to the interaction between land use planning and the environment are:

PPG1	General Policy and Principles
PPG7	The Countryside, Environmental Quality and Economic Development
PPG9	Nature Conservation
PPG12	Development Plans and Regional Policy Guidance
PPG23	Planning and Pollution Control

The DoE (now the DETR) also issue advice to LPAs in the form of Circulars. Circular 30/92 on Development in Flood Risk Areas sets out the type of information which this Agency should provide LPAs on flood plain areas and areas at risk from flooding and the weight which LPAs should give to our advice regarding proposed development in those areas.

We are a statutory consultee under planning legislation and advise County and Local Authorities on development proposals which may have an effect on matters relevant to our interests. The Agency's purpose in this participation is the protection of the environment and the prevention or mitigation of any adverse effects associated with development and land use change. It must be remembered however that the final decision on planning matters rests with the planning authorities.

7.2 Agriculture and Forestry

The Ministry of Agriculture Fisheries and Food (MAFF) play the leading role in the regulation of the agriculture industry. They promote a number of measures to encourage farmers to conserve and enhance the rural environment and its natural resources, including the water environment. Amongst these measures, the designation of Nitrate Sensitive Areas (NSA) and Nitrate Vulnerable Zones (NVZ) are specifically aimed at protecting water from nitrate contamination. The Environmentally Sensitive Area (ESA) scheme promotes farming methods which protect and enhance wildlife, landscape and historic features. Other schemes include:

- *The Habitat Scheme* which was introduced to encourage farmers to create, protect or enhance a range of wildlife habitats by managing land in an environmentally beneficial way. A requirement of the habitat scheme is that land is kept out of agricultural production for 5 years;

- *The Countryside Access Scheme* is open to farmers who have non-rotational set aside land. It is designed to provide new opportunities for public access and recreation and could include access to watercourses;

- *The Countryside Stewardship Scheme* encourages farmers to manage waterside land in a way sympathetic to wildlife and fisheries.

Our powers with respect to agriculture stem from:

- *The Water Resources Act 1991* which gives us certain powers to control pollution from agricultural sources;

- *The Control of Pollution (Silage , Slurry and Agricultural Fuel Oil) Regulations 1991* which enables us to prevent pollution from certain agricultural practices;

- *The Waste Management Licensing Regulations 1994* which enables us to control land spreading of certain wastes;

- *The Land Drainage Act, 1991* which enables us to influence proposals relating to the drainage of land.

The **Forestry Authority** are responsible for the regulation of forestry and have published a series of guidelines which seek to minimise the adverse impact of forestry operations, including the encouragement of environmentally sympathetic planting.

7.3 Air Quality

In 1863 the Alkali Act was the first legislation to be introduced to control releases to air from industrial sources in the United Kingdom. The principles embodied in this Act carried forward over many years but with additions to the number and variety of industrial processes regulated. This applied to releases to air only. In response to the fifth report by the Royal Commission on the Environment, the government introduced the concept of Integrated Pollution Control (IPC) as embodied in the Environment Protection Act (EPA) 1990. This widened the scope of pollution control to that controlling releases of certain pollutants from certain processes to all media.

The requirement of Part One of the EPA90 is to use Best Available Technique Not Entailing Excessive Cost (BATNEEC) to prevent, minimise and render harmless prescribed substances considered to be of most environmental concern as listed in the Environment Protection (Prescribed Substances and Processes) Regulations 1991: SI 472, as amended. Another requirement is due regard to the Best Practical Environment Option (BPEO) if the release can impact on different media. The key part of controlling IPC processes is the precautionary principle - to try and prevent the release in the first place.

SI 472 as amended, also details those processes that come under EPA90. Part A processes, considered to have the greatest polluting potential, come under central control and are regulated by the Agency. These processes include large combustion plant, iron and steel making, the chemical industry, solvent recovery and incineration plants.

The legislation also considers a range of processes which are considered to be less polluting. These Part B processes are regulated by the relevant local authority and only the releases to air are controlled. Examples of Part B processes are paint spraying, small foundries and small combustion plant. Generally, those industrial processes that are not defined as Part A nor Part B are controlled for releases into air by regulations under the Clean Air Act 1993 or under part 3 of the EPA90 : Statutory Nuisance Regulation.

The Department of Transport (DoT) sets vehicle emission standards for enforcement by others such as the Police. These standards also impact upon vehicle manufacturers.

7.4 Water Quality

The Water Resources Act 1991 (as amended by the Environment Act 1995) enshrines previous pollution control legislation including the Control of Pollution Act 1974 and the Water Act 1989.

The Environment Act 1995, the Act that saw the creation of the Environment Agency, supplements and amends various aspects of the Water Resources Act 1991, introduces new duties and powers and passes the powers of the NRA in respect of existing pollution control legislation the Agency.

The Agency controls all discharges of domestic sewage and most industrial effluents are regulated under the above legislation by issuing and enforcing permissions (discharge consents/notices). Permissions specify limits on the quality and quantity of material which may be discharges. Discharge conditions are based on the current upstream water quality, downstream WQOs and dilution available in the receiving watercourse.

Other legislation gives the Agency powers in respect of applications for planning permission and pollution prevention. For example,. some industrial processes which discharge to water are controlled under the Environmental Protection Act 1990, under a regime of Integrated Pollution Control and in terms of agricultural control the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1990 offers additional powers to the Agency.

Significant European legislation relevant to the Plan area includes:

The EC Urban Waste Water Treatment Directive which seeks to protect the environment from the adverse effects of urban wastewater discharges and discharges from certain (organic) trade discharges. The Directive requires the provision of sewerage systems and defines minimum levels of treatment and effluent standards for sewage treatment works. The specific requirements are complex and depend on the size of the discharge, the type of receiving waters (freshwater, estuary, coastal waters) and the sensitivity of those waters.

The EC Dangerous Substances Directives which sets out a framework of measures to control water pollution caused by discharges of certain dangerous substances. The Directive defines two lists of substances which require special control because they are toxic, accumulate and concentrate in plants and animals (List I) and substances that are less dangerous, but may still have a deleterious effect on the aquatic environment (List II). Separate Directives set quality objectives for individual List I substances. Quality objectives for List II substances are set by individual member states.

The EC Surface Water Abstraction Directive which seeks to protect public health and ensure against deterioration in water quality where surface water is abstracted for potable supply. The Directive describes three classes of surface water, dependant on the degree of treatment that the water receives before it enters the potable water supply. Water quality standards apply to designated surface water abstraction points.

The EC Freshwater Fisheries Directive which is primarily for the protection of fish ecosystems. The Directive describes two classes of water which can support salmonid or cyprinid fish. Water quality standards for these two classes are based on research carried out by the European Inland Fisheries Advisory Commission in the 1960's and 70's. The standards apply only to stretches designated under the Directive.

The EC Nitrates Directive which seeks to reduce or prevent pollution of water caused or induced by nitrate from agricultural sources. The intention is to address two problems (i) pollution of drinking water by nitrate and (ii) eutrophication in saline waters (eutrophication in these waters is normally nitrate limited). One of the aims is to provide all waters with a

general level of protection against nitrate pollution, through encouraging good agricultural practice. In addition, specific areas may be designated as Vulnerable Zones (areas of land draining to waters particularly affected by nitrate pollution), where more rigorous protection is afforded.

The EC Protection of the Quality of Groundwater Directive which prohibits the direct or indirect discharge into groundwater of List I substances and limits List II substances, unless prior investigation can establish that pollution of groundwater will not occur, or unless the groundwater is permanently unsuitable for other uses.

The EC Bathing Water Directive which seeks to reduce pollution to identified Bathing Waters and to prevent any deterioration in the quality of these waters thus providing protection to Public Health and the Environment. The Directive describes mandatory and guideline standards for various parameters. The Agency is responsible for sample collection and analysis and the DETR assess compliance.

7.5 Waste Management

Section 42 of the Environmental Protection Act 1990 requires the Agency to licence and supervise licensed waste management activities to prevent pollution of the environment, harm to human health and detriment to the local amenity.

This legislation which controls the treating, keeping or disposal of waste, applies to waste produced by households, commerce and industry. It also includes that waste going to transfer stations, recycling centres and treatment plants. It is only under exceptional circumstances that waste is disposed of directly into or onto land. Usually a protective barrier is required between waste and land.

