

BEDFORD OUSE (LOWER REACHES) CATCHMENT MANAGEMENT PLAN CONSULTATION REPORT



NRA

*National Rivers Authority
Anglian Region*

April 1994

Bedford Ouse/Lower Reaches Catchment Management Plan

Consultation Report

FOREWORD

National Rivers Authority Information Centre Head Office Class No Accession No <u>AJZH</u>
--

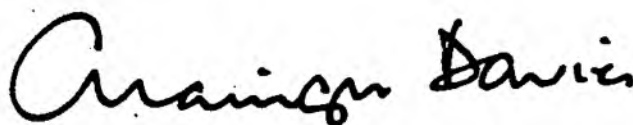
Established in 1989 the National Rivers Authority has as it's role the "Guardians of the Water Environment". As such it is committed to protecting and improving the water environment in its broadest sense. Establishing a sound planning base for the development of river catchments is essential to our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

Catchment management plans are a vehicle to achieve improvements in the water environment. By using public consultation they will allow input from others and provide commitment from all parties to achieving action in important issues.

Key issues in this plan are considered to be:

1. Restoration of degraded river habitat
2. Detailed consideration of the proposal to reduce the Offord Minimum Residual Flow
3. Safeguarding the floodplain from further encroachment by development
4. Blue green algae in Stewartby Lake and Grafham Water
5. Review of Flood Defence Standards of service

This is a further such Plan produced in the Anglian Region. I look forward to receiving comments from those interested, to produce a final Plan balancing the conflicting demands placed upon an integral feature of the Nation's Heritage.



Grainger Davies
Regional General Manager

THE NATIONAL RIVERS AUTHORITY

The NRA's mission:

"We will protect and improve the water environment by the effective management of water resources and by substantial reductions in pollution. We will aim to provide effective defence for people and property against flooding from rivers and the sea. In discharging our duties we will operate openly and balance the interests of all who benefit from and use rivers, groundwaters, estuaries and coastal waters. We will be businesslike, efficient and caring towards our employees".

Our aims are to:

- Achieve a continuing overall improvement in the quality of rivers, estuaries and coastal waters, through the control of pollution.
- Manage water resources to achieve the right balance between the needs of the environment and those of the abstractors.
- Provide effective defence for people and property against flooding from rivers and the sea.
- Provide adequate arrangements for flood forecasting and warning.
- Maintain, improve and develop fisheries.
- Develop the amenity and recreational potential of inland and coastal waters and associated lands.
- Conserve and enhance wildlife, landscape and archaeological features associated with inland and coastal waters of England and Wales.
- Improve and maintain inland waterways and their facilities for use by the public where the NRA is the navigation authority.
- Ensure that dischargers pay the costs of the consequences of their discharges, and, as far as possible, to recover the costs of water environment improvements from those who benefit.
- Improve public understanding of the water environment and the NRA's work.
- Improve efficiency in the exercise of the NRA's functions and to provide challenge and opportunity for employees and show concern for their welfare.

BEDFORD OUSE (LOWER REACHES) CATCHMENT MANAGEMENT PLAN

C O N T E N T S

FOREWORD

NRA MISSION STATEMENT

1. CATCHMENT MANAGEMENT PLAN CONCEPT AND PROCESS

2. CATCHMENT INTRODUCTION

- 2.1 Introduction**
- 2.2 Geology and Landscape**
- 2.3 Hydrology**
- 2.4 Water Quality and Fisheries**
- 2.5 Data Collection**
- 2.6 Key Details**

3. USES AND ACTIVITIES

- 3.1 Catchment Drainage - River Control Structures and Statutory Main River**
- 3.2 Catchment Drainage - Flooding and Flood Alleviation**
- 3.3 Development**
- 3.4 Surface Water Abstractions**
- 3.5 Groundwater Abstractions**
- 3.6 Effluent Disposal**
- 3.7 Waste Disposal**
- 3.8 Agricultural Abstraction**
- 3.9 Industrial Abstraction**
- 3.10 Raw Water Transfer**

- 3.11 Mineral Extraction**
- 3.12 Fisheries**
- 3.13 Angling and Commercial Eel Fishing**
- 3.14 Ecosystem, Conservation**
- 3.15 Conservation - Landscape and Archaeology**
- 3.16 Navigation**
- 3.17 Boating and Immersion Sports**
- 3.18 Recreation and Amenity**

4. OBJECTIVES

- 4.1 Surface Water Quality**
- 4.2 Groundwater Protection**
- 4.3 Water Quantity**
- 4.4 Environmental Features**
- 4.5 Flood Defence**
- 4.6 Development Control**

5. STATE OF CATCHMENT

- 5.1 Water Quality - Surface**
- 5.2 Water Quality - Groundwater**
- 5.3 Water Quantity**
- 5.4 Environmental Features**
- 5.5 Flood Defence**
- 5.6 Development Control**

6. CATCHMENT ISSUES AND OPTIONS

6.1 Water Quality - Surface Water

- 6.1.1 River Quality Objective Failures**
- 6.1.2 Ministry of Defence Bases**
- 6.1.3 Marston Vale Landfill Sites**
- 6.1.4 Eutrophication**
- 6.1.5 Blue Green Algae**

6.2 Water Quality - Groundwater

- 6.2.1 Nitrate Sensitive Areas**
- 6.2.2 Groundwater Contamination**

6.3 Water Resources

- 6.3.1 Future demand cannot be met from groundwater & summer surface water**
- 6.3.2 In River Needs**
- 6.3.3 Requirements for wetland and washland sites**
- 6.3.4 Re-evaluation of Groundwater Resources**
- 6.3.5 River Support**

6.4 Environmental Features

- 6.4.1 Fisheries**
- 6.4.2 Recreation**
- 6.4.3 Conservation**
- 6.4.4 Navigation**

6.5 Flood Defence

6.5.1 Capital Works

6.5.2 River Maintenance

6.5.3 Non-Main River Flooding

6.6 Development

6.6.1 Development Control

6.6.2 New roads and by-passes

6.7 Visionary Issues

6.7.1 Water Quality

6.7.2 Water Quantity

6.7.3 Environmental

6.7.4 Flood Defence

6.7.5 Development Control

LIST OF MAPS

Facing Page

1	CATCHMENT LOCATION MAP	1
2	INFRASTRUCTURE	5
3	LAND CLASSIFICATION	6
4	GEOLOGY - FLUVIAL GAUGING STATIONS	7
5	RAINFALL	8
6	BIOLOGICAL RIVER QUALITY SURVEY	9
7	WATER QUALITY (NWC CLASSES)	9
8	CONTROL STRUCTURES	14
9	FLOODING & FLOOD ALLEVIATION	16
10	POTABLE WATER SUPPLY	23
11	SEWAGE TREATMENT WORKS DISCHARGES	28
12	INDUSTRIAL TRADE DISCHARGES	29
13	WASTE DISPOSAL SITES	31
14	AGRICULTURAL ABSTRACTION	33
15	INDUSTRIAL ABSTRACTION	35
16	MINERAL EXTRACTIONS	39
17	PRESENT FISH BIOMASS	41
18	ANGLING	44
19	SITES OF SPECIAL SCIENTIFIC INTEREST (SSSI's)	46
20	COUNTY WILDLIFE SITES	48
21	ANCIENT MONUMENTS	50
22	NAVIGATION	52
23	BOATING & IMMERSION SPORTS	55
24	RECREATION & AMENITY	57
25	BASELINE FISHERIES ECOSYSTEM CLASSES	60
26	TARGET FISHERIES ECOSYSTEM CLASSES	Follows Map 25
27	GROUNDWATER VULNERABILITY	61
28	TARGET FISH BIOMASS	67
29	FLOOD DEFENCE - CATCHMENT OBJECTIVES	69
30	FISHERIES ECOSYSTEM CLASSES - SHORTFALLS	71
31	CONTAMINATED BOREHOLES	74
32	WATER QUANTITY - AVAILABILITY & ABSTRACTION LICENCE CONTROLS	75
33	FLOOD DEFENCE - STATE OF CATCHMENT	80
34	SHORTFALLS FISH BIOMASS	96
35	STATE OF CATCHMENT - PHYSICAL FEATURES	100



National Rivers Authority Anglian Region

NRA

Map 1

Bedford Ouse (Lower Reaches) Catchment Management Plan

- Regional Boundary
- Catchment Boundary
- Main River
- Main Towns



CATCHMENT MANAGEMENT PLANNING - CONCEPT AND PROCESS

1.1 The National Rivers Authority

The National Rivers Authority (NRA) is responsible for protecting and improving the water environment within England and Wales. It has a wide range of responsibilities which include:

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

To achieve this aim, the NRA must work with or seek to influence central government, local government, industry, commerce, farming, environmental organisations, riparian owners and the general public. Successful management of the water environment requires consideration of a wide range of interests and requirements which may sometimes be in conflict. The competing requirements and interests of users and beneficiaries must be balanced.

To assist in its work, the NRA has developed the concept of **Catchment Management Plans (CMP's)**. These allow the full range of water management issues to be identified and considered within a geographical area which is relevant and meaningful.

1.2 Scope and Process of Catchment Management Planning

The production of Catchment Management Plans within the NRA involves two stages:

- Catchment Management Plan Consultation Report and
- Catchment Management Final Plan

1.2.1 The Consultation Report includes the following sections:

- Uses and Activities

The uses of the catchment are identified and discussed. Information is normally presented in the form of a map with one or more pages of supporting text. Uses may have impacts on the water environment and/or impose requirements on the water environment. Wherever appropriate, objectives and targets are identified in terms of:

- water quality requirements
- water quantity requirements
- environmental features requirements

- Objectives

By taking the objectives and targets relevant to the area where each use takes place, overall objectives and targets for the catchment are derived. At any location it is the most stringent use related target which must be achieved.

- State of the catchment

The State of the catchment is assessed against the objectives and targets which apply. Areas where objectives are not met and issues which need to be addressed in order to meet objectives are identified.

- Issues and Options

The identified issues are discussed and where possible some options for their resolution are proposed. A tabulated summary of issues and options concludes this section. The organisation responsible and also some advantages and disadvantages of the suggested options are proposed.

The Catchment Management Consultation Plan is intended to form a basis for consultation between the NRA and all those with interests in the catchment. Consultees may wish to:

- raise additional issues not identified in the plan
- comment on the issues and options identified in the plan
- suggest alternative options for resolving identified issues

The NRA recognises that many of the options for action identified by the Consultation Plan will involve organisations or individuals other than the NRA and their views will be crucial to the preparation of the Final Plan.

1.2.2

The Final Plan will be produced following consultation and will have regard to the comments received. The Final Plan will form a basis for the NRA's actions within the catchment and also provide a public document which will form a framework for the NRA's interaction with other organisations. The NRA will be seeking commitment to planned actions by others wherever possible.

1.3

Limitations

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

Where improvement works are required to overcome catchment problems, these works will in many cases be the responsibility of other organisations or individuals. This Authority may have no powers to control the necessary actions directly.

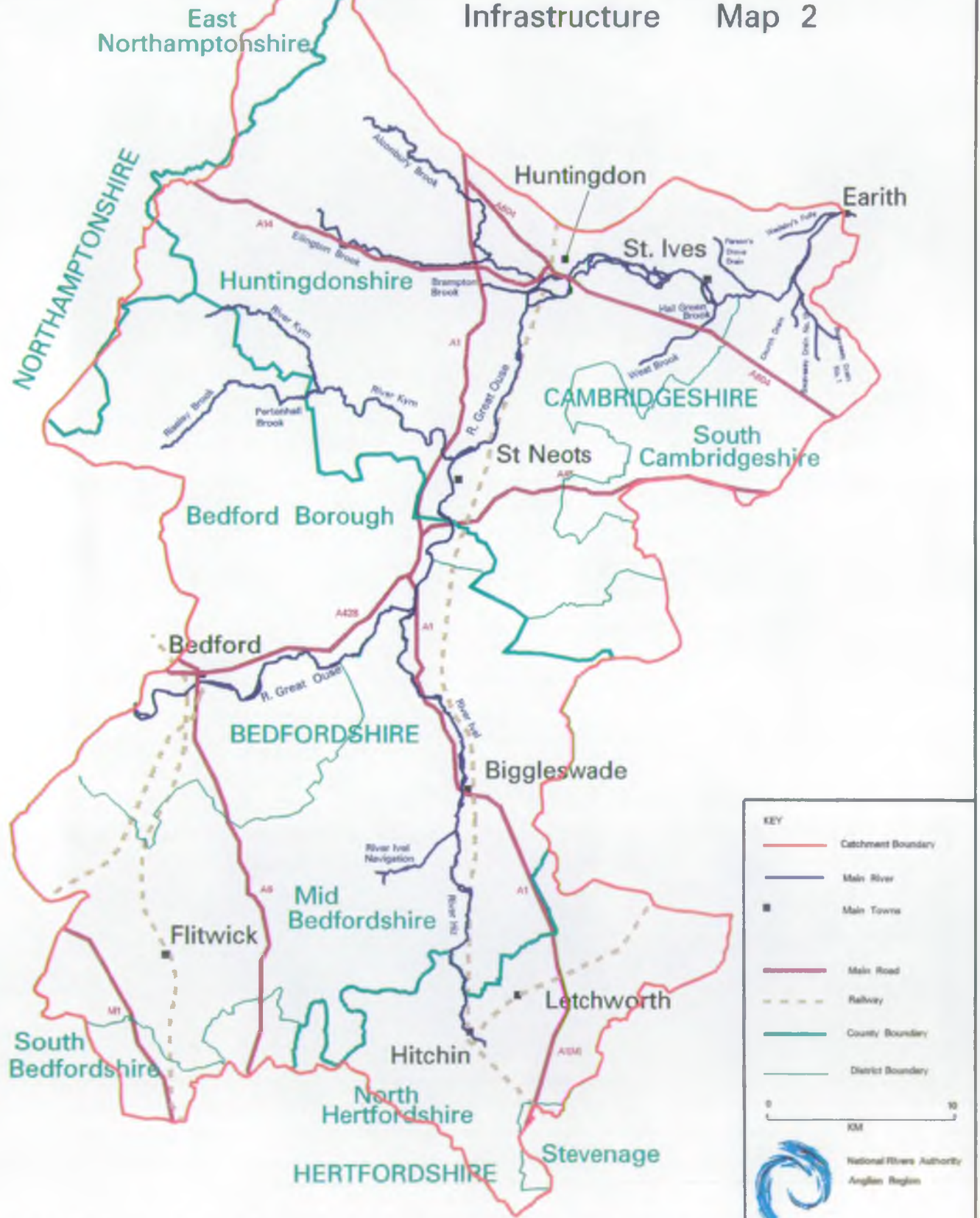
This may be a Company who may see little or no financial benefit in carrying out the actions, or a Local Authority with restricted capital budgets.

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

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

Whilst these limitations will inevitably hamper the achievement of some of the plan objectives, it is essential that these objectives should still be set and striven after. Alternative means of achieving them might be identified, or the very fact of their identification and publication might bring the necessary pressure to encourage those involved to work towards their achievement.

Bedford Ouse (Lower Reaches) Catchment Infrastructure Map 2



2. CATCHMENT INTRODUCTION

2.1 Introduction

The Bedford Ouse (Lower Reaches) Catchment, comprises that part of the River Great Ouse (together with its tributaries) between Kempston and Earith. The River upstream of Earith is also known as the Bedford Ouse. This area has been chosen in order to produce a river catchment of manageable proportions for the Catchment Management Plan (CMP) process. The continuation of the river both upstream and downstream will be the subject of further plans.

The Catchment is 1556 sq km which includes a diversity of landscape.

The Bedford Ouse flows generally in a north easterly direction. The rivers flow over a clay covered catchment, apart from the Hiz, Flit and Upper Ivel, which flow over the Chalk and Greensand rocks. Rainfall is less able to penetrate through the clays so tends to run over the surface. This means that when the land surface is saturated the rivers respond rapidly to rainfall and high river flows may occur. Bedford Ouse flows discharge to either the Hundred Foot River or to a lesser extent the Old Bedford River at Earith. Downstream of Earith, flows may be discharged to sea via the tidal channel or, at times of high flow, can be diverted to the flood storage area known as the Ouse Washes.

The catchment lies within four counties, these in descending order of percentage area being Bedfordshire (47%), Cambridgeshire (40%), Hertfordshire (10%) and Northamptonshire (3%).

The catchment has a population of 422,000 which is a density of 310 persons per km². 51% of the population is situated in the 8 main towns of Bedford, Letchworth, Hitchin, St Neots, Huntingdon, St Ives, Biggleswade and Flitwick. Operational Military air bases are situated at Alconbury and Wyton. Other aviation related establishments are located at Brampton, Thurleigh, Molesworth, Chicksands, Cardington and Henlow.

The area is well served by major road and rail networks which carry large volumes of through and commuter traffic.

The rail routes, both north-south, are the East Coast Main Line passing through Hitchin, Biggleswade, St Neots and Huntingdon and the Midland Line through Flitwick and Bedford. Both lines are served by British Rail Intercity and British Rail Network Southeast.

The major road routes are the north-south A1(T) and the east-west A14(T)/A604(T).

2.2 Geology and Landscape

The area covered by this plan is essentially a lowland river catchment with Chalk uplands at its southern extent. The maximum elevation within the catchment is 184m above sea level and is to be found in the Chalk outcrop area south west of Hitchin. The Bedford area is 25 to 50m above sea level, with areas in the upper reaches of the sub-catchments being around 100m above sea level. The lowest lying land is close to sea level at Earith, Cambridgeshire.

Groundwater occurs in saturated rocks known as aquifers. The principal aquifers in the catchment are the Chalk in the south and the Lower Greensand outcropping in the Flitwick area across South Bedfordshire to Cambridgeshire. Sand and gravel deposits occur within the river valleys and form small aquifers. These are particularly important in the Ivel and Bedford Ouse corridors.

Land use in the catchment is very diverse ranging from industry concentrated in and around the major towns to intensive arable farming on the majority of the catchment and market gardening along the River Ivel corridor. Sand and gravel extraction is a major feature along the catchment's river valleys.