In general, waste not regulated by ourselves includes waste from mining and quarrying operations and waste from premises used for agricultural purposes. New regulations are proposed which may bring a degree of regulation over these wastes.

The Landfill Tax was introduced in 1996 with the intention to direct away from landfill, to options such as recycling and minimisation. This has raised speculation that it could cause an upturn in fly tipping. The Duty of Care regulations place a duty on anyone from producer to disposer to ensure that waste is handled safely and legally.

Under the *Waste Management License Regulations 1994*, liquid industrial wastes which can be shown to benefit agriculture may be deposited on land, subject to our approval and written consent. Sewage sludge may be deposited on land under the above regulations or under the *Sludge (Use In Agriculture) Regulations 1988*, also enforced by ourselves.

Other relevant legislation includes:

- The Control of Pollution (Amendment) Act 1989
- The Environmental Protection Act 1990
- The Controlled Waste (Regulation of Carriers and Seizure of Vehicles) Regulations 1991
- The Environmental Protection (Duty of Care) Regulations 1991
- The Controlled Waste Regulations 1992
- The Waste Management Licensing Regulations 1994
- The Environment Act 1995
- The Special Waste Regulations 1996

In addition the use of regulatory standards by Government has enabled certain disposal options to be made more expensive and thus concentrate the producer's mind to eliminate or reduce the amount of waste he produces. This use of law to increase regulatory standards for certain disposal methods (eg landfill), and hence to increase costs, as with that associated with the new producer packaging regulations, is being utilised by Government as a mainstay waste management strategy. At the European level the development of tighter standards for urban waste water treatment which will preclude the dumping of sewage sludge at sea, is also part of the same trend to use regulatory standards to direct waste and encourage waste reduction and recycling.

7.6 Mineral extraction

In January 1988, the Department of the Environment introduced a new series of Minerals Planning Guidance (MPG) dealing with the control of minerals development. MPGs are the main source of national policy guidance on mineral planning matters. MPG 6 provides advice to mineral planning authorities and the minerals industry on how best to ensure that the construction industry receives an adequate and steady supply of material at the best balance of social, environmental and economic costs. This ensures that extraction and development are consistent with the principles of sustainable development.

Structure Plans and Minerals Local Plans are prepared by the County Councils, under the Town and Country Planning Act 1990, in accordance with Planning Policy Guidance Note 12. These provide the policy framework within which proposals for mineral workings are assessed. They guide the minerals industry and the public as to how much extraction is to be permitted, where it might occur and what conditions will be imposed on any planning permissions. They also aim to steer development to the least environmentally damaging areas.

As a statutory consultee, we make comment upon these Plans to ensure our interests are protected.

MPG6 states that mineral planning authorities should take into account the need to protect the flow, level and quality of surface waters and groundwater to ensure that changes in the water table as a result of mineral extraction do not cause environmental damage or adversely effect water resources. Our 'Policy and Practice for the Protection of Groundwater', addresses matters relating to mineral extraction.

Under the Water Resources Act 1991, dewatering of mineral workings is exempt from the need to obtain an abstraction licence. However, under Section 30 of the Act, the Agency can issue a 'Conservation Notice' to the mineral extraction company, in order to conserve water in the dewatering process. These powers are limited and cannot be used to prevent mineral extraction.

7.7 Water Resources

The Water Resources Act 1991 sets out our duties with respect to the management and development of water resources. Under this legislation we have a duty, and the powers, to take such action as we consider necessary to conserve, redistribute, augment and secure proper use of water resources, taking into account the needs of the environment.

This is achieved by administering a system of licensing abstractions and impoundments and by developing river transfer schemes as appropriate. We have powers to decide whether or not a licence may be granted, the conditions applied to it, and the power to vary licences.

Apart from a few exceptions all abstraction of water whether from ground or surface waters is required to be licensed by ourselves to ensure the balanced and sustainable use of resources. The abstraction and/or impoundment of water without a licence is an offence which we are responsible to enforce.

The Agency may apply to the Secretary of State for drought orders, which enable it to take measures to cope with water shortages such as modifying abstraction licences. Drought orders may involve payment of compensation to affected parties. However, we may restrict abstraction for spray irrigation licences without compensation.

7.8 Land Drainage and Flood Defence

The Ministry of Agriculture Fisheries and Food (MAFF) have overall responsibility for Flood Defence policy in England and Wales which is to:

> "reduce risks to people and the developed and natural environment from flooding, by encouraging the provision of technically, environmentally and economically sound and sustainable defence measures."

The Ministry seeks to achieve this by establishing a policy framework for the responsible organisations such as the Agency to provide flood warnings and to carry out maintenance and improvement works, and by the provision of grant aid for cost effective flood defence works and warning systems.

The Water Resources Act 1991 sets out responsibilities for land drainage and flood defence matters. Our duties are as follows:

- to exercise a general supervision in all matters relating to flood defence;
- to carry out surveys to ascertain the flood defence needs of any area;
- in the carrying out of our functions to promote the maintenance and enhancement of the environment.

We are also a statutory consultee in the Town and Country Planning process which enables the Agency's views and advice to be taken into account by the Local Planning Authority when considering applications which might affect or be affected by the risk of flooding.

7.9 The Natural Environment

The Water Resources Act 1991 sets out our responsibilities and powers in respect of the natural environment. We have a duty when exercising all our functions to promote and further the conservation of flora and fauna. In formulating our proposals or considering proposals from other parties, we 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 our work or consent is likely to impact on the sites above.

The Environment Act 1995 reiterates these points stating that we have "a duty ... generally to promote, the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and the land associated with such waters, [and] the conservation of flora and fauna which are dependent on an aquatic environment."

The Habitat Directive and Regulations

The Habitats Regulations 1994 are the instrument by which the EU Habitats Directive 1992 is implemented. The Regulations effectively amend all previous legislation so that all local and national competent authorities are obliged to exercise their functions to meet the requirements of the Directive in relation to marine Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) under the Birds Directive.

The requirements of the Directive can be summarised as:

- Requiring that sites are managed to contribute the maintaining or restoring the favourable conservation status of their habitats or species.
- Avoiding the deterioration of habitats, habitats of species or disturbance of species for which the site is designated.
- Plans or projects inside or outside SACs which are not necessary for the management of the site and likely to have a significant effect on the conservation status of the sites features shall be subject to an appropriate assessment and only proceed if they will not adversely affect the conservation features of the site and there are no alternative solutions. Activities affecting the site shall be subject to appropriate management.
- Competent Authorities are required to use their powers to ensure the protection of the site and review all outstanding planning permissions or consents in this light.
- A programme of monitoring will be undertaken at each site to ascertain the condition of the conservation features and assess the effectiveness of management measures.

The Regulations also state that management schemes may be established for marine SACs. They also imply that Relevant Authorities should work together, ideally within a management group to develop a single scheme. The Regulations also give the powers to Ministers to direct Relevant Authorities in the production of the scheme.

The implication of this Directive for ourselves is that we shall be obliged to review all our consents and permissions because of their potential impacts upon the Humber Estuary and the Wash.

7.10 Commercial Fisheries

The Salmon and Freshwater Fisheries Act 1975 (Section 25) sets out responsibilities for the regulation of commercial fishing for eels, salmon and migratory trout in all waters.

The licensing of commercial fish farming in Britain is undertaken by MAFF who regulate the movement of fish and eggs onto or off the farm premises. Our consent is required to release fish into any river or still water that is not a MAFF registered fish farm.

Commercial eel fishing upstream of tidal demarcations is regulated by a system of licensing. It may only be conducted with the permission of the owner or controller of the fishing rights, and in accordance with the *Anglian Region Fisheries Byelaws*. Seawards of the demarcation points, eel fishing is excused from licence duties and is effectively free of any constraints or regulations.

7.11 Recreational Fisheries

The Water Resources Act 1991, and in other National and European Community (EC) legislation sets out our responsibilities for recreational fisheries. Under this legislation we have a general duty to maintain, improve and develop salmon, trout, freshwater fish and eel fisheries under our jurisdiction and a more general duty to further the conservation of flora and fauna, which is important for bank-side and in stream habitats.

Under *the Salmon and Freshwater Fisheries Act 1975 and Byelaws* we have a duty to regulate the taking of salmon, trout, freshwater fish and eels by rod and line for recreational (or commercial) purposes, by means of a system of licensing. We also have powers to help ensure the unobstructed migration of salmon and sea trout between the sea and their spawning grounds. These include the power to require the construction of fish passes on weirs or other dams.

The Agency must notify the Ministry of Agriculture, Fisheries and Food (MAFF) of occurrences of fish disease in waters other than fish farms, and have the power to remove dead or dying fish from waters (other than fish farms). Our consent is required for the introduction of fish or spawn into any waters other than fish farms.

Freshwater anglers require permission to fish from the owner or controller of the fishing rights on watercourses. Angling for brackish or salt water species in estuaries and coastal waters is not regulated by licensing or other means, although certain byelaws enacted by various statutory bodies can impinge on its conduct. Netting or trapping does require a licence. There is a public right to fish in virtually all tidal waters, which was established by *Magna Carta.*

7.12 Landscape and Heritage

The principle legislation affecting monuments in England is contained in the *Ancient Monuments and Archaeological Areas Act 1979*, which was subsequently amended by the *National Heritage Act 1983.* Scheduled Ancient Monuments are designated by the Department of National Heritage on advice from English Heritage development and hence afforded statutory protection through the planning process.

Under the 1995 Environment Act we have, in all our work a duty to "further the conservation and enhancement of natural beauty and geological or physiological features of special interest"

7.13 Recreation and Amenity

Under the Water Resources Act 1991 our statutory duties are set out to include:

- to take account of recreation in the performance of our functions in terms of preserving and maintaining access for the public to places of natural beauty and to buildings of historical interest;

- to ensure that water and land under our ownership is made available for recreational purposes (taking into account the needs of persons who are chronically sick or disabled).

We are also able to make byelaws to regulate or prohibit boating and recreational activity on land and waters that it owns or manages and also on inland water where a right of navigation exists but where there is no controlling authority.

7.14 Radioactive Substances

The Radioactive Substances Act 1993 (RAS93) sets out the legislation with respect to radioactive substances. We have a duty that requires regulatory assessment of radioactive substances. This controls the keeping, use and disposal of radioactive substances. We are also the body currently charged with regulating such uses and with the keeping, use and disposal of radioactive substances and in particular the regulation of radioactive waste.

We implement (RAS93) by issuing registrations to keep and use radioactive materials and authorisation for accumulation and disposal of radioactive waste. In the context of radioactivity, the guiding principle in minimising risk from exposure to radioactivity is to ensure the levels of activity used are "as low as reasonably achievable (ALARA)" and the use is justified in relation to the benefit conferred. Because radioactivity can be measured accurately in very low concentrations, the standards to be achieved are high.

For nuclear sites there are direct consultations with the Nuclear Installation Inspectorate (NII) and the Ministry of Agriculture, Fisheries and Food (MAFF). We work closely with NII to ensure that Government policy objectives for radioactive waste management are achieved. NII use their powers to prevent construction or modification that would not satisfy our requirements. We consult both MAFF and NII when setting authorisations so that these take account of implications arising from the increased storage of nuclear waste on-site.

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APPENDIX 1

THE GENERAL QUALITY ASSESSMENT SCHEME (GQA)

The GQA scheme replaces the National Water Council (NWC) scheme and is used to make periodic assessments of the quality of water in the Catchment and enables us to report changes over time.

Chemical quality, of course, is not the only indicator of water quality. In the future, GQA assessments will also be made on the biological, aesthetic and nutrient status of such waters. We refer to these different aspects as 'windows' because each offers a different perspective on the overall health of the river.

Criteria for deciding which watercourses to include for GQA monitoring include river flow, position of tributaries and the presence of major discharges.

Chemistry GQA

The Chemistry Window has already been produced and comprises six water quality grades:

A	}	Good
B		
C	}	Fair
D		
E		Poor
F		Bad

The chemical scheme - to provide continuity with previous schemes - is based on Biochemical Oxygen Demand and ammonia.

Table 1.1: General Water Quality Assessment: Chemical Grading for Rivers and Canals

Water Quality	Grade	Dissolved Oxygen	Biochemical Oxygen Demand (ATU*)	Ammonia
		(% saturation) 10 percentile	(mg/l) 90 percentile	(mg H/l) 90 percentile
Good	A	80	2.5	0.25
	B	70	4	0.6
Fair	C	60	6	1.3
	D	50	8	2.5
Poor	E	20	15	9.0
Bad	F**	-	-	-

* as suppressed by adding allyl thio-urea

** ie quality which does not meet the requirements of grade E in respect of one or more determinands

Chemical samples are taken on a monthly basis, at intervals of about 5 to 8 km on all classified stretches. Retrospective river quality assessments using the GQA scheme have been made based on measurements taken since 1988.

Biology GQA

Some invertebrates are more susceptible to pollution than others and so the presence of such sensitive species is a sign that water quality is good. Each biological sample is given a score according to the number and type of invertebrates present. This is known as the Biological Monitoring Working Party (BMWP) score. It assigns points to each taxon according to its sensitivity to pollution. For example, many mayfly nymphs and caddis larvae score ten points, water beetles score five, molluscs three and worms one. The BMWP score is then divided by the number of scoring taxa to give the Average Score Per Taxon (ASPT). This gives an indication of the contribution made by each to the total. The higher these two scores, the cleaner the water.

However, rivers vary in their size, flow and in the background geology and topography. This means that the life found in rivers varies even when pollution is absent. It is useful, therefore, to describe the biology in terms of a shortfall from that expected under conditions of natural water quality. Damage to the biota can be assessed by comparing the actual biology with the biology predicted for natural conditions of water quality.

The DoE (now DETR)funded the development of a mathematical model that predicts the macroinvertebrates which should be found in a clean river. The model is called RIVPACS, an acronym for River Invertebrate Prediction and Classification System. RIVPACS was developed by the Institute of Freshwater Ecology.

If the BMWP predicted by RIVPACS is higher than the observed BMWP value the results suggest that some form of pollution has occurred. RIVPACS has been used to develop a Biological GQA classification scheme.

Although a GQA equivalent biological survey has been carried out every five years since 1970, a new system of biological quality classification was developed for the 1995 GQA survey, so that in 1995, for the first time, the annual biological survey formally formed part of the General Quality Assessment (GQA) of the waters of England and Wales.

A site is placed in one of six classes, a to f. The classes are assigned on the basis of the ratio of observed and predicted ASPT and Number of Taxa, and provides a general statement as to the biological quality of rivers. Table 1.2 illustrates this.