The land classification grades as a percentage of the whole catchment are:-

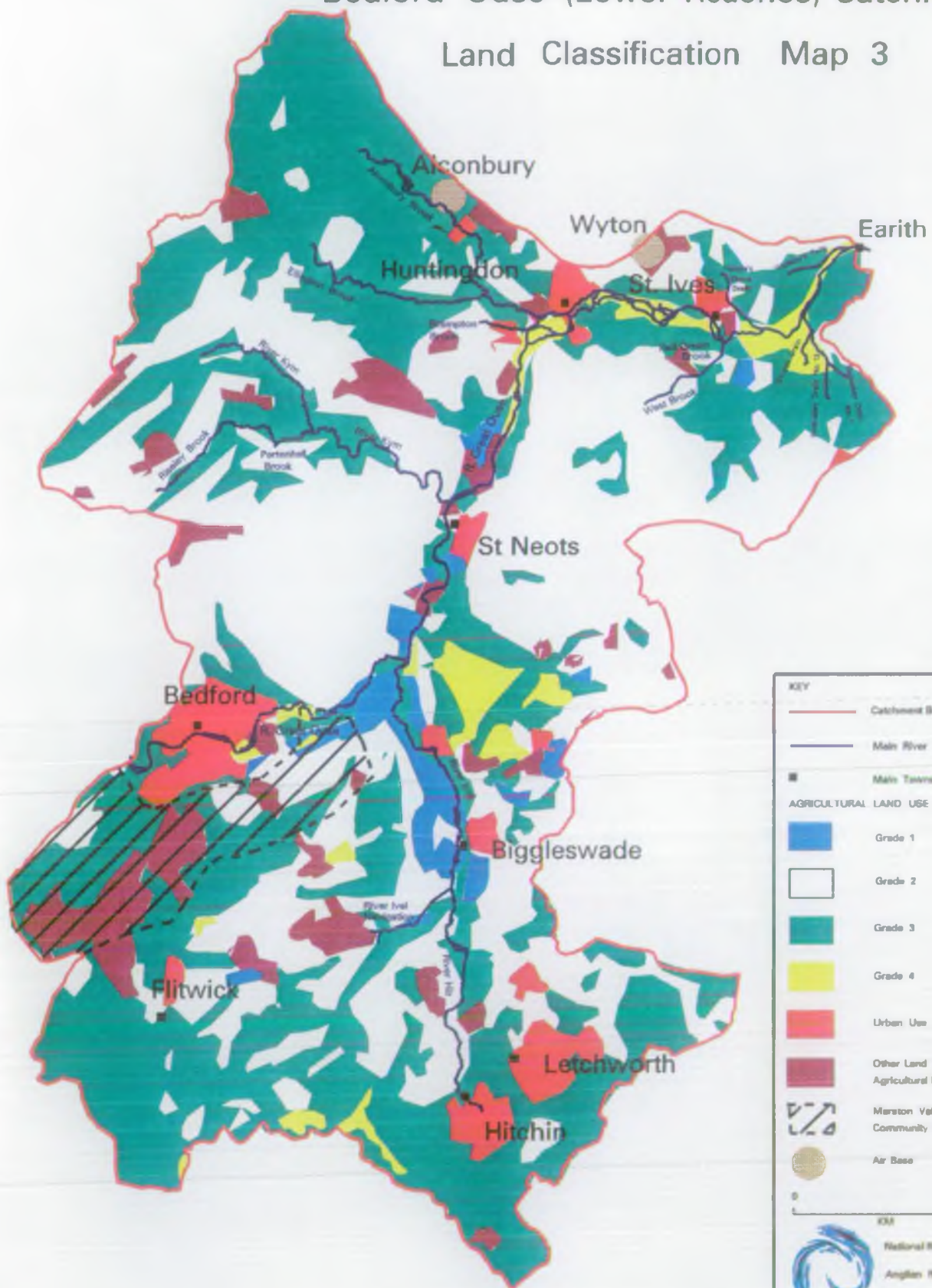
Grade I	2.7%
Grade II	38.6%
Grade III	44.7%
Grade IV	3.3%
Non agricultural use	
e.g woodland	6.4%
Urban	4.3%

Flood meadows are an important feature of the Bedford Ouse (Lower Reaches) Valley. Though reduced in number since the beginning of the century, those still existing are of conservation value. Because of their botanical importance several sites in the St Neots - Huntingdon area are Sites of Special Scientific Interest (SSSI). These include St Neots Common, Brampton Meadow and Portholme Meadow.

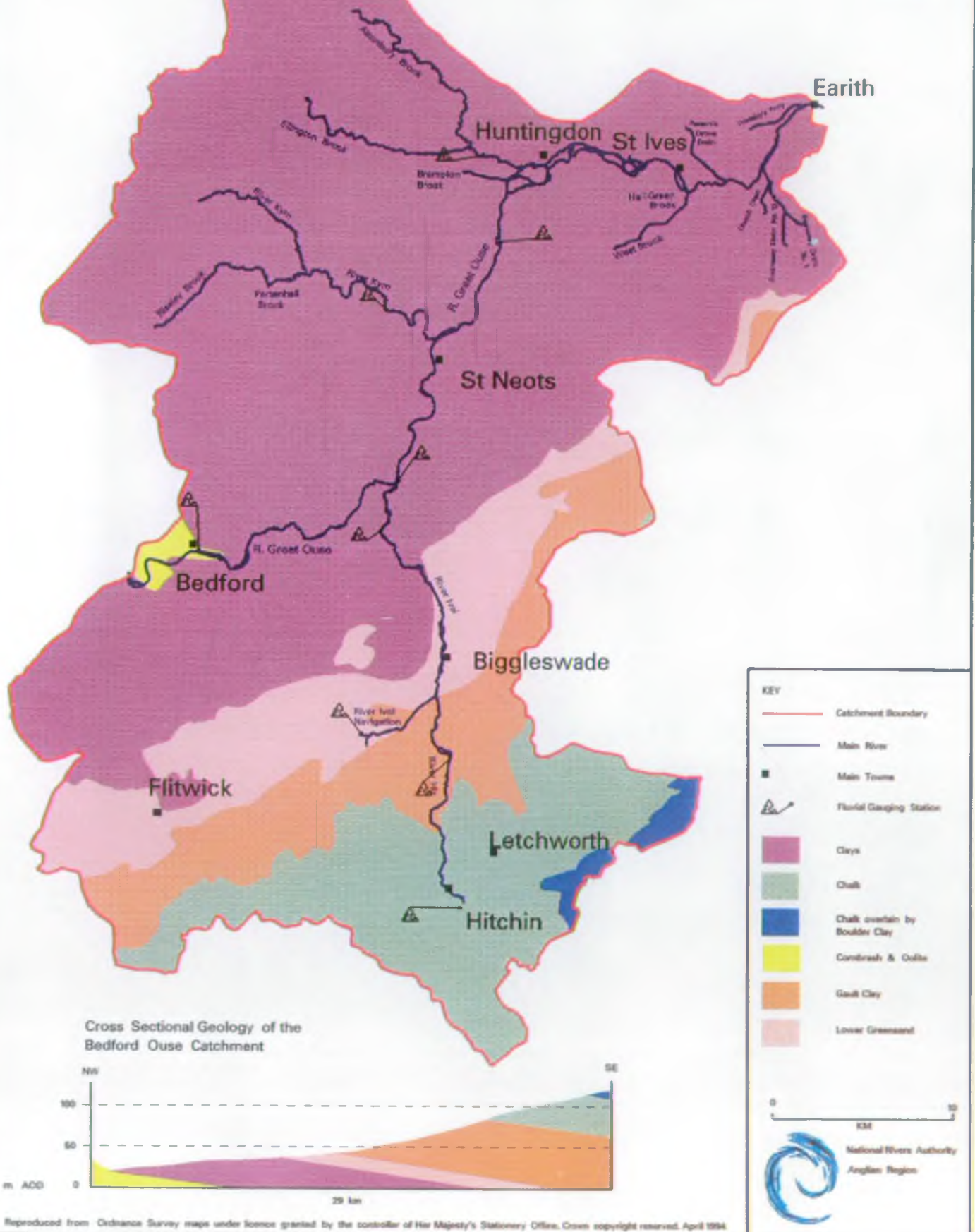
A major proposal which will affect the Bedfordshire landscape is the Marston Vale Community Forest, a Countryside Commission/Forestry Authority initiative. The extent of the proposed forest is shown on the Land Classification Map.

Bedford Ouse (Lower Reaches) Catchment

Land Classification Map 3



Bedford Ouse (Lower Reaches) Catchment Geology- Fluvial Gauging Stations Map 4



The catchment also provides some of the best locations for water-based recreation and waterway activities. For example, north west of St Neots is Grafham Water, a public water supply reservoir also used for amenity with facilities for fishing, sailing and nature trail. The Bedford Ouse from Earith to Kempston is a major navigable waterway.

2.3 Hydrology

The majority of the summer flow in the Bedford Ouse (Lower Reaches) is derived from discharges from sewage treatment works and runoff from the urban conurbations to the west of the catchment such as Milton Keynes, Bletchley, and Newport Pagnell. However; in addition, springs which issue from the Chalk and Lower Greensand contribute to the flow in the tributaries. This all provides a relatively stable discharge throughout the year. There are 7 permanent gauging stations in the catchment. Winter high flows tend to be a result of rapid run off when the land is saturated.

The flow record at Bedford (1933 - present) shows the influence of the urbanisation upstream. In most summers prior to urbanisation, the flow was virtually nil. After the early 1970's this minimum was only reached during the 1976 drought. In the prolonged drought of 1989 to 1992 the minimum recorded flow was 1 cubic metre per second (cumec). The maximum recorded flow was around 280 cumecs during the serious floods of March 1947. The long-term average flow is 10 cumecs of which flows greater than 1 cumec are exceeded 95% of the time.

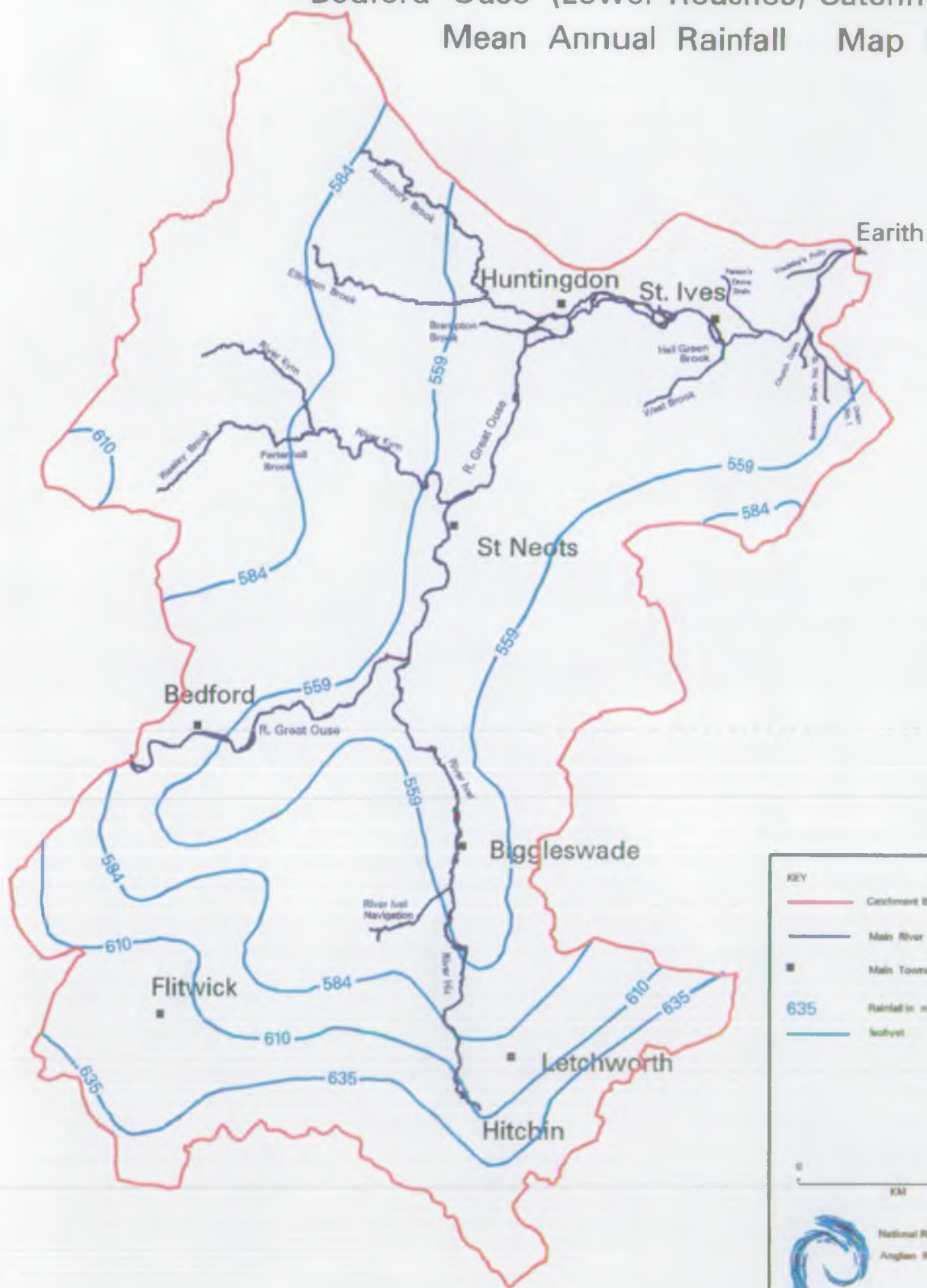
Rainfall is highest in the south-west of the catchment over the Chalk and Lower Greensand uplands. The long-term average rainfall at Bedford is 570mm which compares with 605mm for the Great Ouse catchment as a whole.

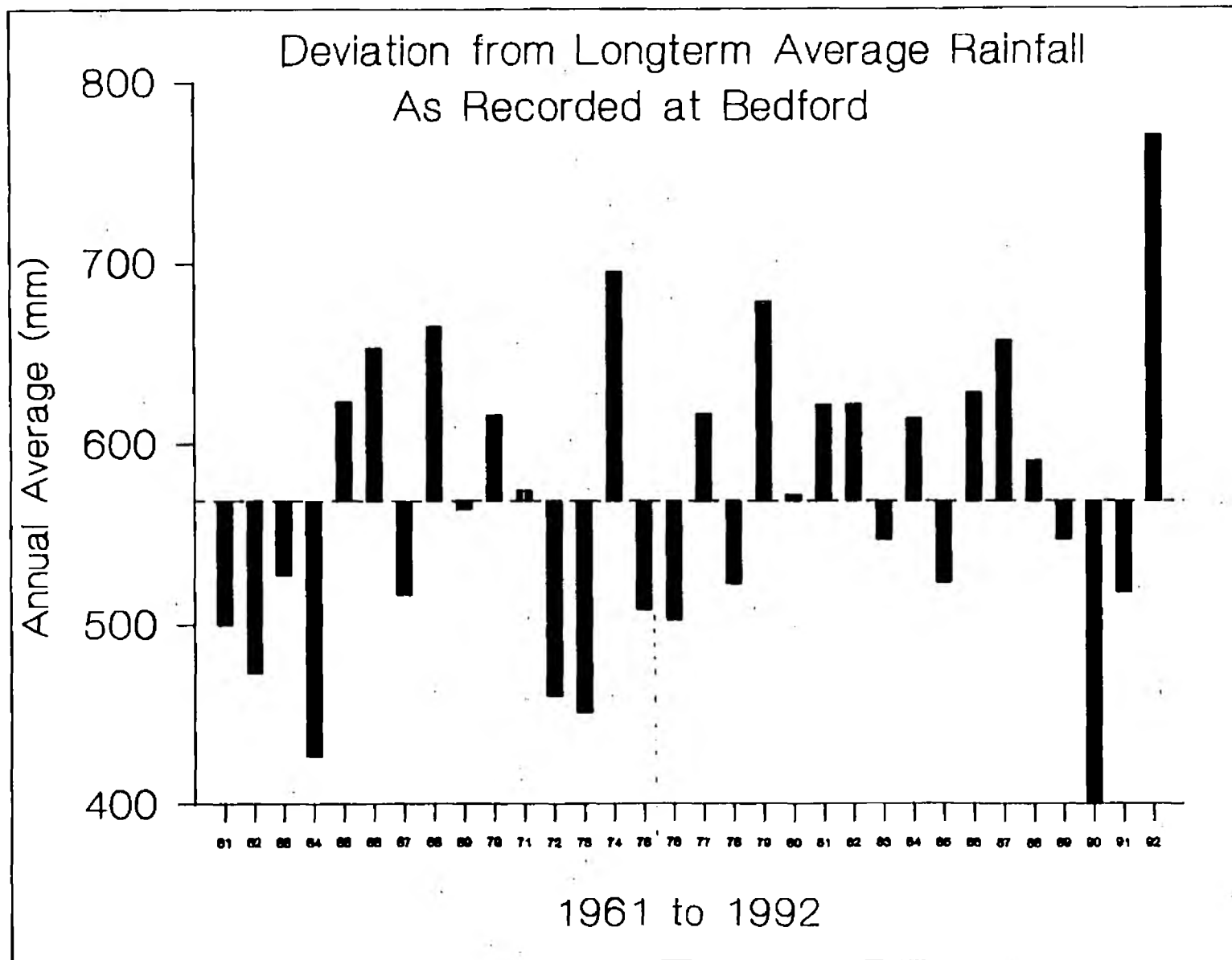
The diagram on page 8a shows the annual rainfall patterns compared to the long term average.

Rainfall (mm) at Bedford (Thurleigh)

Year	1984	1985	1986	1987	1988	1989	1990	1991	1992
Rainfall	613	523	628	657	591	547	400	517	771

Bedford Ouse (Lower Reaches) Catchment Mean Annual Rainfall Map 5





2.4 Water Quality and Fisheries

The majority of rivers in this catchment are of good or fair quality. In the more urbanised southern areas there are stretches of poor quality. The main River Ouse is good quality throughout most of this catchment, the exception being a stretch immediately downstream of Bedford where there is a deterioration in quality.

The most important point for the protection of surface water quality is at Offord on the Bedford Ouse. Water is abstracted from the river here for storage in the Grafham Water reservoir, which is a major public water supply source in the region. Grafham has been affected by algal blooms which are influenced by the nutrient levels in the abstracted river water.

Sewage treatment works are the major source of pollutant loads in the catchment. Most trade effluent discharges are made to the public foul sewer for treatment. It is important to remember that increased abstraction from sources such as Grafham, result in increased flows to the river via the effluent returns from the sewage treatment works.

Some 29 species of fish have been recorded by NRA within the catchment, and many of the main river and some of the non-main river reaches support good fish populations. Many of these reaches also support valuable coarse fisheries.

Migratory salmonid species, notably sea trout, brown trout and occasionally salmon have been recorded in the catchment.

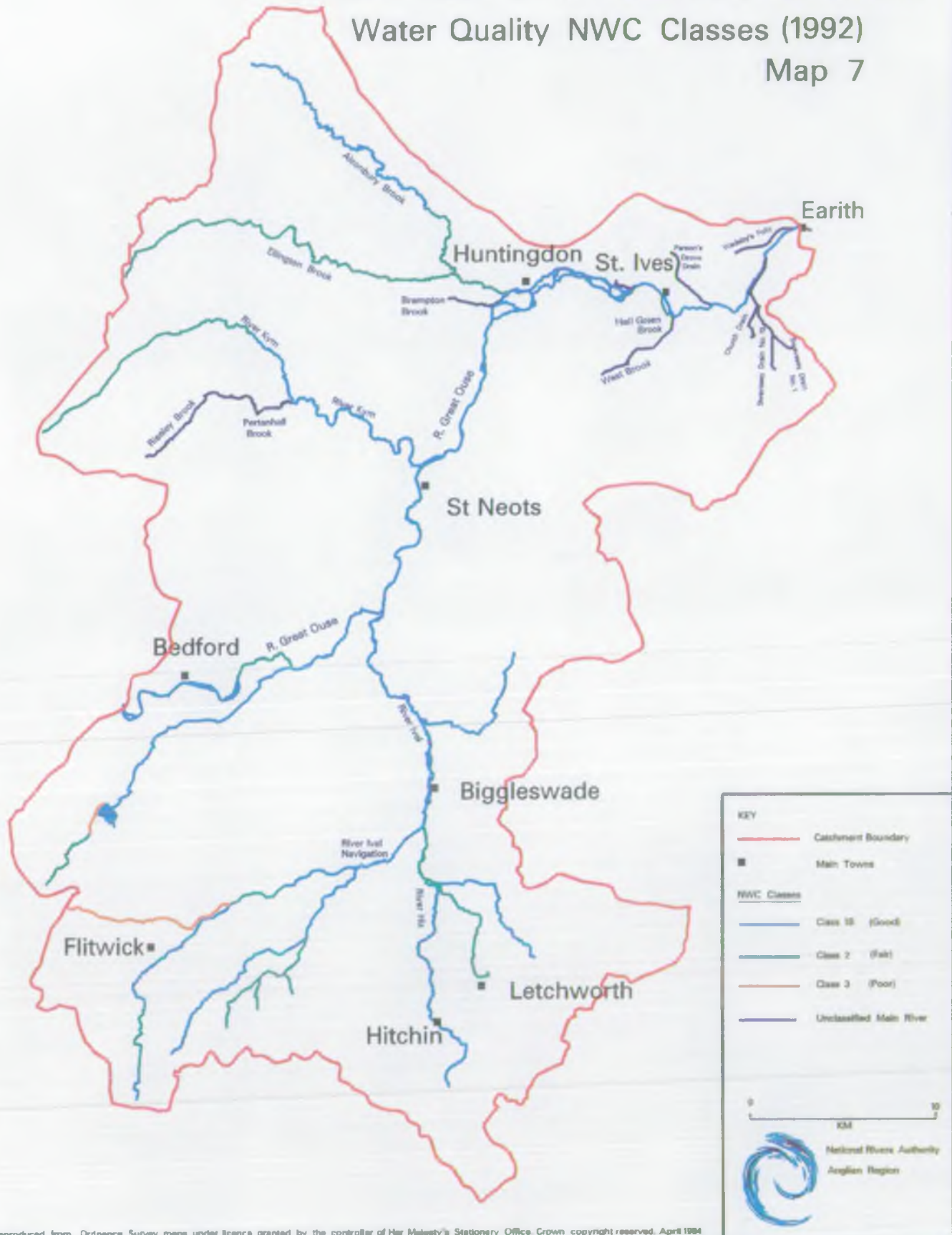
Bedford Ouse (lower Reaches) Catchment
1992 Biological River Quality Survey
Map 6



Reproduced from Ordnance Survey maps under licence granted by the controller of Her Majesty's Stationery Office. Crown copyright reserved. April 1994

Bedford Ouse (Lower Reaches) Catchment Water Quality NWC Classes (1992)

Map 7



2.5 Data Collection

The NRA requires information and data about the water environment to carry out its regulatory and planning functions. Rainfall, river levels and flows, groundwater levels, environmental water chemistry, biology and fish populations and river corridor surveys are all measured within the catchment.

This is undertaken either by regular site visits or by telemetry links. The Authority telemetry system takes daily readings which are used for both operational purposes and long term data collection.

In addition much information is obtained from private individuals such as rainfall observers. Additionally abstraction licence holders are required to submit data on the amount of water taken annually to the NRA.

2.6 Key Details

Catchment Details

Area	1556 sq km	
Population	<u>Existing (1993)</u>	<u>Predicted(2006)</u>
	421,734	477,000

Topography

Ground Levels	Min Level 2m AOD Max Level 184m AOD
---------------	--

Geology

North	-Clays with overlying gravels along rivers
Central	-Clays with Greensand outcrop in east
South	-Chalk, Gault clay and Greensand

Administrative Details

<u>County Council</u>	Bedfordshire	47% of catchment area
	Cambridgeshire	40%
	Northamptonshire	3%
	Hertfordshire	10%

District & Borough Councils

East Northamptonshire DC
Huntingdonshire DC
Mid Bedfordshire DC
Bedford Borough Council
North Hertfordshire DC
South Bedfordshire DC
South Cambridgeshire DC
Stevenage DC

National Rivers Authority

Anglian Region - Central Area
Catchment (South) (Bedford)

Water Supply Companies

Anglian Water Services Limited of catchment	77% of Catchment
Cambridge Water Company	12% of Catchment
Three Valleys Water Company	11% of Catchment

Major Sewage Treatment Works

Bedford
Chalton
Hitchin
Huntingdon

Internal Drainage
Boards

Alconbury & Ellington, Bedfordshire
& Ivel, Bluntisham, Houghton & Wyton,
Over & Willingham, Swavesey

Main Towns and Populations

Bedford	73,655
Letchworth	32,356
Hitchin	29,563
St Neots	25,620
Huntingdon	15,744
St Ives	15,622
Biggleswade	13,206
Flitwick	10,828

Water Quality - Chemical

Water Quality - Biological

Length of river in National
Water Council (NWC)
Class for 1992

Length of river in Biological
Classes for 1992

<u>Class</u>	<u>km</u>	<u>Class</u>	<u>km</u>
1A (very good)	0	A	147
1B (good)	165	B	75
2 (fair)	77.2	C	82
3 (poor)	5.6	D	87
4 (bad)	0		

Water Resources

Availability for resource development

Chalk aquifer	None
Lower Greensand	None
Oolite	None
River gravels	Limited availability
Surface water preferred	Limited availability winter

Flood Protection

Length of statutory main river	221km
Embanked main river	32km
Area protected by embanked channel	34.2km ²
Area of natural flood plain	59.7 km ²

Navigation

Length of navigable river	66.2km
---------------------------	--------

Fisheries

Length of game (trout) fisheries	0
Length of coarse fisheries	190km

Conservation

Sites of Special Scientific Interest (SSSIs)	53
Water Dependant SSSIs (included in above)	31
County Wildlife Sites	31 (including 4 SSSIs)
Scheduled Ancient Monuments	136

Bedford Ouse (Lower Reaches) Catchment Control Structures Map 8



3. USES AND ACTIVITIES

3.1 Catchment Drainage - River Control Structures and Statutory Main River

3.1.1 General

This use identifies the basic role of the river as the conveyance of water from land in the catchment to the sea. There is a clear requirement for the provision of effective defence for people and property against flooding from rivers and the sea. Normally flooding is a result of extreme climatic conditions, such as high winds or very heavy rainfall. Flood events are described in terms of frequency at which, on average, a certain severity of flood is exceeded. This frequency is usually expressed as a return period in years e.g. 1 in 50 years.

The effectiveness of flood defences can be measured in terms of the return period up to which they prevent flooding. It is clear that different types of land use, for example, urban areas and pasture land, require different levels of effectiveness for the defences.

3.1.2 River Control Structures and Statutory Main River

In the river system, certain channels are designated as statutory Main River, by which means the NRA takes a greater responsibility for the maintenance and control of the channel. At the same time various powers to control the activities of others are taken.

The responsibility for the maintenance of any watercourse normally rests with the riparian landowner, whose ownership as a general rule extends to the centre line of any such river. However, the NRA does have control of the construction of any structure in or close to the statutory Main River. This and other activities likely to affect the bed or bank of the river require the formal consent of the NRA. The NRA has a flood defence operational maintenance department which deals with emergencies (flooding and some pollution control support) together with "permissive" powers to carry out river maintenance. This work is targeted carefully at past flood and drainage schemes to ensure they function as required. In other areas maintenance work is undertaken to a standard consistent with existing land use.

The NRA has powers in respect of consents for weirs, dams and culverts and similar obstructions on watercourses, which are not designated statutory Main River. District and County Councils have powers to carry out schemes on such

watercourses, but no legal obligation to do so. They would require the NRA's consent under its requirements for overall supervisory duty of drainage matters. With a few minor exceptions, the Water Act 1989 did not change the basis of responsibility and powers in drainage neither does the Water Resources Act 1991 or the Land Drainage Act 1991.

3.1.3 Within the catchment significant lengths of Main River have been designated as shown on the map opposite. In respect of the operation of the river system the plan indicates the location of control structures on the Main River channels including 15 navigation locks. Whilst the majority of these structures are operated by this Authority 3 mill sites still remain within private ownership, at Tempsford saw mills and Blunham Mill on the River Ivel, and Duck Mill on the Ouse at Bedford.

These river control structures are operated for various reasons such as maintaining navigation and recreation levels, reductions in flood level, conservation, water power, aiding abstraction for public water supplies and irrigation.

3.1.4 Objectives

- To control development and works in or adjacent to main river in accordance with the NRA's Flood Defence Byelaws.
- To ensure the correct operation of river control structures during both flood and normal flows.

Bedford Ouse (Lower Reaches) Catchment Flooding and Flood Alleviation Map 9



3.2

Catchment Drainage - Flooding and Flood Alleviation

3.2.1 General

The flood plain is an important element of the overall river system to convey flood flows. In a major flood event, water is "stored" temporarily in the flood plain thereby decreasing peak flows downstream. Normally the wider the flood plain the more important it is in attenuating flood levels. The NRA can control within its Byelaws some activities in the flood plain likely to worsen flood conditions. Planning Authorities also seek the NRA's advice and take this into account when deciding on planning consent for proposals within the flood plain.

Urban Flooding

In pre-war years, the pressure for new development was very much less than occurs now. Individual communities were more stable, and had accumulated local knowledge; thus building would not take place on land subject to flooding through local advice. Nowadays the pressures are greater, and there is very much greater reliance on the intervention of Planning Controls to avoid unsuitable locations. The greater the concentration of housing within each development together with the much higher value of home contents makes the potential losses through flooding very high indeed.

Rural Flooding

For many years, the improvement of drainage to increase agricultural production has been a major component of the work of predecessor Authorities to the NRA. Both capital schemes and major maintenance programmes have been carried out to ensure reduced water levels and to minimise flood losses. This position has now changed with the result that most NRA activity is now centred on protection of urban communities from river and sea flooding.

3.2.2 Local Perspective

The catchment has a predominately clay structure producing rapid runoffs during periods of intense rainfall. This runoff finds its way into the Bedford Ouse along with additional waters from the tributaries discharging by gravity to the tidal Hundred Foot River at Earith.

During high flood discharges, when the available channel capacity is exceeded, use is made of the natural flood plain by floodwaters. This is an important characteristic of all channels within the catchment by attenuating flows before they reach constrictions imposed by urban development areas.

Since the major floods of 1947 some structures have been enlarged/replaced with corresponding improvements to channel capacity in certain reaches. These improvements offer an improved level of flood defence up to certain return periods but not major events towards 1947 levels. Therefore the use of the existing flood plain, especially upstream of and within towns, is essential to prevent increased levels of property flooding. However, in this respect, it should be noted that some 360 Ha. of floodplain has been lost to development since the 1947 floods.

Surface water and non-Main River flooding is likely to be more frequent than that experienced from a Main River, and solutions to these rest with the District and County Authorities.

The Internal Drainage Boards (IDB's) are responsible for drainage within their administrative areas and perform maintenance and flood protection duties.

Whilst schemes for the protection of property can be devised there is always the possibility of an event more severe than the design standard. Thus planners of future development close to the river corridor should be mindful of potential risks.

3.2.3

Flood Warning

The NRA provides information and advice to the County Police Forces for the purpose of giving them sufficiently advanced warnings of areas likely to be affected by fluvial flooding. Flood warnings are based on a 3 phase colour system; Yellow for minor flooding and no public warning issued; Amber for road flooding and flooding of isolated properties - no generalised public warning; Red for full flood situation, property flooding expected, public warning issued.

The Catchment Emergency Procedure manual outlines the catchment type and response to rainfall, sites considered to be at special risk, data gathering points in the catchment, and specific flood warning data. This latter item, based on calculated and observed river responses, consists of various threshold water levels (i.e rates of flow) at upstream gauging stations which will be likely to result in downstream flooding. Periods of time before the flooding can be expected at each location at risk are included and this information will form the

basis of any warning issued. Such procedures are re-assessed and modified if necessary in response to each flooding or near flooding event.

3.2.4 Maintenance Operations

This involves a variety of activities needed to ensure the efficient use of the river system for its basic purpose of conveying water. These regular maintenance activities include dredging, weed control, bushing, obstruction removal and structures operation and maintenance.

3.2.5 Environmental Considerations

The annual maintenance dredging programme takes full account of conservation recommendations identified by the regions rivers environmental data base, where identified special features are thus protected and the most appropriate working methods adopted to enhance river habitats, whilst maintaining flood defence objectives.

3.2.6 Objectives

- To control development and other works in rivers and on the flood plain such that risks of flooding are not increased.
- To provide effective defence for people and property against flooding from rivers. The standard of protection to be appropriate to the land use, where this is economically viable.
- To provide adequate arrangements for flood forecasting and warning.
- Carry out maintenance in the channels before the winter flood season where necessary to protect people and property to the appropriate standard.
- Ensure correct operation of relevant sluice gates.
- Carry out flood defence works with reference to the environmental needs and requirements.

3.3

Development - Housing, Industry and Commerce

3.3.1 General

All development has an impact on the catchment to some degree. In a river flood plain it can be at risk from flooding and can increase the flood risk to others. It concentrates surface water run-off which unless carefully considered can result in flooding. The concentration of surface water can also change the flow regime of a watercourse thus affecting its ecosystem. Development can prevent aquifer recharge and can also pose a pollution threat to an aquifer which if realised can cause irreparable damage. Development generates infrastructure, potable water demand and can overload sewage treatment facilities. It can also promote mineral extraction.

The NRA is a statutory consultee under planning legislation and advises county and local authorities on land allocations and development proposals which are considered to impact on the water environment.

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

Irrespective of a planning consent being obtained, the NRA may where appropriate and available, use its relevant powers to control the nature of development proposals.

3.3.2 Local Perspective

The catchment is situated within Bedfordshire, Cambridgeshire, Hertfordshire and Northamptonshire. The eight District/Borough Councils covered by the catchment are as listed in the Key Details. The structure plans of the four counties all define the land requirement to accommodate the predicted need for housing, industrial and leisure facilities.

The current status of structure plans and local plans is tabulated in Appendix 1.

In Bedfordshire the average annual population growth rate is expected to be 1.4% to the year 2001 and then drop to 0.7% by the year 2006. Residential and commercial development proposals are generally confined to the major urban areas of Bedford, Biggleswade and Sandy. Barton-le-Clay in the south of the catchment however, has a residential land allocation of 11 hectares.

Hertfordshire has an anticipated annual population growth rate of 0.4% to the year 2006 with development proposals restricted to the major urban areas of Hitchin, Letchworth and Baldock.

The anticipated annual growth rate for the population of Cambridgeshire is 1% to the year 2006. Major residential and commercial development is centred on Huntingdon and St Neots. Other notable residential allocations are Papworth Everard 22.7 hectares, and Longstanton 12.8 hectares. Other notable commercial allocations are at St Ives 13.8 hectares and Swavesey 10.12 hectares.

Only 3% of the catchment area is within Northamptonshire. There are no large centres of population nor proposals for major developments.

Village development through the catchment is generally limited to infill only. There are no proposed new settlements.

3.3.3

Development - Objectives

Flood Defence:

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

Conservation and Enhancement of the Water Environment:

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

Water Quality:

- To protect surface and groundwaters from pollution arising from development.

Water Quantity:

- To ensure that development does not cause unacceptable effects on surface water and groundwater resources and to protect the rights of those who abstract water.

3.3.4

Development - Policy Summary

(See Appendix 2 for Anglian Region Model Policies)

Introduction:

The NRA through its available legislation and by consultation, addresses:

- i) The disposal of surface water run-off
- ii) Pollution prevention measures to both surface and groundwater.
- iii) The crossing of watercourses and their attendant flood plains.
- iv) The effect on water resources and protection of existing sources.
- v) The impact of the works on the conservation aspects of the water environment.
- vi) The consenting of all works involving watercourses (not within Internal Drainage Board Districts).

Flood Defence:

- The NRA will generally oppose development, including the raising of land where, in the opinion of the NRA, such development would be likely to impede the flow of flood water, or increase the risk of flooding elsewhere or increase the number of people or properties at risk.

Conservation and Enhancement of the Water Environment:

- The conservation and enhancement of wildlife, landscape and archaeological features associated with rivers, ponds, lakes, wetland etc. will be encouraged.

Water Quality:

- The NRA will generally oppose development including changes in land use which, in the opinion of the NRA will pose an unacceptable risk to the quality of ground and surface water.

Water Quantity:

- The NRA will generally oppose development including changes in land use which, in the opinion of the NRA, will have an unacceptable impact on water resources.

3.4 Surface Water Abstraction - Potable Water Supply

3.4.1 General

This use relates to the abstraction of surface water (ie rivers and springs) for domestic or industrial potable use.

Anglian Water Services Limited is the only water supply company to make surface water abstractions in the catchment. In addition individual householders may abstract from springs for their own domestic use.