Table 1.2: Biological GQA Classification

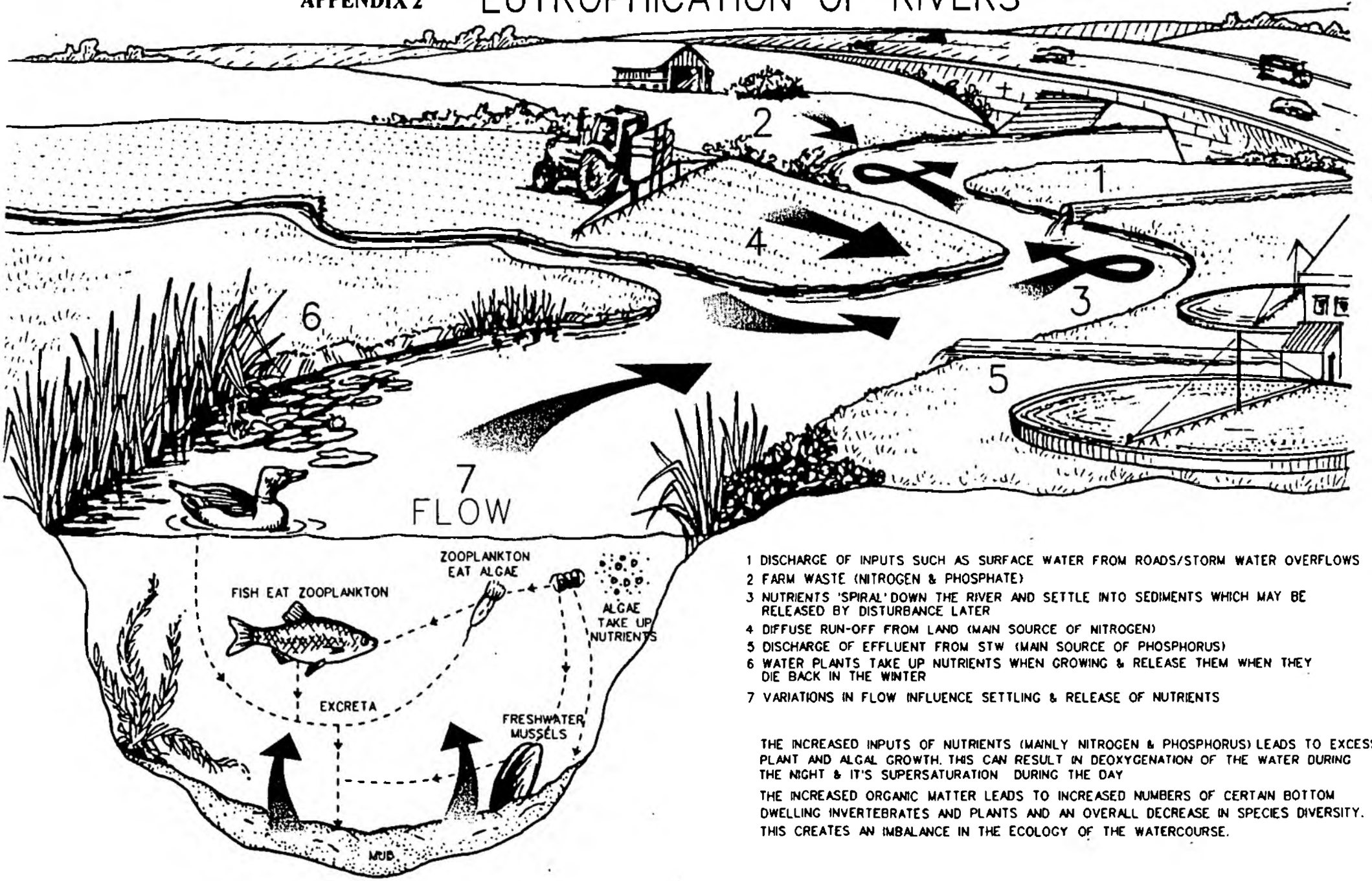
Biological GQA Classification			
Biological Class		Ratio ASPT	Ratio Taxa
a	Excellent	> 1.0	> 0.85
b	Good	0.90	0.70
c	Moderate	0.77	0.55
d	Fair	0.65	0.45
e	Poor	0.50	0.30
f	Bad	<0.50	<0.30

Nutrient & Aesthetic GQA

Formal schemes to implement both nutrient and aesthetic GQA components of the GQA are currently being developed. Further details are available in an Environment Agency R & D Report entitled Development and Testing of General Quality Assessment Schemes.

APPENDIX 2

EUTROPHICATION OF RIVERS



DECOMPOSITION & DISTURBANCE (EG DREDGING & FLOODS) OF MUD RELEASES PHOSPHORUS

1 DISCHARGE OF INPUTS SUCH AS SURFACE WATER FROM ROADS/STORM WATER OVERFLOWS
2 FARM WASTE (NITROGEN & PHOSPHATE)
3 NUTRIENTS 'SPIRAL' DOWN THE RIVER AND SETTLE INTO SEDIMENTS WHICH MAY BE RELEASED BY DISTURBANCE LATER
4 DIFFUSE RUN-OFF FROM LAND (MAIN SOURCE OF NITROGEN)
5 DISCHARGE OF EFFLUENT FROM STW (MAIN SOURCE OF PHOSPHORUS)
6 WATER PLANTS TAKE UP NUTRIENTS WHEN GROWING & RELEASE THEM WHEN THEY DIE BACK IN THE WINTER
7 VARIATIONS IN FLOW INFLUENCE SETTLING & RELEASE OF NUTRIENTS

THE INCREASED INPUTS OF NUTRIENTS (MAINLY NITROGEN & PHOSPHORUS) LEADS TO EXCESSIVE PLANT AND ALGAL GROWTH. THIS CAN RESULT IN DEOXYGENATION OF THE WATER DURING THE NIGHT & IT'S SUPERSATURATION DURING THE DAY

THE INCREASED ORGANIC MATTER LEADS TO INCREASED NUMBERS OF CERTAIN BOTTOM DWELLING INVERTEBRATES AND PLANTS AND AN OVERALL DECREASE IN SPECIES DIVERSITY. THIS CREATES AN IMBALANCE IN THE ECOLOGY OF THE WATERCOURSE.

APPENDIX 3

SETTING SHORT-TERM OBJECTIVES

In preparation for SWQOs, for some river stretches in our Consultation Document long-term objectives are supplemented by short-term objectives which reflect the financial constraints upon the water industry and others, and which recognise that not all improvements can realistically be achieved within the timescale of this Plan or perhaps not even within the next 10-20 years.

Short-term objectives recognise that since we assess compliance using three years data, it may take a number of years for affected stretches to become compliant.

Targets may also be set for issues such as: -

- where there is a difficult problem to solve and there are no quick or immediate answers eg. eutrophication ;

- where watercourses suffer due to low flows/drought conditions;

In these cases we are proposing interim targets that are less stringent than the long-term target. Where these two-tiered targets are proposed, wherever possible future investment to secure compliance and/or further investigation should be viewed as a priority.

Long-term targets will continue to form the basis for water quality planning, including the setting of consent criteria for discharges.

Tables 6.1 and 6.2 in Appendix 6 provide full details of the Agency's proposals for long-term and interim RE objectives for all classified and non-classified stretches within the catchment (non-Classified stretches are those which are biologically but not chemically monitored).

APPENDIX 4

IMPROVEMENTS PLANNED BY AWS

Second Asset Management Plan - AMP2

During 1994, the Director General of Water Services (OFWAT) set charges for the ten years 1995-2004. There will be an interim review in 1999. AWS reviewed its Asset Management Plan for these years (AMP2). AMP2 included work for environmental improvements as agreed between the NRA (now Environment Agency) and AWS.

In our discussions with AWS, we identified our requirements for sewage treatment works (STWs) and intermittent discharge. Agreed investment in this Plan area is outlined below.

STWs

Investigations are ongoing at several STWs to establish exactly what investment will be required to meet the requirements of the UWWTD. The Agency will continue to liaise with AWS on this. To date the only firm investment obligation is to ensure compliance with UWWTD phosphate limits at Louth STW by the end of 1998.

WTWs

Provision was included in AMP2 to make improvements to the emergency discharge and ensure compliance with legal Consents to Discharge at Covenham and Driby WTWs.

Intermittent Discharges

Several discharges were identified for improvement during AMP2 negotiations. Summary details are shown below.

Planned Improvement	**Discharges**
1995-2000	Louth CSOs (see Issue 4d)

Following the development of AMP2 the Agency has continued to liaise with AWS over priorities for investment.

Customer Related Environment Enhancement Programmes (CREEP1 & CREEP2)

In 1995 AWS announced that £5m would be spent on environmental improvement schemes (CREEP1) aimed at improving SWSs and the performance of smaller STWs. The Agency has been involved in the prioritisation of these programmes.

Schemes included in these programmes, in the Plan area, are summarised on the next page.

Programme	Activity/Discharge
CREEP1 - STWs	Saltfleet STW

In 1996 a further programme of investment, CREEP2, was announced by AWS. The provision of a bird scrape at Newton Marsh STW was included.

APPENDIX 5

CHEMICAL STANDARDS FOR RIVER ECOSYSTEM CLASSIFICATIONS

(1) Class	(2) Dissolved Oxygen % saturation 10 %ile	(3) BOD (ATU) mg/l 90 %ile	(4) Total Ammonia mg N/l 95 %ile	(5) Un-ionised Ammonia mg N/l 95 %ile	(6) pH lower limit as 5 %ile; upper limit as 95 %ile	(7) Hardness mg/l $CaCO_3$	(8) Dissolved Copper µg/l 95 %ile	(9) Total Zinc µg/l 95 %ile	Class Description
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Water of very good quality suitable for all fish species
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Water of good quality suitable for all fish species
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 700 1000 2000	Water of fair quality suitable for high class coarse fish populations
RE4	50	8.0	2.5	-	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 700 1000 2000	Water of fair quality suitable for coarse fish populations
RE5	20	15.0	9.0	-	-	-	-	-	Water of poor quality which is likely to limit coarse fish populations

APPENDIX 6

SETTING LONG-TERM OBJECTIVES

Anglian Region inherited two different systems for setting river quality objectives. One was based on the National Water Council (NWC) classificationand the second was based on regionally derived use-related classes, which included salmonid and coarse fisheries and various types of amenity use. The majority of these objectives were consulted upon locally and set in the late 1970s/early 1980s.