The abstractions made by the water supply companies are controlled by abstraction licences issued by the NRA under the Water Resources Act 1991 (previously the Water Resources Act 1963). An abstraction licence is only issued by the NRA if there is sufficient water available, the need for the water is justified, all rights of existing users are protected and the water environment, (eg rivers springs and wetland sites) is not unacceptably affected.

Abstraction made by private individuals for their own individual domestic use is not required to have an abstraction licence under the Water Resources Act 1991 unless the quantity used exceeds 20 cubic metres per day.

3.4.2 Local Perspective

Anglian Water Services Limited (AWS) is licensed to abstract water from the Bedford Ouse at Offord to fill Grafham Water Reservoir. Much of the water from the reservoir is used to supply the population of the Bedford Ouse catchment. Grafham Water is however also part of a much larger supply system including the Rutland Water and Pitsford reservoirs enabling water to be moved around the West Anglian region to meet demand. This is known as the Ruthamford System. Water from Grafham is also transferred to the Three Valleys Water Company supply area.

Anglian Water is licensed to take 459 thousand cubic metres a day (tcmd) from the Bedford Ouse at Offord. The licence contains clauses to protect the downstream flow of the river. The abstraction has to leave in the river a minimum residual flow (mrf) of at least 136 tcmd plus 25% of the natural flow above 136 tcmd. Separate licences govern the amount of water to be taken from Grafham at any given time. The company has an existing licence, which is not in use, to take more water from the river further downstream at Brownhill Staunch, again subject to clauses to protect the river. However this would

Bedford Ouse (Lower Reaches) Catchment
Potable Water Supply Map 10



Reproduced from Ordnance Survey maps under licence granted by the controller of Her Majesty's Stationery Office. Crown copyright reserved. April 1994

involve a major tunnel and intake works and as a possible alternative they are considering a reduction in the Offord mrf instead. This would reduce low flow between Offord and Brownhill. Consultants have undertaken an Environmental Impact Assessment to find out what the environmental consequences would be, and the NRA is currently making a detailed assessment of its conclusions. Any variation to the Company's licence would have to be publicly advertised.

The current abstraction by AWS from the Bedford Ouse represents 72% of the total quantity of water licensed for abstraction in the catchment.

There are a small number of spring sources within the catchment which are used for private domestic supplies.

3.4.3 Environmental Objectives

Water Quantity

- To protect surface water from overcommitment and ensure abstraction does not have an unacceptable effect on environmental waters
- To ensure the proper use of resources
- To conserve water resources, for example, by encouraging efficient water use and leakage control
- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability

Water Quality

- Compliance with EC Directive 75/440/EC on the quality required of surface water abstracted for drinking water
- Implement catchment control measures in order to enhance pollution prevention

3.5 Groundwater Abstractions - Potable Water Supply

3.5.1 General

This relates to the use of groundwater for domestic purposes, such as drinking, cooking and washing and for industry. The water is abstracted from wells and boreholes constructed within the underground rocks (called aquifers).

Abstractions by water supply companies require an abstraction licence under the Water Resources Act 1991. An abstraction licence is only issued by the NRA if there is sufficient water available, the need for the water is justified, all rights of existing users are protected and the water environment, eg rivers, springs and wetland sites, is not unacceptably affected.

Abstraction by a private individual for one household's domestic supply only requires a licence if the abstraction is greater than 20 cubic metres per day.

3.5.2 Local Perspective

The major sources of groundwater in this catchment are the Chalk aquifer and the Lower Greensand aquifer. Minor abstractions are also made from local sand and gravel deposits.

Abstractions are made by the water supply companies, in particular Three Valleys Water Services (Three Valleys), Anglian Water Services Limited (AWS) and Cambridge Water Company. In addition, individual householders abstract from wells or boreholes for their own domestic use.

There are 14 borehole sites operated in the catchment for public water supply.

Seven of these sites are operated by Three Valleys, who are licensed to abstract a total quantity of almost 12 million cubic metres per year from the Chalk aquifer.

AWS Limited is licensed to abstract almost 6 million cubic metres per year from 4 sites in the Lower Greensand aquifer, and 1 million cubic metres per year from a borehole into river gravels.

The total annual quantity licensed to Cambridge Water Company is 750 thousand cubic metres, all of which is derived from two river gravel boreholes.

The total quantity of groundwater licensed for public water supply is 20 million cubic metres per year. This is 14% of the total water licensed for abstraction in the catchment.

A limited number of groundwater sources in the catchment are used for private domestic supply. Such abstractions are principally from the Chalk aquifer and Lower Greensand aquifers, but there are some shallow wells into local sand and gravel deposits. The majority of this use is exempt from licensing under the Act. The small amount that is licensed accounts for less than 1% of the total licensed for abstraction in the catchment.

3.5.3 Environmental Objectives

Water Quantity

- To protect aquifers from overcommitment and ensure groundwater abstraction does not have an unacceptable effect on the environment.
- To ensure the proper use of groundwater resources
- To conserve water resources, for example, by encouraging efficient water use and leakage control
- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability

Water Quality

- To protect existing licensed potable water abstractions from pollution using protection zones which are currently being prepared
- To protect all groundwater as a potential future resource in accordance with the NRA Groundwater Protection Policy

3.6 Effluent Disposal

3.6.1 General

The quality of any effluent discharged to rivers must comply with criteria set out in a consent issued by the NRA under the Water Resources Act 1991. New consents limits are calculated so that the receiving water remains acceptable for its many uses and is compliant with prescribed water quality standards: these are termed "River Needs Consents". Historically, some discharges have consents which are laxer than that required by modern standards, but are under review for future improvements.

In addition to consented discharges, surface water drainage from urban areas, spillages from a range of domestic, commercial, agricultural and industrial activities can contribute significantly to pollution loads in watercourses.

Crown discharges are exempt under the legislation from the consenting requirements which apply to all other discharges, but the NRA does set discharge standards in "pseudo-consents" which the Crown has given a commitment to comply with.

3.6.2 Sewage Treatment Works

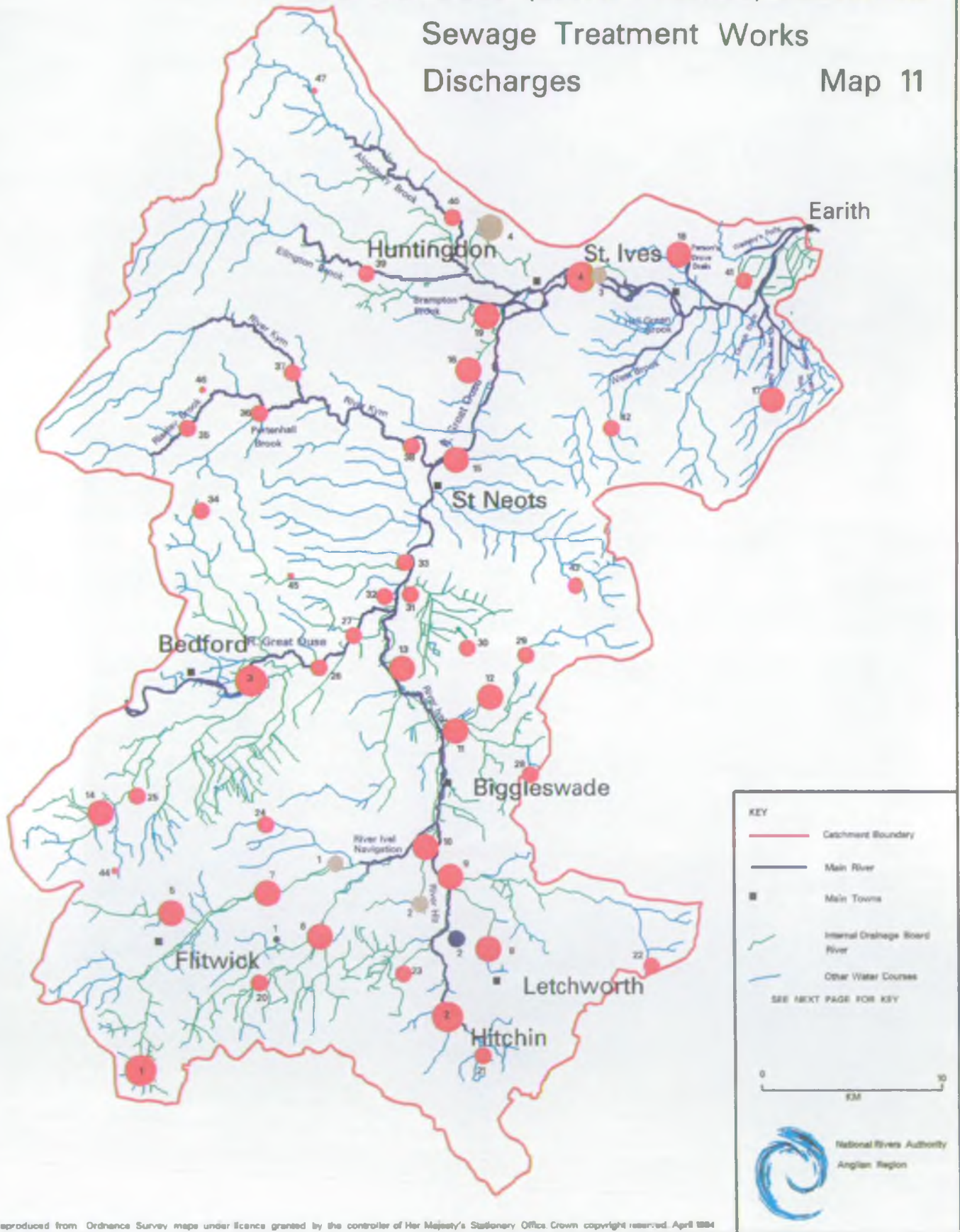
Local Perspective

Continuous Effluents:

There are 50 main Sewage Treatment Works (STWs) with dry weather flows greater than 20m³/d operated by Anglian Water Services (AWS) within the catchment. The sewage effluents treated are predominantly of domestic origin, the consent conditions therefore primarily aim to control loads of suspended solids, ammonia and the biochemical oxygen demand in the final effluent released to watercourses. 8 STWs in the catchment receive significant quantities of trade waste and consequently have metal limits in their consents. Of the 50 main STWs, 44 meet their River Needs Consents (RNC). The priority for dealing with works not meeting RNCs is under discussion with AWS and is being considered in a region-wide scheme so that the discharges that have the greatest environmental impact can be improved first.

Bedford Ouse (Lower Reaches) Catchment Sewage Treatment Works Discharges

Map 11



Sewage Treatment Works Discharges

Map 11

Key

● Anglian Water Services

● Ministry of Defence

● Private



D.W.F. > 10,000 m³/d

1 -Chalton 2 -Hitchin 3 -Bedford 4 -Huntingdon



D.W.F. 1,000-9999 m³/d

5 -Flitwick 6 -Shillington 7 -Clophill 8 -Letchworth 9 -Poppyhill 10 -Clifton 11 -Biggleswade
12 -Potton 13 -Sandy 14 -Marston Moretaine 15 -St Neots 16 -Buckden 17 -Uttons Drove
18 -St Ives 19 -Brampton



D.W.F. 100-999 m³/d

20 -Barton-le-clay 21 -Ashbrook 22 -Sandon 23 -Holwell 24 -Haynes 25 -Stewartby
26 -Willington 27 -Great Barford 28 -Dunton 29 -Gamlingay 30 -Everton 31 -Tempsford
32 -Roxton 33 -Chawston 34 -Thurleigh 35 -Riseley 36 -Pertenhall 37 -Kimbolton
38 -Hail Weston 39 -Easton 40 -Alconbury 41 -Needingworth 42 -Papworth Everard
43 -Waresley



D.W.F. 20-99 m³/d

44 -Millbrook 45 -Wilden 46 -Swineshead 47 -Great Gidding

Ministry of Defence



1 -R.A.F Chicksands 2 -R.A.F Henlow 3 -R.A.F Wyton



4 -R.A.F Alconbury

Private



1 -N.I.A.E.



2 -Fairfield Hospital

Bedford STW is the largest in the catchment and discharges to the Bedford Ouse, complying with its RNC. Other major STWs include Chalton, Letchworth and Hitchin which make up a large effluent flow to the River Ivel. All of these works comply with their RNC's. Chalton is an unusual case as it treats some effluent originating from Luton which is outside the Great Ouse catchment.

There are many small STWs and septic tank discharges in unsewered areas. Twelve private STWs are of a significant size in the catchment. The larger STWs are associated with military establishments at RAF Chicksands, Henlow, Alconbury and Wyton.

There are also a number of unsewered villages which discharge effluents into "village drains". There are about 20 of these that give rise to significant local problems such as at Hargrave, Molesworth and Bythorn. The majority are in the former Huntingdonshire County area.

In order to prevent the proliferation of small treatment plants, each of which presents an additional pollution hazard, the NRA will seek to ensure that new development connects to main foul sewer if one is available.

Intermittent Discharges:

Associated with the larger STWs are many sewage pumping stations. Most of these have consented emergency overflows. A significant number of storm overflows are found on combined sewer systems and also on some pumping stations. The majority of these overflows operate infrequently and are not significant to the general water quality in the catchment, although there may be a significant local effect.

Other intermittent, non consented discharges include surface water outfalls, accidental spillages and diffuse sources such as run off from land.

3.6.3 Industrial/Trade Discharges

Local Perspective

Intermittent and Diffuse Sources:

Surface water run-off from industrial development can cause a significant impact on water quality. Developers must be aware of this and provide adequate pollution prevention measures such as bunding oil and chemical tanks and installing oil interceptors where appropriate.

Contamination of surface water discharges causes significant localised pollution, one such area being Letchworth. The intermittent nature of the discharges makes identification of the specific origin of contamination difficult.

Modern agricultural techniques sometimes have effects from the point of view of river pollution. This applies particularly to the use of artificial fertilisers, the intensive rearing of livestock, the manufacture of silage and the use of pesticides and herbicides. Discharges to watercourses of effluent from agriculture are discouraged because of the problems of treating such waste and complying consistently with consent standards.

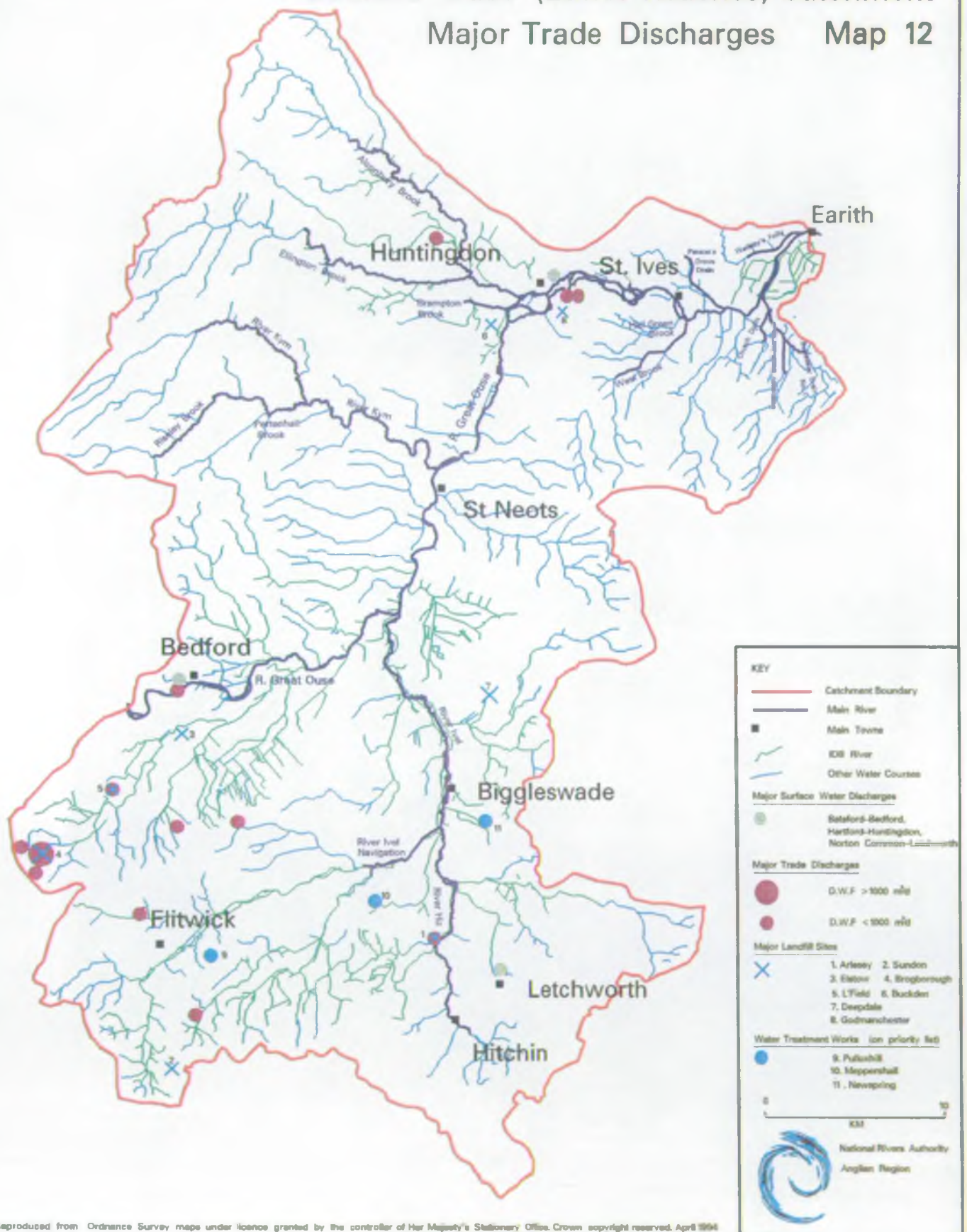
Continuous Effluents:

The majority of industrial trade effluents discharge to sewer for treatment at Anglian Water STWs. There are no major industrial discharges direct to watercourse in the catchment.

Of the larger industrial effluents the most significant in terms of volume are those associated with four major waste disposal sites and 11 gravel extraction sites. Most of these discharges operate on a seasonal or intermittent basis and are related to rainfall. A recent development is a power station at Little Barford. This will abstract water for cooling and return it to the Bedford Ouse.

Six AWS Treatment Works in the catchment have discharges to watercourse and may impact on the aesthetic quality of water. Recently a large activated carbon regeneration plant has begun operation at Perry which discharges effluent into Grafham Water.