To provide for a smooth transition to the new RE system the Agency has developed a protocol to merge both of these systems using a process of neutral translation. This relates the threshold standards for the relevant determinands in the new and old schemes.

The long-term quality objectives presented in this consultation report are largely derived from this neutral translation. However, for a limited number of stretches a review of historic data and an evaluation of both the chemical and biological characteristics of the river, indicates that the historic long-term objectives did not reflect the natural characteristics/land use in the vicinity of the river and/or these characteristics have changed over time.

Tables 6.1 and 6.2 provide full details of the Agency's proposals for long-term and interim RE objectives for all classified and non-classified stretches within the Plan area.

Table 6.1: Proposed WQOs for the Louth Coastal LEAP area - classified stretches

PROPOSED WQOs FOR THE LOUTH COASTAL CATCHMENT - CLASSIFIED STRETCHES

SI = Spray Irrigation, LW = Livestock Watering, PWS(I) = Public Water Supply (Indirect)

* Shaded entries indicate that short-term targets have been proposed

Compliance has not been assessed for entries in italics as our review of stretches and sample points has resulted in the need for new sample points. Once data has been collected we will be able to assess whether their is a need for short-term targets and associated investigations.

Watercourse	Stretch	Long-term RE target (Short-term RE target)*	Additional (locally derived) RQO's
WAITHE BK	HATCLIFFE HSE...BRATTON HSE FM	RE2	SI LW
WAITHE BK	BRATTON HSE FM...TETNEY BLOW WELLS	RE2 (RE3)	SI LW
WAITHE BK	TETNEY BLOW WELLS...TETNEY LOCK	RE2 (RE3)	SI LW
LUD	TATHWELL SPR...B1200 ROADBRIDGE	RE2	SI LW
LUD/LOUTH CANAL	*B1200 ROADBRIDGE...RIVERHEAD GAUGING STATION*	*RE2*	*SI LW*
LOUTH CANAL	RIVERHEAD GAUGING STATION...LOUTH STW	RE3	SI LW
LOUTH CANAL	LOUTH STW...ALVINGHAM FOOTBRIDGE	RE3 (RE4)	LW
LOUTH CANAL	ALVINGHAM FOOTBRIDGE...AUSTIN FEN	RE3	PWS(I)
LOUTH CANAL	AUSTIN FEN...FIREBEACON BRIDGE	RE3	SI LW
LOUTH CANAL	FIREBEACON BRIDGE...THORESBY BRIDGE	RE3	SI LW
LOUTH CANAL	THORESBY BRIDGE...TETNEY LOCK	RE3	SI LW

Watercourse	Stretch	Long-term RE target (Short-term RE target)*	Additional (locally derived) RQO's
GT EAU	CLAYTHORPE MILL BRIDGE...A157 ROADBRIDGE WITHERN	RE2	SI LW
GT EAU	*A157 ROADBRIDGE WITHERN...LONG EAU*	*RE2*	*SI LW*
GT EAU	LONG EAU...CLOVES BRIDGE	RE2 (RE3)	PWS(I) SI LW
LONG EAU	*LITTLE CAWTHORPE...LITTLE CARLTON ROADBRIDGE*	*RE2*	*SI LW*
LONG EAU	LITTLE CARLTON ROADBRIDGE...GREAT EAU	RE3 (RE4)	SI LW
WOLD GRIFT DRAIN	*HEADWATERS...ALFORD GAUGING STATION*	*RE3*	*SI LW*
WOLD GRIFT DRAIN	ALFORD GAUGING STATION...MABLETHORPE STW	RE3 (RE4)	SI LW
WOLD GRIFT DRAIN	MABLETHORPE STW..SEA OUTFALL	RE3 (RE4)	LW
ORBY DRAIN	MARSH HOUSE FARM ROADRIDGE...WILLOUGHBY HIGH DRAIN	RE3	SI LW
WILLOUGHBY HIGH DRAIN	CLAXBY...CHAPEL ST LEAONARDS SEA OUTFALL	RE3	SI LW
LYMN/STEEPING	HEADWATERS...NORTHORPE FARM BRIDGE	RE2	SI LW
LYMN/STEEPING	NORTHORPE FARM BRIDGE...HAVEN HOUSE SLUICE	RE2 (RE3)	SI LW

Table 6.2: Proposed WQOs for the Louth Coastal LEAP area - NON-CLASSIFIED STRETCHES

Although these stretches are non-classified, and therefore will not have RE targets set on a statutory basis, for waterquality management purposes the Agency intends to consult on proposals for RE targets.

SI = Spray Irrigation, LW = Livestock Watering, PWS(I) = Public Water Supply (Indirect)

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs*
Thoresway Beck	Thoresway...Waithe Beck	RE2	LW
Orford Beck	Kirmond Le Mire...Waithe Beck	RE2	
North Thoresby Beck	N Thoreseby STW...Blackleg Drn	RE5	LW
Blackleg Drain	Ross Foods STW...New Dike	RE5	
New Dike	blackleg Drain...Louth Canal	RE3	SI
Old Fleet Drain	North Coates STW...Louth Canal	RE5	LW
Louth Canal	Tetney Lock...Tidal Sluice	RE3	
Humberston Beck	Holton Le Clay...O/F to Louth Canal	RE4	LW
Seven Towns Drain	N Somercotes...O/F to Sea	RE4	LW
The Cut/Sykes Drain	Manby STW...Greyfleet Drain	RE5	
Greyfleet Drain	Sykes Drain....O/F to Sea	RE4	

Watercourse	Stretch	Long-term RE target	Additional (locally derived) use-related RQOs*
Ketsby Beck	Headwaters...Gt Eau	RE2	
Trusthorpe Pump Drain	Axletree Hum...O/F to Sea	RE4	
Boygrift Drain	Headwaters...Sea	RE3	SI LW
Anderby Main Drain	Cumberworth...Gowt Bridge PS	RE3	
Willoughby High Drain	Orby Drn...Sea PS	RE3	
Ingoldmells Main Drain	Addlethorpe...Sea	RE3	LW
Wainfleet Drain/Well	Wainfleet...Thorpe Culvert	RE4	LW
Wainfleet Relief Channel	Thorpe Culvert PS...White House Farm	RE4	SI LW
Steeping Relief	Clough Hse...Gibraltar Point	RE3	
Cowbank Drain	Skegness...Wainfleet Haven	RE4	SI LW

APPENDIX 7

DANGEROUS SUBSTANCES WITH STATUTORY STANDARDS

List I substances are regarded as particularly dangerous because of their toxicity, persistence and bioaccumulation. Pollution of the water environment by List I substances must be eliminated. The EC lays down standards for these substances. List II substances are less dangerous, but may still have a deleterious effect on the aquatic environment. Pollution by List II substances must be reduced. The EC Member States set standards for these in national law.

Red List substances, like those in Lists I and II are dangerous because of their toxicity, persistence and bioaccumulation. The Government agreed to reduce the input loads of Dangerous Substances to the North Sea by 50% by 1995 (using 1988 as a baseline).

Table 7.1: Dangerous Substances List

	LIST I	LIST II	RED LIST
METALS			
Mercury (Hg)	••••		••••(1)
Cadmium (Cd)	••••		••••(1)
Copper (Cu)		••••	
Zinc (Zn)		••••	
Lead (Pb)		••••	
Tributyltin (TBT)			••••
Triphenyltin (TPT)			••••
Organotins		••••	
Chromium (Cr)		••••	
Nickel (Ni)		••••	
Arsenic (As)		••••	
Boron (B)		••••	••••
Vanadium (V)		••••	
PCBs			••••
PESTICIDES & ORGANOCHLORINES			
Hexachlorocyclohexane	••••		
Gamma-HCH (Lindane)			••••
DDT	••••		••••
Aldrin	••••		••••
Dieldrin	••••		••••
Endrin	••••		••••
Isodrin	••••		
Trifluralin			••••
Trichlorobenzene	••••		••••
Trichloroethylene	••••		
Tetrachloroethylene	••••		
Hexachlorobenzene	••••		••••
Hexachlorobutadiene	••••		••••
Carbon Tetrachloride	••••		
Chloroform	••••		
Endosulfan			••••
Dichlorvos			••••
Fenitrothion			••••
Malathion			••••
Azinphos-methyl			••••
Atrazine			••••
Simazine	••••		••••
Pentachlorophenol	••••		••••
1,2 Dichloroethane			••••
Mothproofing Agents		••••	
pH		••••	

APPENDIX 8

FRESHWATER FISH DIRECTIVE 78/659/EEC, MANDATORY STANDARDS

Parameter	Salmonid Imperative Standard	Cyprinid Imperative Standard	Notes
Dissolved Oxygen (mg/l O_2)	≥ 9	≥ 7	50% of samples must meet this standard.
	≥ 6	≥ 4	Absolute minimum
pH[1]	6-9[3]	6-9[3]	Derogations allowed in naturally acidic waters
Un-ionised ammonia (mg/l NH_3)	≤ 0.025	≤ 0.025	Calculated from temperature, total ammonia and pH
Total ammonium[2] (mg/l NH_4)	≤ 1	≤ 1	Relaxed standard of 3mg/l can be applied where there is good evidence of healthy fish populations
Total Zinc (mg/l Zn) Water Hardness (mg/l $CaCO_3$)			Derogation allowed in areas of high mineralisation, natural enrichment or abandoned mines
≤ 10	≤ 0.03	≤ 0.3	
> 10 and ≤ 50	≤ 0.2	≤ 0.7	
> 50 and ≤ 100	≤ 0.3	≤ 1.0	
>100	≤ 0.5	≤ 2.0	
Temperature at thermal discharges (°C)	≤ 1.5	≤ 3	Temperature change
	≤ 21.5[3]	≤ 28[3]	Maximum absolute limit
	≤ 10[3]	≤ 10[3]	Maximum during breeding periods if cold water needed for reproduction for certain species of fish
Total residual chlorine (mg/l HOCl)	≤ 0.005	≤ 0.005	A suitable test is not yet available for this parameter

1 Artificial pH variations with respect to the unaffected values shall not exceed ±0.5 of a pH unit within the limits falling between 6.0 and 9.0 provided that these variations do not increase the harmfullness of other substances present in the water.

2 In particular geographical or climatic conditions and particularly in cases of low water temperature and of reduced nitrification or where the competent authority can prove that there are no harmful consequences for the balanced development of fish population, Member states may fix values higher than 1 mg/l.

3 Derogation possible in accordance with Article 11.

APPENDIX 9

Water Quality Monitoring Undertaken for the *EC Bathing Water Directive*

Microbiological
Total coliforms (/100ml)
Faecal coliforms (/100ml)
Faecal streptococci (/100ml)
Salmonella /1 litre
Entero viruses (PFU/10 litres)
Physio-chemical
pH
Colour
Mineral oils (mg/litre)
Surface-active substances reacting with methylene blue (mg/litre)
Phenols (mg/litre)
Transparency (m)
Dissolved oxygen (% saturation O_2)
Tarry residues and floating materials etc.
Ammonia (mg/litre NH_4)
Nitrogen Kjeldahl (mg/litre N)
Other substances regarded as indicators of pollution
Pesticides (mg/litre)
Heavy metals (mg/litre)
Cyanides (mg/litre)
Nitrates and phosphates (mg/litre)

APPENDIX 9A

European Blue Flag Scheme

The European Blue Flag Scheme is organised by the Federation of Environmental Education in Europe (FEEE). In 1995 it continued to be administered in the UK by the Tidy Britain Group (TBG), a registered charity and an independent voluntary body, part-funded by the Department of the Environment, Transport and the Regions. European Blue Flags are awarded to high quality EC identified bathing beaches which meet the water quality and land-based requirements of the award scheme. Beaches are only considered for an award if an application (by a relevant local authority or other interested party) is made, and should any criterion of the award scheme no longer be met during the bathing season, then the Blue Flag has to be removed.

Water quality is judged on the results of the analyses of samples taken throughout the previous bathing season.

Seaside Award Scheme

The Seaside Award scheme was introduced in 1992 and is also administered by the TBG. It is intended to complement the European Blue Flag Awards and aims to recognise beaches which attain high standards of facilities and management, beach cleanliness, and water quality. Again, water quality is judged on the results of the analyses of samples taken throughout the previous bathing season.

APPENDIX 10

MARGINAL FAILURES AGAINST LONG-TERM REC

The following stretches all have marginal dissolved oxygen failure. This is associated with low flows/drought conditions.

Waithe Beck, Bratton House Farm...Tetney Blow Wells
Waithe Beck, Tetney Blow Wells...Tetney Lock
Long Eau, Little Carlton Rd Br...Great Eau
Great Eau, Long Eau...Cloves Bridge
Wold Grift Drain, Alford Gauging Stn...Mablethorpe STW
Wold Grift Drain, Mablethorpe STW...Sea Outfall

The following stretch fails for BOD, dissolved oxygen and pH. These failures are thought to be associated with eutrophication (see Issue 4c).

R Lymn/Steeping R, Northorpe Farm Bridge...Haven House

APPENDIX 11

SSSI Name (Oher Designations)

Bratoft Meadow (CWS)
Calceby Marsh (AONB, NR)
Candlesby Hill (AONB, NR)
Claxby Chalk Pit (AONB, NR, SM)
Dalby Hill (AONB)
Gibraltar Point (RAMSAR, SPA, NR, SAC)
Harrington Hall Sandpit
High Barn, Oxcombe
Hoplands Wood (NR, SM)
Mavis Enderby Valley
Muckton Wood
North Lincolnshire Coast (CWS)
Saltfleetby - Theddlethorpe Dunes
Sea Bank Clay Pits (NR)
Skendleby Psalter Banks (NR)
Swaby Valley (NR)
Tetford Wood
Tetney Blow Wells
Welton-Le-Wold Old Gravel Pits
Willoughby Meadow
Willoughby Wood
Winceby Rectory Pit (NR)

Key: Other Designations

ANOB	Area Of Outstanding Natural Beauty
CWS	County Wildlife Site
SPA	Special Protection Area
NR	Nature Reserve
SAC	Special Area Of Conservation
SM	Scheduled Monument

APPENDIX 12

FISHERIES CLASSIFICATION SYSTEM

Fish population surveys are normally undertaken on a 3 year rolling programme which covers the principal rivers/drains in the Area.

The data collected has been used to calculate the following classification systems, which are part of a national fisheries classification system. This system will enable fisheries throughout England and Wales to be compared in a standard way, taking into account broad habitat types.

Biomass and density classification

Absolute

This system compares coarse fish abundance in terms of a g/100m² for the total coarse fish population. For salmonid species abundance is gauged in terms of No. 100m².

Figure 1

The class or grades are:

	Coarse species		**Salmonid species**	
		g.100m²		No. 100m⁻²
	A		A	
		3291 or 33 gm⁻²		62
	B		B	
		1935 or 19.4gm⁻²		43
	C		C	
		1029 or 10.3 gm⁻²		31
	D		D	
		371 or 3.7 gm⁻²		18
	E		E	
		0		0
	F		F	
		No coarse fish caught		No salmonid fish caught

Relative

This system uses the biomass data for coarse fish without eels. Consideration of the river gradient and width zone means that fish abundance is compared at the site to be classified with all other sites in the same broad habitat.