Bedford Ouse (Lower Reaches) Catchment Major Trade Discharges Map 12



3.6.4 Environmental Objectives

Water Quality:

- To quantify and pursue required improvements in effluent quality from existing discharges so that river quality targets are complied with and other uses are not compromised.
- To ensure that new consent conditions safeguard water quality.
- To monitor environmental waters and discharges to establish compliance with standards and to take steps to ensure compliance.
- To prevent and/or control intermittent and diffuse pollution in such a way that no other uses are compromised.
- To ensure that developers and industrialists take measures to minimise the risk of pollution from their sites so as not to compromise water quality.
- To encourage first time sewerage schemes in areas with difficult drainage conditions.

Water Quantity:

- To ensure adequate monitoring of effluent returns made to surface waters to enable better assessment of water resource usage.
- No diminution of the flow regime below that assumed in setting consents.

Physical Features:

- Outfalls must be sited so as to achieve a specified degree of effluent mixing with the river within a specified distance.

3.7 Waste Disposal

3.7.1 General

The NRA is a statutory consultee on all activities that require a waste disposal licence issued by the Waste Disposal Authority (County Council) under Part 1 of the Control of Pollution Act 1974. Powers contained in the Environmental Protection Act 1990 relating to Waste Management are to be implemented in May 1994.

There is NRA involvement at three levels:

- i) On the Waste Disposal Plan which each County Council is required to produce
- ii) On the Planning Application for individual sites; this allows consideration of the principle of a waste disposal activity at a particular location and includes aftercare considerations
- iii) On the Site Licence; this covers the operation of the site.

A wide range of operations require a licence; for example, transfer stations, waste storage facilities and scrap yards. All of which have potential to pollute water. In general, the greatest threat is from waste landfill sites.

In recent years there has been a major change in the philosophy of landfilling waste. Previously a policy of "dilute and disperse" was applied. This assumed that any leachate generated could be accepted in an aquifer provided that no local use was threatened. (Taking into account attenuation mechanisms). Nowadays all new sites taking any potentially polluting water must be designed on a containment basis in order to protect all groundwaters, as required by the EC Directive (80/68/EEC) on the protection of groundwater quality.

3.7.2 Local Perspective

Following the transfer of disposal responsibilities for domestic waste to the County Councils in 1974, waste disposal was concentrated in fewer large sites, and it is these that may pose a longer-term risk to water quality rather than the large number of small sites. Currently, the main sites for domestic waste are at Buckden, Stewartby, Brogborough and Sundon, with a newly licensed, but as yet non-operational, site at

Bedford Ouse (Lower Reaches) Catchment Waste Disposal Sites Map 13



Godmanchester. There are a number of other older sites still operating that pose a lower, but still significant risk to groundwater quality for example Deepdale, Sheepcote, and Little Wymondley.

In addition there are closed sites of significance at Flitwick, Conington, Fen Drayton, Godmanchester, Meppershall and Old Brogborough Site.

In practice, any disposal site in use prior to 1972 could have taken virtually any type of waste as there was no control of dangerous waste and the records for many sites are poor or non-existent.

3.7.3 Environmental Objectives

Water Quality:

- To ensure that waste disposal activities do not compromise water quality, particularly groundwater: regard will be given to the NRAs Groundwater Protection Policy.
- To ensure compliance with EC Directives, (80/68/EEC and 80/778/EEC) especially the "groundwater" directive.
- To ensure adequate monitoring of existing and closed waste disposal sites.
- To take steps to alleviate any pollution coming from landfill activities.

Water Quantity:

- To ensure that the development of a landfill site does not cause unacceptable effects on surface water and groundwater resources and to protect the rights of those who abstract water.

3.8 Agricultural Abstraction

3.8.1 General

This use includes water abstracted for general agricultural use (eg stock watering, crop spraying), fish farms and overhead spray irrigation. All abstraction, except for general agricultural use less than 20 cubic metres per day taken from surface waters, requires a licence under the Water Resources Act 1991.

An abstraction licence is only issued by the NRA if there is sufficient water available, the need for the water is justified, all rights of existing users are protected and the water environment, eg rivers, springs and wetland sites, is not unacceptably affected. Abstraction from surface water sources is subject to low level or flow restrictions in order to protect the river and downstream users.

3.8.2 Local Perspective

Water abstracted for agricultural use represents less than 4% of the abstraction demand in the catchment. However the greatest number of licences issued are for agricultural uses. This reflects the impact of a number of large industrial licences and that of AWS at Offord.

General Agriculture

There are 149 licences for general agricultural use of water in the catchment. Abstraction is mainly from shallow sand and gravel wells and catchpits with only limited surface water abstraction. The total licensed for this use is 573 thousand cubic metres per year which is less than 1% of total water licensed for all uses in the catchment.

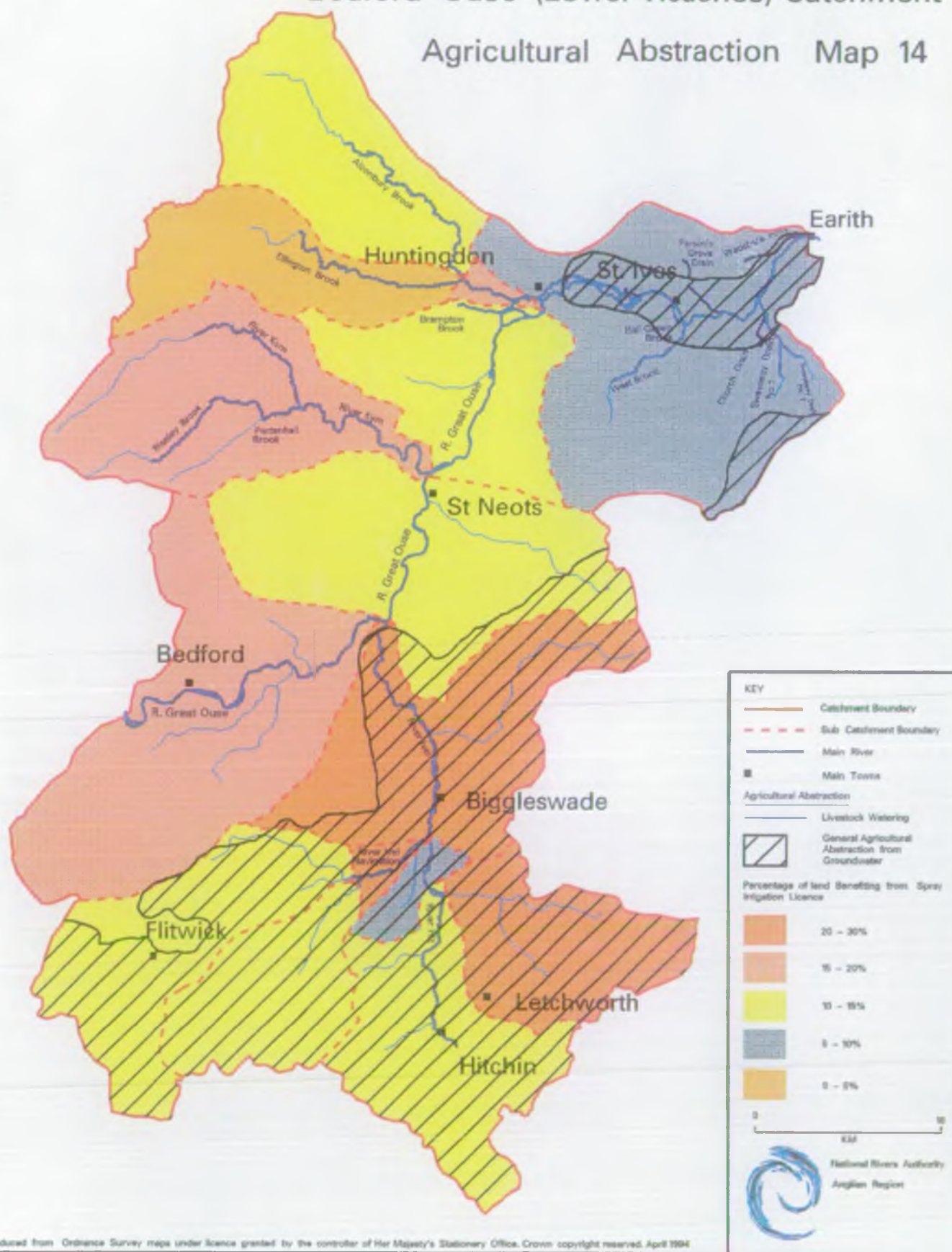
Spray irrigation

Water abstracted for spray irrigation is considered as a total loss to resources. Licences for spray irrigation are issued on a time limited basis, normally 10 years, so that their impact may be reviewed.

Water abstracted from surface water is used for spray irrigation across the whole catchment. The abstraction of groundwater for spray irrigation is primarily sourced from the lower Greensand. In areas of limited summer resource, farm reservoirs may be used to store winter water for subsequent

Bedford Ouse (Lower Reaches) Catchment

Agricultural Abstraction Map 14



use. The total of 398 spray irrigation licences accounts for 6.71 million cubic metres, of which 5.3 million cubic metres is from surface water sources. Spray irrigation represents a total of 3% total licensed abstraction in the catchment.

Livestock Watering

Most watercourses in the catchment are used or have the potential to be used for livestock watering.

3.8.3 Environmental Objectives

Water Quantity

- To protect aquifers and surface waters from overcommitment and ensure water abstraction does not have an unacceptable effect on environmental waters
- To ensure the proper use of water resources
- To conserve water resources, for example, by encouraging good irrigation practice
- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability

Water Quality

- To meet the water quality criteria set for spray irrigation and livestock watering
- To prevent abstraction having an adverse impact on water quality

3.9 Industrial Abstraction

3.9.1 General

This use describes the abstraction of water from ground and surface waters for industrial purposes. This is in addition to PWS supplies to industry. Industrial abstractions include water used for industrial processing, cooling and sand and gravel washing. These abstractions require an abstraction licence under the Water Resources Act 1991. An abstraction licence is only issued by the NRA if there is sufficient water available, the need for the water is justified, all rights of existing users are protected and the water environment, eg rivers, springs and wetland sites, is not unacceptably affected.

3.9.2 Local Perspective

Industry is centred around the main urban areas of the catchment and is largely light manufacturing and engineering based with a generally low demand for water. Much of the industrial demand for water is supplied by the water companies rather than from private licences.

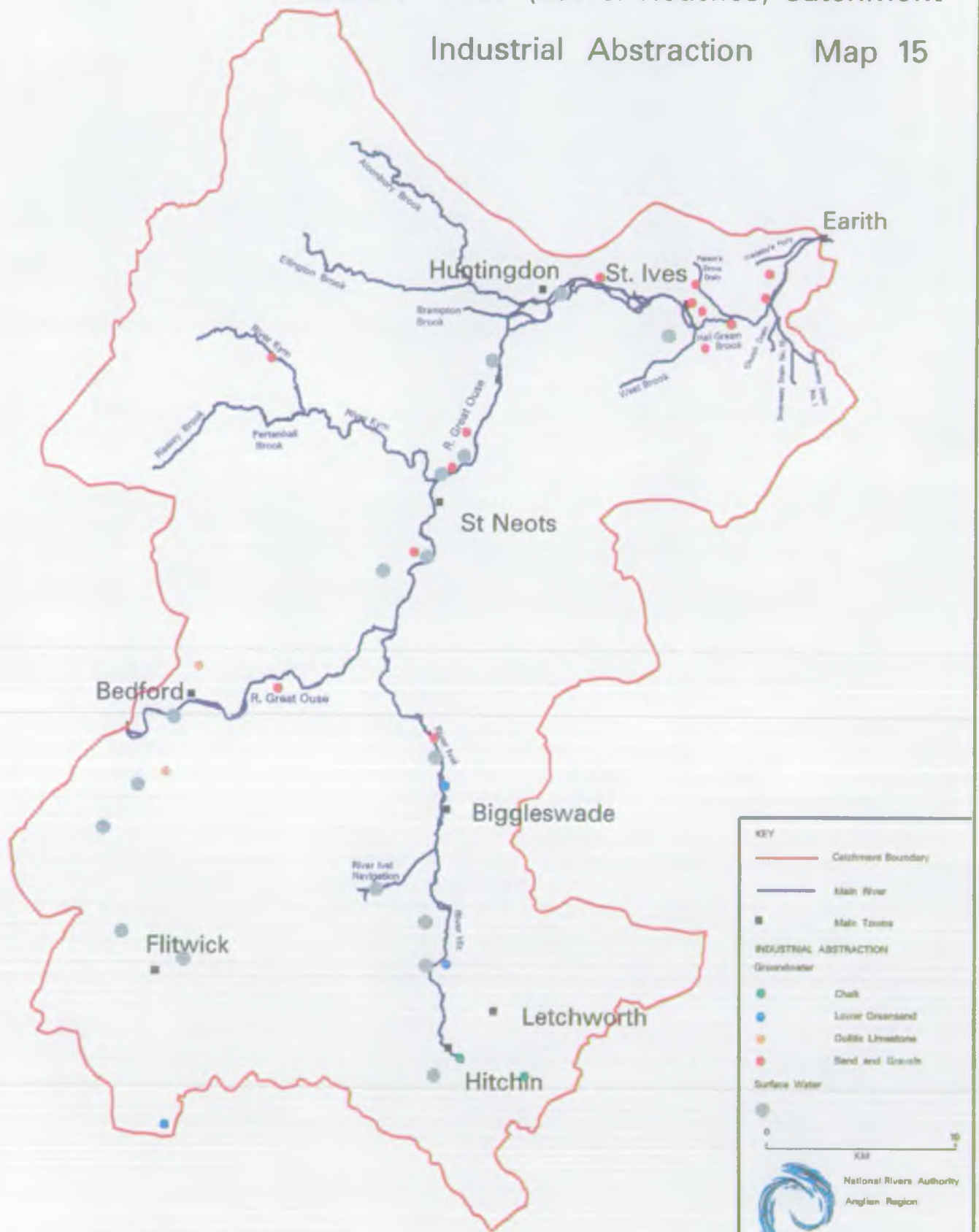
The largest single use of water is for mineral washing plants which are licensed to abstract 7.6 million cubic metres per year, most of this water is returned to source. Cooling water represents the second largest use with just over 6 million cubic metres licensed to be abstracted per year, virtually all of which is returned. Other industrial uses in the catchment include concrete and brick manufacture, brewing, laundry, process water and food processing.

There are 43 licensed industrial abstractors in the catchment abstracting almost 16 million cubic metres per year, 48% of which is derived from surface water sources and 52% from groundwater. Industrial abstraction represents 10% of total licensed abstraction in the catchment, and is the second largest use.

Virtually all of the industrial groundwater abstraction is derived from river and glacial sands and gravels, with the water primarily used for mineral washing. Surface water abstraction is concentrated along the Bedford Ouse downstream of Tempsford where water is abstracted for cooling, mineral washing and electricity generation.

Bedford Ouse (Lower Reaches) Catchment

Industrial Abstraction Map 15



3.9.3 Environmental Objectives

Water Quantity:

- To protect aquifers and surface water from overcommitment and ensure water abstraction does not have an unacceptable effect on the environment.
- To ensure the proper use of water resources
- To conserve water resources for example, by encouraging efficient water use.
- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability

Water Quality

- To meet the water quality criteria set for industrial abstraction
- To prevent abstraction having an adverse impact on water quality

3.10 Raw Water Transfer

3.10.1 General

The NRA has a responsibility to conserve, redistribute, augment and protect water resources and ensure their proper use. It therefore undertakes raw water transfers to redistribute water to areas where there are local deficits. There are raw water transfers between catchments and also within the same catchment, where possible the schemes use existing watercourses to redistribute the water.

3.10.2 Local Perspective

The NRA operates a small transfer of water out of the catchment at Earith into the Old West River, part of the Ely Ouse system, through the penstocks of Hermitage Lock (see Section 3.1). The transfer is undertaken to supplement the Old West River, to retain navigation levels and prevent deterioration in water quality.

Water may also be transferred, under licence, from the catchment at Earith as part of a two stage scheme to provide water to the Middle Level Fen area, which has a very limited natural summer resource. This water is used for irrigation.

To the south, the NRA are currently investigating a scheme where groundwater may be pumped into the River Hiz as part of a scheme to alleviate low flows.

3.10.3 Environmental Objectives

Water Quantity

- To protect aquifers from overcommitment and ensure water abstraction does not have an unacceptable effect on the environment
- To ensure the proper use of groundwater resources
- To conserve water resources, for example, by encouraging efficient water use
- To augment and/or redistribute water resources, where appropriate, to meet water demands to appropriate standards of reliability

Water Quality

- To ensure that pollutants are not transferred from one catchment which could affect the water quality objectives of the receiving system

3.11 Mineral Extraction

3.11.1 General

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 NRA can issue a "Conservation Notice" to the Mineral Extraction Company in order to conserve water in the dewatering process, but these powers are limited, and cannot be used to prevent mineral extraction.

Mineral extraction can affect both groundwater quantity and quality. It can restrict recharge to the sand and gravel strata and divert flow, hence interruption of existing rights to abstract might occur. Subsequent use of mineral extraction sites for landfill also poses a significant threat to groundwater quality.

All County Councils within the catchment have produced Mineral Plans as required under the Town and Country Planning Act 1990, in accordance with Planning Policy Guidance Note 12. The NRA as a statutory consultee, makes representation to any Mineral Plans.

3.11.2 Local Perspective

The majority of sites are found along the main river corridors of the Rivers Ivel and Bedford Ouse. Most of the extraction is from sands and gravels (10 sites); however, there are also three Lower Greensand, one clay and one Fullers Earth quarry.

Demand for aggregates reflects the economic climate. Although the NRA has issued "Conservation Notices" for dewatering at a number of sites in the past there are none which are currently in force.