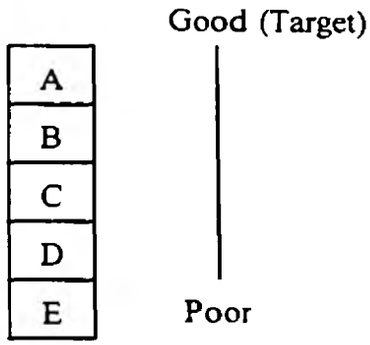
An example is shown below:-

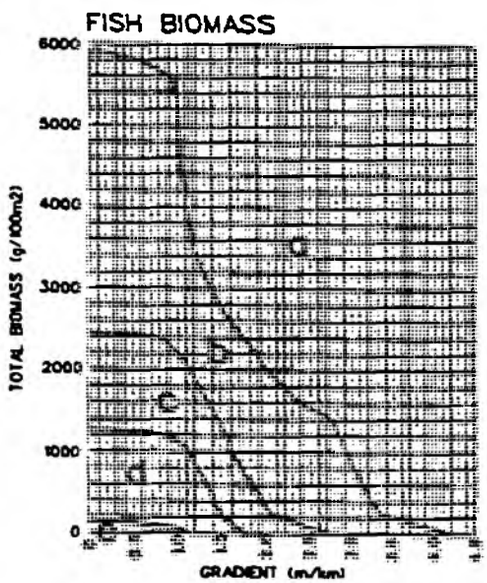
Data:	Width	4.2 metres
	Gradient	1.5m km
	Total biomass	2000 g/100m²

From Figure 1, this means CLASS B status is achieved.

The advantage of the relative system is that it includes information on river features and natural bias in the data. For example, an upland stream would not be expected to achieve a biomass much greater than 1000 g/100m² whereas a large lowland river system would be expected to achieve a biomass greater than 3000 g/100m².

The classes described by this scheme are:-





Species Richness

Species richness refers to the total number of individual species occurring within the survey area. This is a relative measure as river gradient and width zone are taken into account.

Figure 2

River width is classified into 1 of 4 zones:

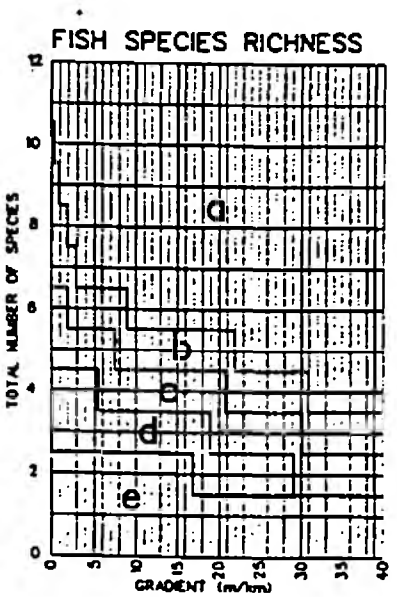
Zone 1	
	4m
Zone 2	
	6m
Zone 3	
	9m
Zone 4	

For example:

Data:	Width	30.m
	Gradient	10m.km
	Total number of species	6

From Figure 2 the species richness classification is A.

In a natural river system the lowland reaches would be expected to support a greater number of fish species than upland reaches. By incorporating river width and gradient into the 'species richness' classification this bias is largely removed.



GLOSSARY

Abstraction	The removal of water from any source, either permanently or temporarily, usually by pumping.
Abstraction Licence	A statutory document issued by the Environment Agency to permit removal of water from a source of supply. It can limit the quantity of water taken daily etc.
Agenda 21	A comprehensive programme of worldwide action to achieve a more sustainable pattern of development for the next century. UK Government adopted the declaration at the UN Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro in 1992.
Agrochemicals	Chemical substances used in agricultural production including fertilisers, herbicides, fungicides and insecticides.
Algal blooms	Rapid growth of phytoplankton in marine and freshwaters which may colour the water and may accumulate on the surface as a green scum. Decomposing dead cells consume large quantities of oxygen in the water which may result in the waters becoming anaerobic. Some blooms (such as certain species of blue-green algae) may produce poisons.
AMP (Asset Management Plans)	Means by which the water undertakers plan the work required and capital expenditure necessary for improvements and maintenance of the water supply, sewage treatment works and sewerage systems. AMPs are drawn up through consultation with the Environment Agency and other bodies to cover a five year period. AMPs have to be agreed by DoE and OFWAT.
Aquifer	A permeable geological stratum or formation that is capable of both storing and transmitting water in significant amounts.
Aquifer (Confined)	Where upper and lower layers are low permeability which confine the groundwater under greater than atmospheric pressure.
Aquifer (Unconfined)	Where the upper surface of a saturated zone forms a water table within the water-bearing stratum.
Augmentation	The addition of water by artificial input. (Usually to "top up" low flows in summer by either groundwater pumping or via reservoir release.)
Beach Recharge	The artificial creation or restoration of a beach by the use of imported material.
Benzene	A carcinogenic organic compound found in petrol and emitted mainly from car exhausts.
Bioaccumulation	The accumulation by living organisms of materials from their surroundings such that the concentrations of these materials in the organisms are higher than in the surrounding medium.
Biochemical Oxygen Demand (BOD)	A standard test which measures over 5 days the amount of oxygen taken up by aerobic bacteria to oxidise organic (and some inorganic) matter.
Biodegradable	Capable of being decomposed by bacteria or other biological means.
Bio-diversity	Diversity of biological life, the number of species present.
Blow-Well	Pond/lake formed by artesian waters bubbling to the surface.
Borehole	Generally a small diameter bored hole which is used to exploit an aquifer.

Bubble Curtain	A perforated pipe laid across the river and secured to the bed. Compressed air passes through the pipe such that bubbles form a 'curtain' in the water column. The curtain helps to prevent the passage of the heavier saline water from one side of the curtain to the other by a circulatory/mixing action.
Buffer Zone (strip)	Strip of land 10-100m wide, alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types.
Catchment	The total area from which a single river system collects surface run-off.
Chemical Oxygen Demand	A measure of the total amount of chemically oxidisable material present in liquid.
Coarse Fish	Freshwater fish other than salmon and trout.
Coastal Plain	Low-lying land adjacent to the coast.
Combined Sewer Overflow (CSO)	An overflow structure which permits a discharge from the sewerage system during wet weather conditions, and consists of both foul and surface water discharge.
Consent (Discharge)	A statutory document issued by the Environment Agency. It can authorise entry and indicate any limits and conditions on the discharge of an effluent to a Controlled Water. A land drainage consent is an approval for specified structural works in areas under Agency control.
Controlled Landfill	Where wastes are deposited in an orderly planned manner at a site licensed under the Control of Pollution Act 1974.
Controlled Waste	Industrial, household and commercial waste, as defined in UK legislation. Controlled waste specifically excludes mine and quarry waste, wastes from premises used for agriculture, some sewage sludge and radioactive waste.
Controlled Waters	All rivers, canals, lakes, groundwaters, estuaries and coastal waters to three nautical miles from the shore, including the bed and channel which may for the time being be dry.
Dangerous Substances	Substances defined by the European Commission as in need of special control. This is because they are toxic, accumulate and concentrate in plants and animals, or do not easily break down into less dangerous substances. They are classified as List I or List II.
Demand Management	Activities to manage the amount of water required from a source of supply; includes measures to control waste and/or to discourage use.
Derogate	Loss or impairment of a water resource, action causing such loss or impairment.
Development Plans	(Local Plans, Structure Plans) - Planning documentation which makes provision for the control of the use of land through structure plans, local plans and the grant or refusal of planning permission.
Diffuse Pollution	Pollution from widespread activities with no one discrete source. eg. acid rain, pesticides, urban run-off etc.
Dissolved Oxygen (DO)	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of the 'health' of the water. It is used to classify waters.
EC Bathing Beach	Beach which meets criteria defined by EC Directive concerning the quality of bathing waters.