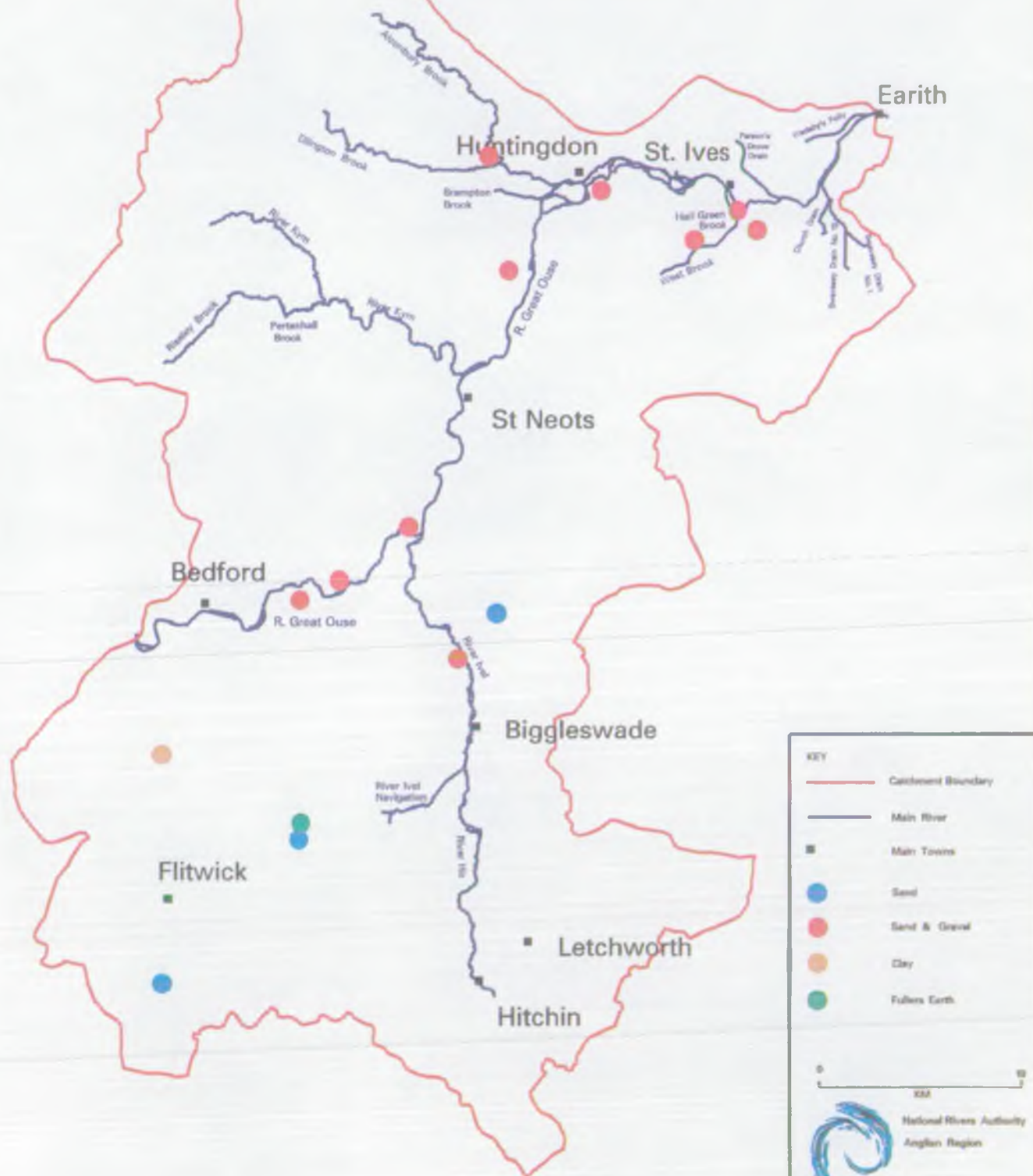
3.11.3 Environmental Objectives

Whenever possible, groundwater reserves must be conserved and protected. Mineral workings must be operated within the guidance given in the NRA's Groundwater Protection Policy.

Water Quality

- No deterioration of groundwater or surface water quality
- Avoid the risk of silting up the river beds

Bedford Ouse (Lower Reaches) Catchment Mineral Extraction Map 16



Water Quantity

- To ensure that dewatering a mineral extraction site does not cause unacceptable effects on surface waters and groundwater resources and to protect the rights of those who abstract water.

Physical Features

- No obstruction to flood flows for those extractions within flood plains both during and after working and following final reinstatement
- No detriment to areas of ecological or archaeological value
- Potential for development to enhance conservation and water based recreation should be maximised

3.12 Fisheries

3.12.1 General

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

Specified fisheries are designated under EC Fisheries Directives which set water quality criteria according to fishery type; either salmonid (salmon and trout) or Cyprinid (coarse fish).

This use covers:

1. Game fisheries; that is the maintenance of breeding populations of salmonid fish species, namely brown trout and sea trout in this catchment.
2. Coarse fisheries; that is the maintenance of breeding populations of coarse fish species.

3.12.2 Local Perspective

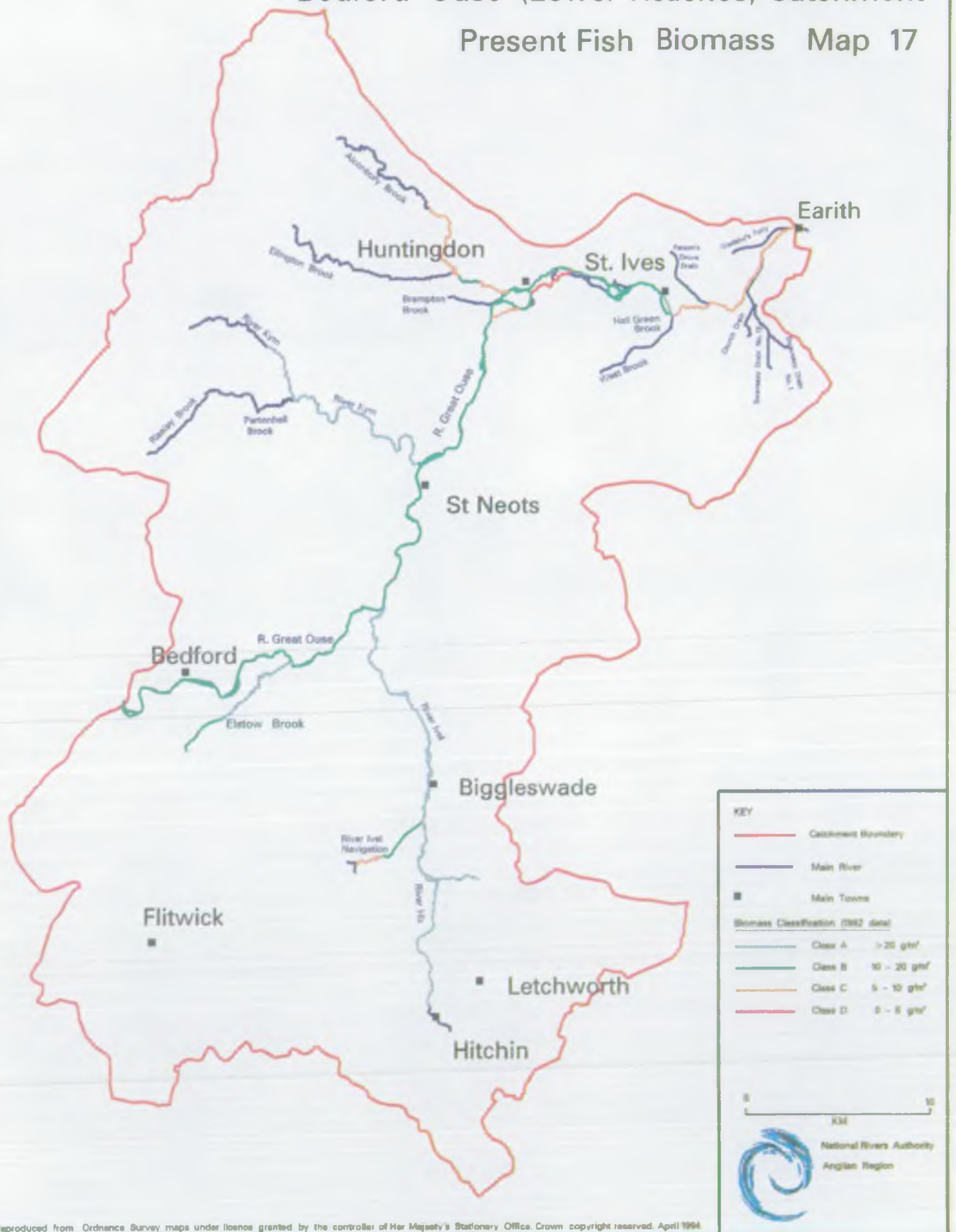
In order to monitor fish stocks the NRA undertakes fish population surveys on all its important river fisheries on a three year rolling programme. The extensive data collected on fish populations allows the fisheries to be classified on a scale of A to D dependent on biomass estimates.

The principal coarse fishery in this area lies with the main navigable sections of the Ouse and its main tributary the River Ivel. Between Bedford and St Ives the Main River supports a good class 'B' biomass fish population dominated by roach, bream and pike although the biomass drops to a moderate to poor class 'C' between St Ives and Earith. The catchment supports a good species diversity with 29 species of fish recorded.

The River Ivel supports an excellent class 'A' biomass category fishery and is important for roach, chub, bream and pike.

A number of tributaries enter the Bedford Ouse, such as the Elstow Brook, River Kym and Alconbury Brook and these provide important production areas for species such as chub and dace. There are also a considerable number of backwaters to this section of the Bedford Ouse such as the New Cut, the Lees Brook and the Cook's Backwater which form important habitat diversity.

Bedford Ouse (Lower Reaches) Catchment Present Fish Biomass Map 17



The upper sections of the River Hiz show characteristic Chalk stream features and have historically supported a small breeding population of brown trout. A small number of migratory salmonids have been recorded in the Bedford Ouse with sea trout being caught as far upstream as Offord, although the majority of reports are from the Brownhill and St Ives area, including a 14lb salmon taken by a pike fisherman in 1990. It is likely that the majority of these fish are strays with little suitable habitat for salmonid recruitment.

The following sections of river are designated under the EC Fisheries Directive.

Cyprinid:

- Bedford Ouse Kempston to Bedford Sewage Treatment Works 9.7km
- Bedford Ouse Godmanchester to Earith 21.4km
- Elstow Brook Harrowden to River Great Ouse confluence 5.5km

All of these stretches comply with the requirements of the Directive.

3.12.3 Environmental Objectives

The overall objective is to sustain a natural fish population appropriate to the catchment and achieve a biomass Class 'A' fish population. It is however recognised that this level of population will not be achieved in some small river channels where habitat is limiting.

Water Quality

- To ensure that the requirements of the EC Fisheries Directive continue to be achieved.
- To comply with water quality objectives for fisheries in other appropriate stretches.

Water Quantity

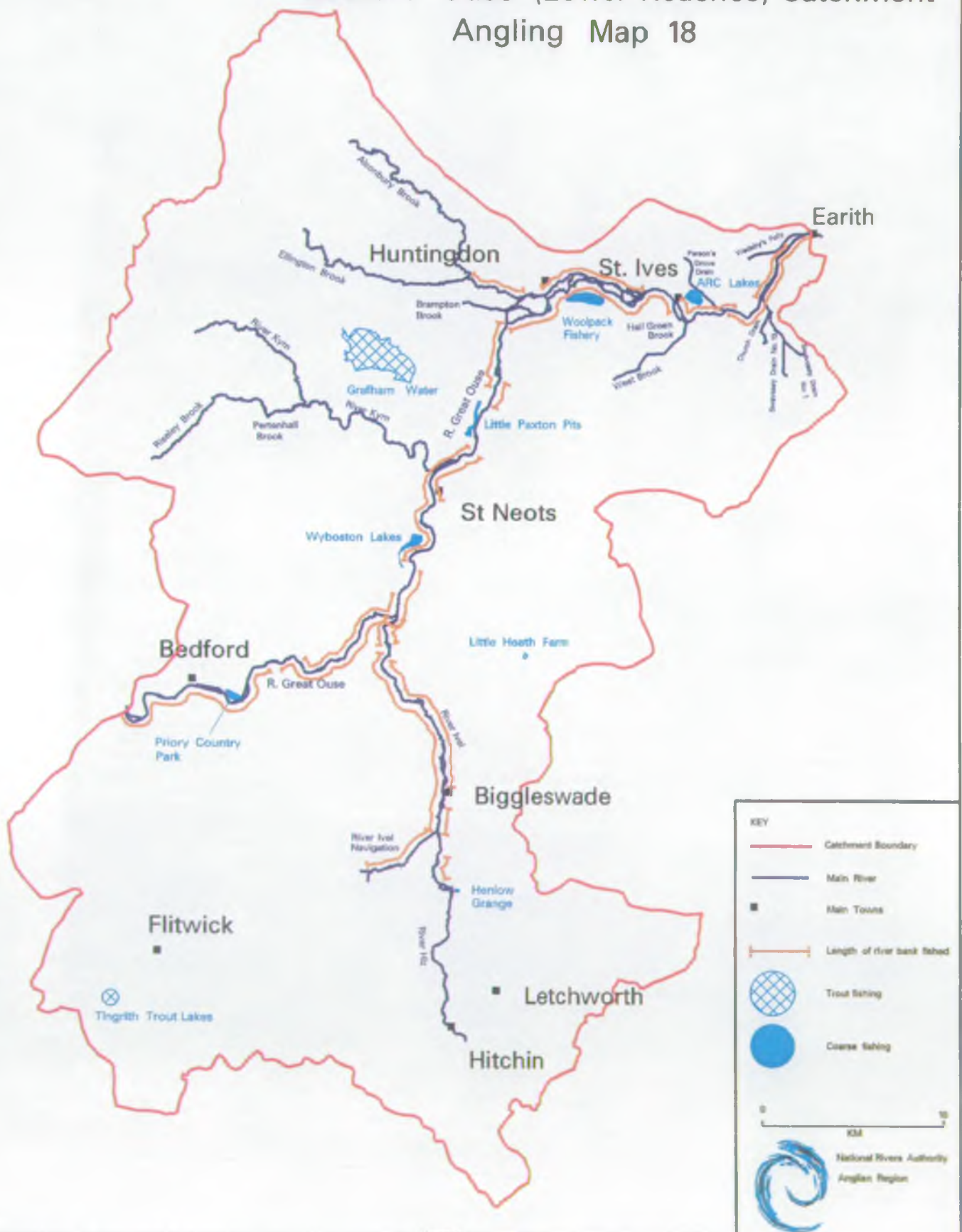
- To maintain a flow regime to meet the "in river needs" identified for fish species native to the catchment.

3.12.4 Physical Features

Maintain and enhance habitat diversity to improve fish production and where possible manage river levels and flow regimes in a manner sympathetic to instream environmental needs.

Balance the need for instream weed control between flood defence, navigation and angling and the ecological benefits of instream plants.

Bedford Ouse (Lower Reaches) Catchment Angling Map 18



3.13 Angling and Commercial Eel Fishing

3.13.1 General

This relates to the recreational and commercial use of the fishery.

3.13.2 Local Perspective

This catchment supports an important riverine coarse fishery on both the main Bedford Ouse and the River Ivel. There are in excess of thirty angling clubs with water available for fishing by both pleasure and match anglers.

The most popular species for anglers on the Bedford Ouse is roach although localised shoals of common bream can provide some very big catches. Some of the tributaries of the Main River and backwaters where gradient is sufficient to preserve a riffle-pool sequence provide important fisheries for chub and dace and these include the New Cut, the River Kym, the Alconbury Brook, the Lees Brook and the St Ives Chub stream. The main Bedford Ouse is a popular venue for winter pike fishing and occasional zander are also taken.

Former gravel extraction sites along both the Ouse and Ivel valleys have created a maze of lakes providing a diversity of angling opportunities in these stillwaters. Gravel-pit complexes of note for coarse fishing include Little Paxton Pits, Wyboston Lakes, Woolpack Fisheries, ARC Lakes at St Ives and Henlow Grange Lakes near the River Ivel.

Stillwater fishing for brown and rainbow trout is available at a number of lakes including Tingrith Trout Fishery near Milton Keynes, Little Heath Farm Sandy, and reservoir trout fishing takes place on the internationally famous 1,500 acre Grafham Water. Reference can be made to the Eastern Council for Sport and Recreation's report "Enclosed Waters and Water Sports in the Eastern Region (1993)".

Commercial eel fishing using dutch fyke nets occurs at a very low level in this catchment on the River Ivel and Bedford Ouse and this activity is carried out principally between April and October.

Within the catchment there are a number of facilities for anglers with disabilities, and these include the London Angling Association's water at Portholme Meadow on the Bedford Ouse and the Manderson Trust for the Disabled lakes at Over.

3.13.3 Environmental Requirements

To protect and enhance fish stocks and to maximise access to NRA owned fisheries where this does not conflict with other users.

3.13.4 Environmental Objectives

Water Quality

- To comply with the appropriate use related water quality objective. This should be salmonid fishery quality where breeding trout populations occur and cyprinid fishery in other areas.
- To ensure that the requirement of the EC Fisheries Directive continue to be achieved.

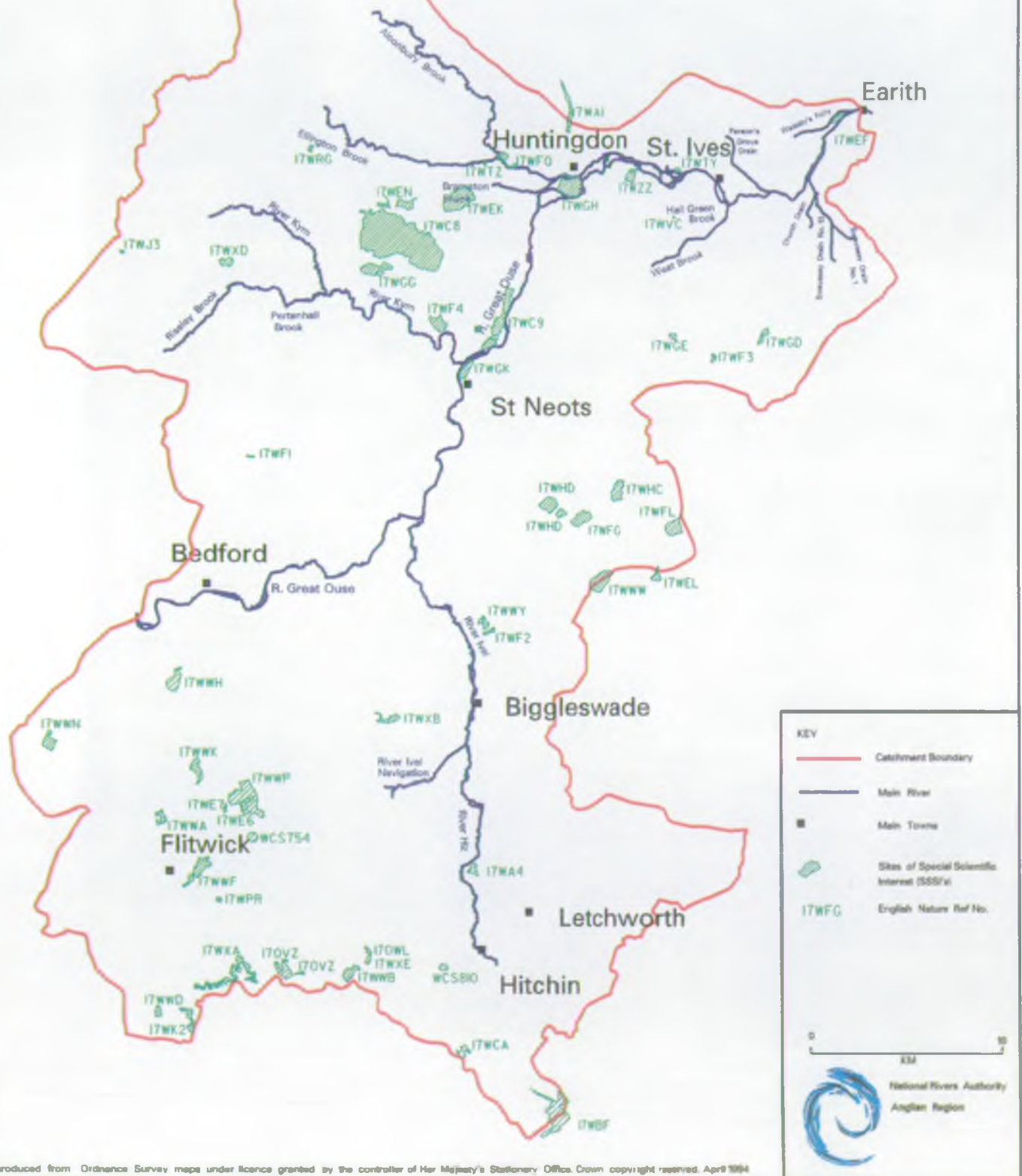
Water Quantity

- Sufficient to ensure the long term viability of all fish species native to the catchment.
- Sympathetic control of river flow and level at operational structures.

Physical Features

- Maintain and enhance habitat diversity to maximise angling opportunities.
- Maintain suitable access for anglers to NRA owned fisheries.

Bedford Ouse (Lower Reaches) Catchment SSSI's Map 19



3.14 Conservation - Ecosystem

3.14.1 General

This use relates to the protection of flora and fauna both within the river corridor and in sites of conservation value which are wetland dependent. These areas will support a range of plant and animals ranging from those species wholly dependent on open water to species which simply exploit river corridors and wetlands as relatively natural 'wild' places.

The maintenance and enhancement of species diversity in these areas will depend on the future management regimes. The NRA has a statutory duty to further the conservation of flora and fauna when carrying out its duties, and will assess the likely impact of these activities before work is carried out.

In addition to general conservation duties the NRA is specifically required to consult outside organisations where NRA work or consent is likely to impact on sites of high conservation value such as National Nature Reserves and Sites of Special Scientific Interest (SSSI).

The conservation demand for water consists of two elements; the level and flow needed to maintain wetland sites of interest and the "in river needs".

The wetland sites exist where the geomorphology, geology and land use allow a concentration of surface and groundwater flows and levels. The proportion of these contributing factors will vary for each site and hence this adds to the complexity of the study of wetlands. The area of groundwater contributing to the wetland site can be defined as the wetland catchment area. Therefore the NRA will seek to protect wetland sites of conservation interest by controlling future abstraction from boreholes within the wetland catchment area.

In terms of ecosystem conservation the "in river needs" can be defined as the flow, level and quality of water necessary to satisfy:-

- a) the aquatic and riparian communities;
- b) the requirement for effluent dilution; flushing of silt.

Extensive ecological and hydrological studies are required to define the existing ecology of the river system and to establish the minimum water level, flow and quality required to maintain the system.

3.14.2 Local Perspective

The main Bedford Ouse river throughout the section covered by this plan is navigable, and is characterised by 'ponded' reaches within which water levels are controlled by sluices and weirs. The effect of ponding is to create areas of silt or sand deposition, and although there are some of clean gravel, notably between St Ives and Brownhill Staunch, lack of shallow gravel riffles influences the distribution of certain plant, invertebrate and fish species.

Another important feature of this section of the Bedford Ouse is the presence of backchannels which, because of their different physical characteristics and the paucity or absence of boat traffic, often support distinctly different plant, invertebrate and fish communities than those found in the main river. The backchannels can be classified broadly into two categories; those which are fed via a fixed weir and flow between adjacent river reaches and those which have an open connection at each end to the same river reach. These differing configurations can significantly affect their ecology. Backwaters which are fed via a fixed weir frequently have a steeper gradient than the adjacent main river and therefore contain gravel riffles, glide and pool areas. Examples of this type of backchannel are to be found on Lees Brook, Houghton Trout Stream and the St Ives chub stream.

The backwaters which are open at both ends to a single reach generally share a very similar gradient to that found on the adjacent main river and therefore lack the erosive features such as riffles and pools. They do however often support a very diverse aquatic plant community. Cooks Backwater between Godmanchester and Hartford is a prime example of this backchannel type.

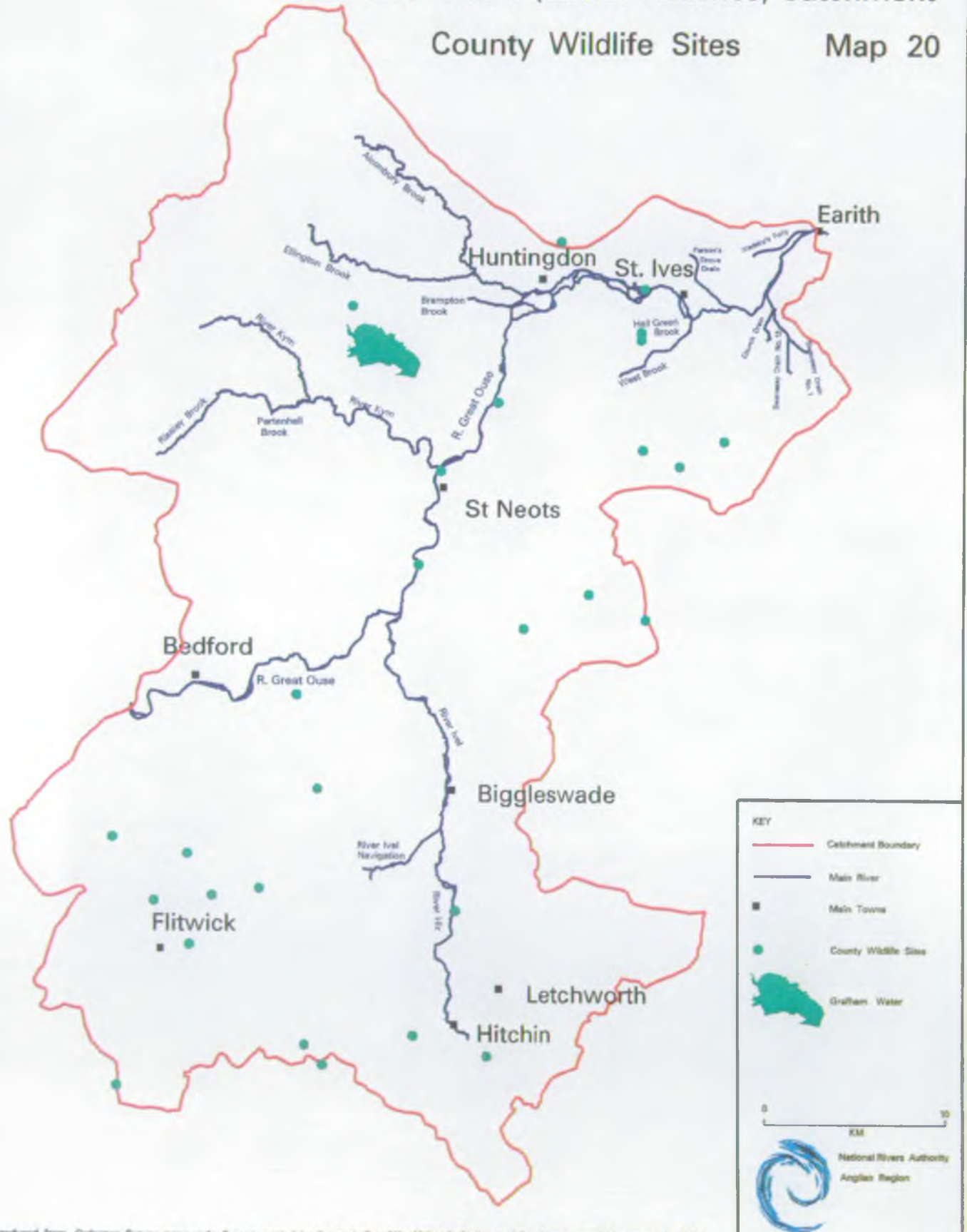
The flood plains of the Bedford Ouse support large areas of grassland and these form a dominant feature of the landscape below the town of St Neots. The areas of floodplain grassland contribute significantly to the habitat value of the river corridor, particularly the unimproved grassland of the Port Holme Meadow SSSI and the Godmanchester Meadow SSSI. Both of which support a wide diversity of plant and invertebrate species and are fine examples of a river flood meadow.

The largest tributary of this section of the Bedford Ouse is the River Ivel. The River Ivel rises in Hertfordshire as a chalk stream and then flows approximately northerly to its

Bedford Ouse (Lower Reaches) Catchment

County Wildlife Sites

Map 20



confluence into the main river at Tempsford. The River Ivel is in many ways similar to the middle reaches of the Bedford Ouse being often tree fringed, flowing through arable land and extensive floodplain grassland. The River Ivel has also been designated as a linear country park by Bedfordshire County Council, this designation will provide opportunities for enhancement to both the conservation and recreational aspects of the Ivel valley.

The other significant tributaries are the River Kym and Alconbury Brook. Both are similar in that they drain areas of heavy clay land used primarily for arable agriculture. As is commonly found in such situations, the river channels are very large in relation to their summer flow, giving the impression of an overwidened river. The habitat diversity and overall ecological value of these rivers is generally lower than that of the main river.

In addition to the interest within the river corridor the catchment also contains a number of SSSI's. Including those previously mentioned the catchment total is 53 SSSI's, 31 of which are wetland dependent.

Grafham Water reservoir is the largest SSSI site in the catchment, and is noted for its large numbers of overwinter bird species. The site is also an important recreational area. Another important wetland site is Flitwick Moor, a 50 hectare remnant area of valley mire and the largest wetland SSSI in Bedfordshire.

The catchment also contains a large number of County Wildlife Sites and Local Nature Reserves. In total there are some 31 County Wildlife Sites and a number of Local Nature Reserves. The Cambridgeshire and Bedfordshire Wildlife Trust are active in the management of many of these sites as well as a number of SSSI sites in the catchment.

3.14.3 Conservation Objectives

Water Quality:

- All rivers to comply with the relevant use-related standard.
- Water quality should be maintained or improved to ensure that sensitive ecosystems do not deteriorate particularly where notable aquatic invertebrate communities are known to occur.

- Groundwater quality should not deteriorate to a level where the conservation value of wetland SSSI sites is adversely affected.
- To ensure that water quality does not adversely affect the general conservation value of watercourses, and to prevent any deterioration in water quality which could in any way affect special conservation areas.

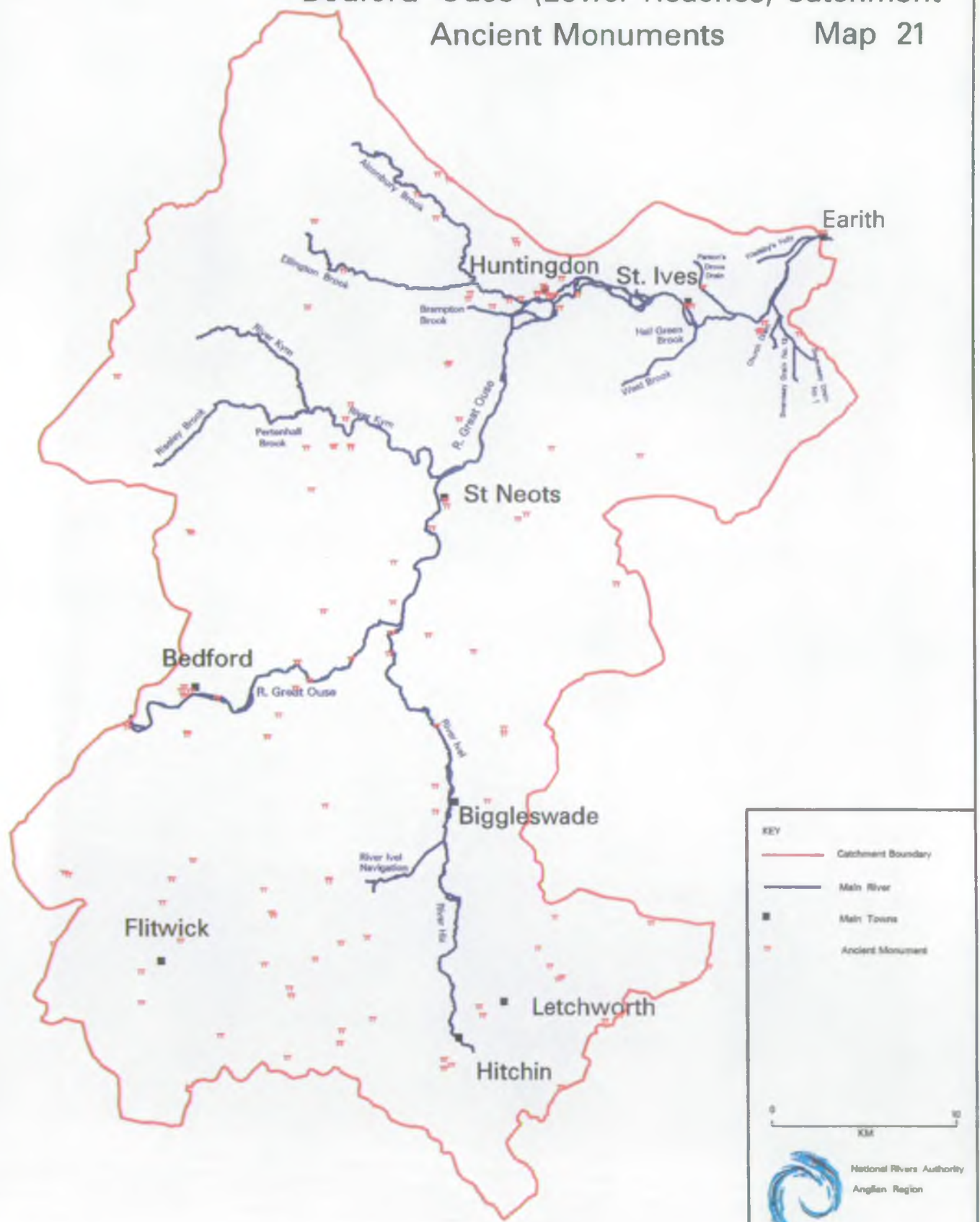
Water Quantity:

- To protect aquifers and surface water from overcommitment and ensure water abstraction does not have an unacceptable effect on the environment.
- To identify the river flow regime necessary to satisfy the "in river needs" of the catchment.
- To ensure that the "in river needs" are satisfied if necessary by the augmentation and redistribution of water resources.
- To investigate wetlands in order to understand their vulnerability to abstraction and define wetland catchment areas.

River Physical Features:

- The maintenance and enhancement of habitat diversity within the river corridor. Features such as riffles/pools, meanders, river margins, adjacent wetlands and bankside trees all contribute to the diversity and therefore conservation value of the river corridor.
- The channel cross section should be appropriate for the prevailing flow regimes of the river.

Bedford Ouse (Lower Reaches) Catchment Ancient Monuments Map 21



3.15 Conservation - Landscape and Archaeology

3.15.1 General

The NRA has a statutory duty to conserve and enhance landscape and archaeological features associated with water.

This includes specific duties with respect of areas formally designated as being of value, e.g Areas of Outstanding Natural Beauty and Scheduled Ancient Monuments. In addition, the NRA also has a general duty to protect areas which although valuable in landscape or archaeological terms are not formally protected.

3.15.2 Local Perspectives

Within the catchment there are 136 sites designated as Scheduled Ancient Monuments (SAM's). In addition to scheduled sites, there are a number of other county sites which are recognised as being of archaeological value.

The archaeological sites most affected by the work of the NRA are those sensitive to changes in groundwater level. This is particularly important where reduced water table results in drying out at foundation level.

River valleys form an important component of the landscape and the aesthetic as well as the ecological value of these areas is considered when assessing the impact of any NRA activity. Between the towns of Bedford, St Neots, Huntingdon and Earith, the Bedford Ouse valley is characterised by a matrix of grassland flood meadows, arable areas on the higher ground. there are also a significant number of gravel pits, some active with others, of value to conservation and recreation. It is however the flood plain grassland with tree lined river banks and field boundaries which form the classic lowland river landscape in the Bedford Ouse valley.

3.15.3 Environmental Objectives

To protect the landscape and archaeological features associated with rivers in the catchment and to safeguard the special interest for which sites have been designated.

Water Quantity:

- To have due regard of the water requirements of archaeological features.