Ecology	The study of relationships between an organism and its environment.
Ecosystem	A functioning, interacting system composed of one or more living organisms and their effective environment, in biological, chemical and physical sense.
Effluent	Liquid waste from Industry, agriculture or sewage treatment plants.
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.
Fish Pass	A device to permit fish to transverse structures within a river.
Flood Defences	Anything natural or artificial that protects against flooding, to a designed return period.
Flood Plain	This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood.
Flora	Plant life.
Fluvial	Relating to the freshwater river.
Fluvial Defence	Structure providing protection from flooding from rivers.
Fly Tipping	The illegal dumping of rubbish/material in places such as hedgerows, lay-bys, fields even on streets and in parks.
Forestry Authority (FA)	Advisory and Regulatory arm of the Forestry Commission.
Geomorphology	Scientific study of land forms and of the processes that formed them.
Gravity outfall	Discharge through a pipe or sluice with no pumping.
Groundwater	May refer to all subsurface water as distinct from surface water. Generally groundwater is considered to be that water which is below the zone of saturation and contained within porous soil or rock stratum (aquifer).
Groundwater Protection Zones	Identify the proximity of land to a groundwater source.
Habitat	The customary and characteristic dwelling place of a species or community.
Hydrogeology	The study of the occurrence and movement of groundwater and the interaction with geology.
Hydrology	The study of water on and below the earths surface.
Hydrometric	The measurement of water.
Impounded	The holding back of water behind a dam. Strictly a structure which raises water levels above their "normal" height. May need a licence and/or Land Drainage Consent from the Environment Agency.
In river needs	The requirement for an acceptable regime of river flows necessary to sustain legitimate 'in-river' uses, including biological requirements as well as human uses - such as navigation, power generation and amenity.
Internal Drainage Boards (IDBs)	Authorities responsible for dealing with land drainage within a district. They are primarily concerned with agricultural land drainage but also may be involved

	with water supply to their district for agricultural purposes.
Intertidal	Refers to the region of the shore which lies between the highest and lowest tides.
Integrated Pollution Control	A system of pollution control, administered by Her Majesty's Inspectorate of Pollution, that applies to the most potentially polluting or technologically complex industrial and other processes in UK. IPC deals with releases of all media (air, land and water) and uses the principles of BATNEEC and BPEO.
IPC Authorisation	An authorisation issued by Her Majesty's Inspectorate of Pollution prescribed by the Environmental Protection Act 1990 covering certain operation of processes .
Landfill	The engineered deposit of waste into or onto land in such a way that pollution or harm to the environment is minimized or prevented and, through restoration, to provide land which may be used for another purpose.
Leachate	Liquor formed by the act of leaching.
Local Agenda 21	At the Earth Summit in Rio de Janeiro in June 1992, world leaders signed a global environment and development action plan called Agenda 21. The majority of Agenda 21 cannot be delivered without the commitment and cooperation of local government. Each local authority is encouraged to adopt its individual Local Agenda 21 - its own sustainable development strategy at the local level, involving partnerships with other sectors, such as the Environment Agency, businesses, community and voluntary groups.
Macroinvertebrate	Animals without backbones eg leeches, snails worms, insects.
Main River	The watercourse shown on the statutory 'Main River maps' held by Environment Agency and MAFF. The Agency has permissive powers to carry out works of maintenance and improvement on these rivers.
Minimum Residual Flow (MRF)	Target flow set locally and not legally defined.
Mitigation	Refers to the environmental impact of scheme development or operation and the actions which may be taken to reduce or ameliorate such impacts.
Morphology	The form of the structure of plants and animals.
National Nature Reserve (NNR)	An area of national importance for nature conservation.
Nature Reserve	A tract of land managed to preserve its flora, fauna and physical features.
Nitrate Sensitive Areas (NSA)	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1980 EC Drinking Water Directive, and where voluntary, compensated agricultural measures were introduced in 1990 as a means of reducing those levels.
Nitrate Vulnerable Zone (NVZ)	An area where nitrate concentrations in sources of public drinking water exceed, or are at risk of exceeding the limit of 50 mg/l laid down in the 1991 EC Nitrate Directive, and where compulsory, un-compensated agricultural measures will be introduced from 1996 as a means of reducing those levels.
Nutrient	Substance providing nourishment for plants and animals eg nitrogen, phosphorus.
Organic	Generally any substance containing carbon as part of its chemical make-up.

Outfall	The point at which a river discharges to a downstream source eg estuary, sea; it may also include an outfall structure to prevent sea waters backing up the system.
Part A Process	Processes prescribed for Integrated Pollution Control (IPC). IPC regulates those processes with the greatest potential for serious pollution to the three environmental media. Part A processes are regulated by the Environment Agency.
Part B Process	Processes regulated under the local authority air pollution control system and are those with less serious potential to pollute.
Particulates	Fine solid particles found in the air or in emissions.
Pesticides	Substances used to kill pests, weeds, insects, fungi, rodents etc.
pH	A measure of the acidity or alkalinity of a liquid; a pH less than 7 is acidic, a pH greater than 7 is alkaline and a pH is neutral.
Potable Water	Water of a suitable quality for drinking.
Public Water Supply	The supply of water by companies appointed as Water Undertakers by the Secretary of State for the Environment under the Water Industry Act 1991.
Putrescible Waste	Solid waste which will produce leachate when chemically and or biologically degraded.
RAMSAR	Wetland site of International Importance that is designated under the Ramsar* convention (*a town in Iran where the international convention originally agreed in 1975 to stem the progressive encroachment on, and loss of, wetland).
Return Period	Refers to the frequency of a rainfall or flooding event. Flood events are described in terms of the frequency at which, on average, a certain severity of flow is exceeded. This frequency is usually expressed as a return period in years, eg. 1 in 50 years.
Riffle	A shallow area in a river where the substrate is composed of gravel and the flow is faster.
Riparian Owner	Owner of riverbank and/or land adjacent to a river. Normally owns riverbed and rights to midline of channel.
River Corridor	The continuous area of river, river banks and immediately adjacent land alongside a river and its tributaries.
River Habitat Survey (RHS)	An inventory survey of physical features of the river and adjacent habitat.
River Quality Objectives (RQO)	The level of water quality that a river should achieve, in order to be suitable for its agreed use. Is being replaced by Water Quality Objectives (WQO's).
Saline Intrusion	Salt water is heavier than freshwater and will therefore tend to sink to the bottom of a watercourse. Once salt water has entered a watercourse it is difficult to remove other than by flushing with high flows during floods. It can have profound effects on the ecology of a river.
Saltmarsh	Expanses of herbaceous plants in the supratidal zone.
Sewerage	System of sewers usually used to transport sewage to a sewage treatment works.

Site of Special Scientific Interest (SSSI)	A site given a statutory designation by English Nature or the Countryside Council for Wales because it is particularly important, on account of its nature conservation value.
Sludge	The accumulation of solids from treatment processes. Sludge can be incinerated or spread on farm land.
Sluice Gate	Structure to control upstream river levels and downstream flows.
Source Protection Zones	A Source Protection Zone (SPZ) is the area over which recharge is captured by an abstraction borehole. SPZs are designated by the Environment Agency and are delineated to protect potable water supplies against the polluting effects of human activity.
Spray Irrigation	The watering of crops by spraying. Can have a high impact on water resources.
Statutory Water Quality Objectives (SWQO)	Methods of classifying waters and targets for individual waters that have been given statutory force through the issue of Regulations by the Secretary of State under the Water Resources Act 1991.
Surface Water	Water collecting on and running off the surface of the ground.
Sustainable Development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Taxa	Groups of similarly classified animals and plants.
Telemetry	A means of directly collecting data from remote sites.
Tidal Floodplain	Land at risk to flooding from the sea in the event of overtopping or a breach of a sea or tidal defence.
Topography	Physical features of a geographical area.
Transfer Station	A place where refuse, collected from premises, is compacted into large containers and transported onward for disposal.
Urban run-off	Rainfall from towns and cities that is carried off by streams and rivers.
Washlands	Extensive semi-natural area of flood plain adjacent to a river, where water is stored in time of flood. Structures can be added to control the amount of water stored in the washland and time its release to alleviate peak flood flows in areas downstream.
Waste Minimisation	Reducing the quantity and/or hazard of waste produced.
Water Resource	The naturally replenished flow of recharge of water in rivers or aquifers.
Water Table	Top surface of the saturated zone within the aquifer.
Wetland	An area of low lying land where the water table is at or near the surface for most of the time, leading to characteristic habitats.
Winter Storage Reservoir	Reservoirs built by farmers to store water during the winter months when it is "plentiful" for re-use during the summer.

MANAGEMENT AND CONTACTS:

The Environment Agency delivers a service to its customers, with the emphasis on authority and accountability at the most local level possible. It aims to be cost-effective and efficient and to offer the best service and value for money.

Head Office is responsible for overall policy and relationships with national bodies including Government.

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The 24-hour emergency hotline number for reporting all environmental incidents relating to air, land and water.

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