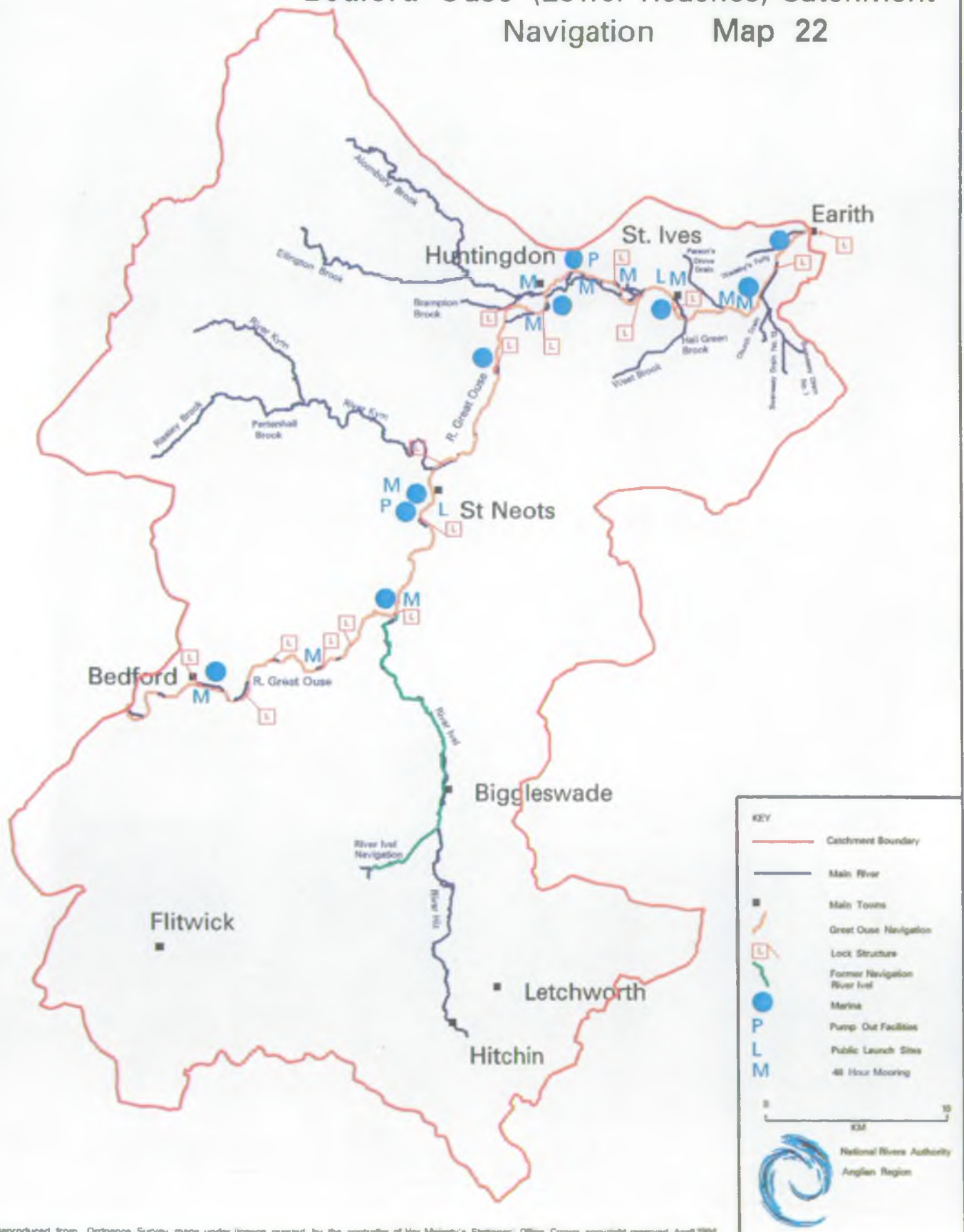
Water Quality:

- All rivers to comply with the relevant use related standard.
- To ensure that water quality does not adversely affect the landscape and archaeological value of land adjacent to watercourses.

Physical Features:

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

Bedford Ouse (Lower Reaches) Catchment Navigation Map 22



3.16 Navigation

3.16.1 General

NRA are the navigation authority on all public navigations within this catchment. The legal framework under which these powers are exercised are given in the Anglian Water Authority Act of 1977. Recreational Byelaws are also made under this act to regulate matters such as boat registration, boat safety and speed limits.

The NRA acknowledge the Zone One Strategy Report for Water Recreation which was produced by the Eastern Council for Sport and Recreation.

3.16.2 Local Perspective

The following length of river within the catchment is defined in Schedule 1, Part III of the Anglian Water Authority Act, 1977 as a recreational waterway and for which the NRA is the navigation authority:-

"The River Gt Ouse, also known as the Bedford Ouse, from the Hundred Foot River in the Parish of Earith to Kempston Mill in the Parish of Kempston Urban in the District of Bedford in the County of Bedfordshire".

Navigation on the Bedford Ouse developed during the mid to late 17th Century, reaching Bedford in 1689. The river continued to carry commercial traffic, almost uninterrupted until the early 20th Century when navigation above St Ives ceased. From 1932 onwards a combination of the Gt Ouse Catchment Board and subsequent authorities, with the Gt Ouse Restoration Society re-established navigation reaching Bedford in 1978.

Today the Bedford Ouse is a popular recreational waterway. In 1992-93 a total of 3210 craft were registered on the river. The river falls approximately 20 metres through 15 lock structures between Bedford and Brownhill Stauch, a distance of some 61 km. Downstream of Brownhill Stauch the river is tidal.

The size of craft which can navigate the Bedford Ouse will vary to a degree according to the prevailing river conditions. At normal river levels the maximum size of craft would be no more than:

Length	80 ft (24.6m)
Beam	13 ft (4m)
Draught	3 ft (0.9m)
Headroom	6½ ft (2m)

The principal headroom limitations are at Offord road bridge (2.46m), Bedford railway bridge (2.29m) and Bedford foot bridge (2.13m). Minimum draught is at the St Ives lock cill level of 0.9m, a similar cill level is also found at Hemingford.

There are eighteen marinas on the Bedford Ouse, the largest being located at Needingworth, St Ives, Hartford and Buckden.

None of the tributaries in this catchment is currently navigable. The River Ivel however was once navigable to Shefford, but following a relatively short period of use in the mid 19th Century, navigation was closed in 1876.

3.16.3 Navigational Requirements

To take due regard of the Eastern Council for Sport and Recreation Regional Strategy for Water Recreation, Zone One Report on the Gt Ouse and its Associated Waterways.

- to develop and implement an NRA navigation strategy taking account of other navigation authorities views.
- to enforce navigation statutes and byelaws and to regulate through a consistent series of licences.
- to seek to recover from users, as far as practicable, the specific identifiable costs of providing navigation facilities.
- to undertake programmes of repair and maintenance on NRA navigation.
- to achieve optimal use of NRA navigation and consider the need for the NRA to seek under S158(2) of the Water Act 1989 to make navigation byelaws for waters where it is not otherwise the statutory navigation authority.

3.16.4 Environmental Objectives

Water Quality:

- To promote and encourage with external bodies provision of pump out facilities at strategic locations.

- To promote, with British Waterways and Inland Waterways Association, boat safety standards to meet present day environmental needs.
- To ensure that litter collection requirements as legislated within the Environmental Protection Act 1990 are carried out.
- To ensure that weed cutting operations during summer months meet environmental needs and legislative requirements.

Water Quantity:

- To maintain river retention levels to at least as good a standard for the purpose of navigation as that to which they were maintained in the period of nine months immediately preceding 8th December 1975.

3.16.5 Physical Features:

- Maintain depth of water at navigation level and allow permissible headroom at bridges.
- Maintain existing public launching sites.
- Provide short stay moorings.

3.17 Boating and Immersion Sports

3.17.1 General

This use deals with water based recreational activities, such as sailing, canoeing, rowing, water skiing and swimming. The NRA acknowledges the existence of the Zone One Strategy Report for Water Recreation, prepared by the Eastern Council for Sport and Recreation.

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

3.17.2 Local Perspective

Water based recreation is well catered for within this section of the Bedford Ouse catchment. In addition to the Navigation, Angling and Recreation activities outlined in other parts of this report, the large number of former gravel pits offer a variety of other sports.

Sailing on the river is to a degree limited by frequent locks and bridges, but enclosed water sailing takes place at a number of sites, including Grafham Water, St Ives, Stewartby, Priory Lake, Wyboston, Little Paxton, and Hinchingsbrooke. Similarly, windsurfing takes place on a number of enclosed waters, notably Grafham Water.

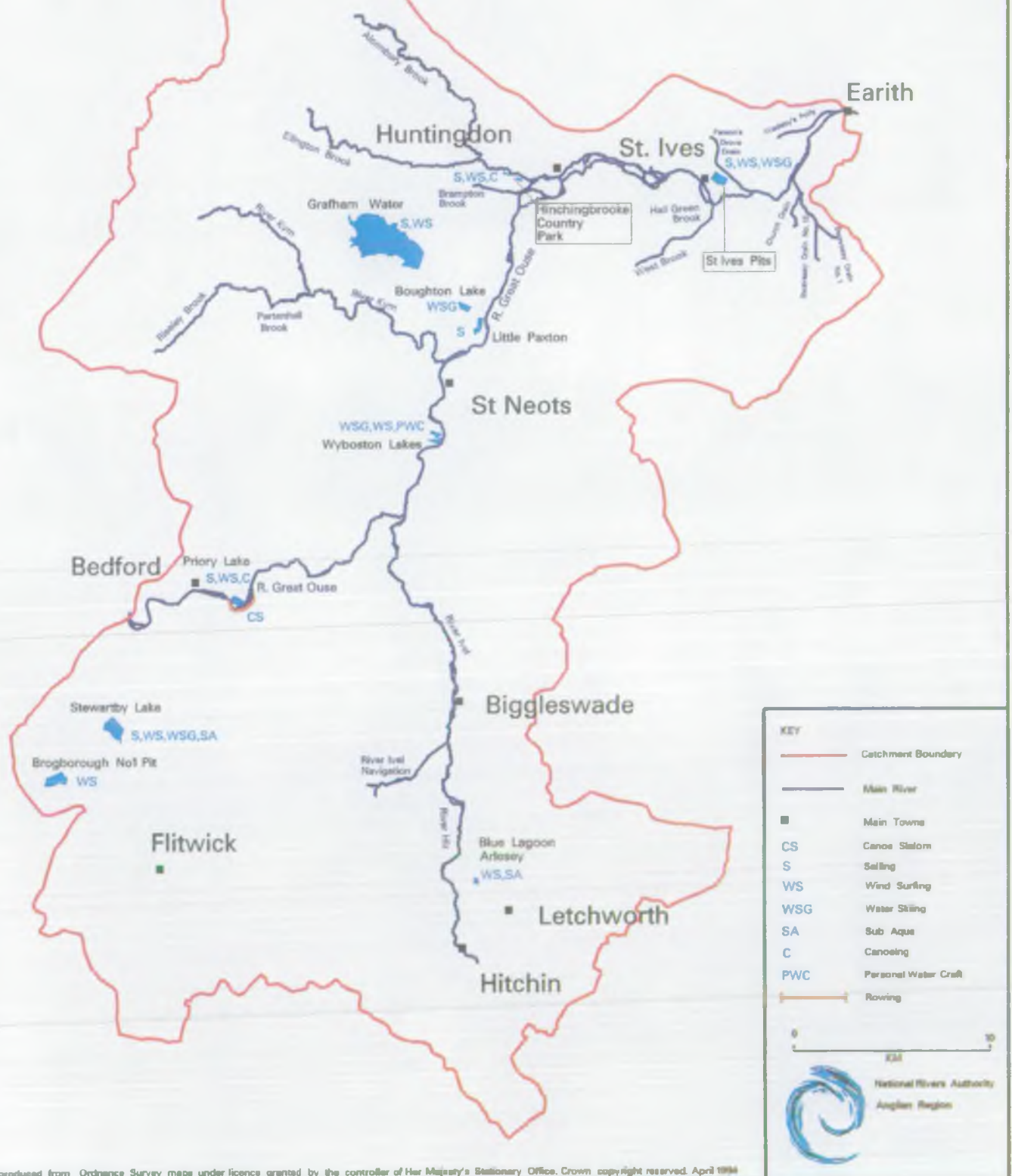
The rivers are used extensively by canoes and the catchment contains a number of canoe clubs as well as scout and school groups. The purpose built Cardington canoe slalom near Bedford provides competition facilities within a man made channel with a controllable flow rate.

Also in Bedford are a number of rowing clubs which hold events for all classes through the Bedford Town section.

Speed restrictions on the river mean that all powered-craft sports take place off river. Water skiing takes place at Stewartby, Brogborough, Wyboston, Arlesey, Southoe (Lt Paxton) and St Ives. Personal water craft, e.g jet ski, activity is again centred on old mineral pits at Wyboston.

Sub Aqua is one of the less common sports associated with water recreation and in this catchment takes place at Stewartby and Arlesey.

Bedford Ouse (Lower Reaches) Catchment Boating And Immersion Sports Map 23



A study ("Enclosed Waters and Water Sports in the Eastern Region (1993)") commissioned by the Eastern Council for Sport and Recreation in 1993 showed participation in water based recreation was above the national average in East Anglia and the South East. The report also concluded that mineral working will continue to provide the principal opportunities for the development of water sport venues. Given the large number of potential sites within this catchment it is likely that there will be continued development of facilities along the Bedford Ouse valley.

3.17.3 Environmental Requirements

To maintain and where desirable promote the recreation use of waterways, so as to:

- (i) Safeguard those involved in immersion sports.
- (ii) Provide suitable conditions for all water based recreational activities.

3.17.4 Environmental Objectives

To maintain water quality, water resources and river conditions so as to:

- Protect those involved in immersion sports.
- Provide suitable access and conditions for these activities.

3.18 Recreation and Amenity

3.18.1 General

This use deals with recreational and amenity facilities such as walking, horse riding, caravanning and camping, tourism and sites of interest within the water environment and on land owned by the NRA. Navigation, boating and angling are all major recreational activities and are covered elsewhere in this plan.

3.18.2 Local Perspective

All of the local authorities within the catchment promote tourism, much of which is indirectly linked to the water environment. There are many sites throughout the catchment attracting visitors which have historical and archaeological links with the river system.

There are many opportunities to gain access to the Bedford Ouse, and to an extent the River Ivel, via a comprehensive network of footpaths. Largest of these, in terms of river access, is the Ouse Valley Way. Promoted by Huntingdonshire District Council and the Countryside Commission, the Ouse Valley Way runs from Eaton Socon to Earith, a distance of 26 miles.

Riverside camping and caravan sites are available at St Neots and Houghton.

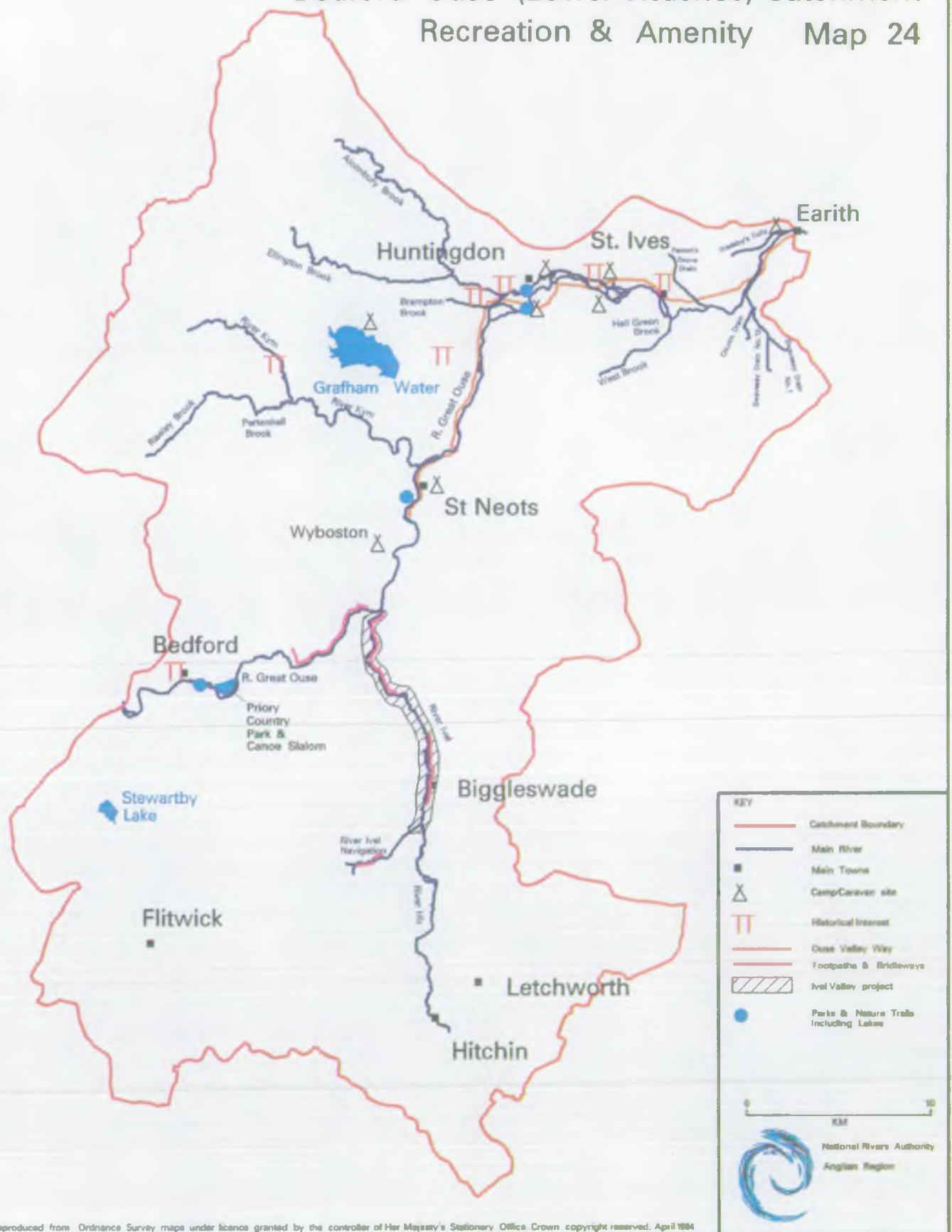
Grafham Water is one of the major multi-recreation centres within the catchment, in addition to angling, sailing and board sailing, Grafham Water also offers footpaths, nature trails, bird watching and picnic areas. Another prime site for birdwatching is the nearby Little Paxton pits, the site is managed as a Local Nature Reserve and lies on the Ouse Valley Way footpath.

Informal recreational opportunities such as short riverside walks, picnics, etc, are available at any of the riverside parks at Bedford, St Neots, Godmanchester and Huntingdon.

Other areas of interest include:

- The Three Shires Way footpath, in the West of the catchment.
- Priory County Park, Bedford - walking, angling and boating.

Bedford Ouse (Lower Reaches) Catchment Recreation & Amenity Map 24



- Cromwell Country - Huntingdon and St Ives, including historic river bridges in both towns.
- Houghton Mill, a river mill upstream of St Ives and owned by the National Trust.

3.18.3 Environmental Objectives

- To develop the recreational and amenity potential of NRA land, either directly or in association with outside bodies.
- To develop with outside bodies opportunities for water based recreation on land not owned by the NRA.
- To maintain water quality, water resources and the river condition so as to provide a suitable environment for recreation and amenity.

4. CATCHMENT OBJECTIVES

4.1 Surface Water Quality

Historically, river quality in Anglian Region has been assessed against a variety of criteria.

- a) Compliance with relevant EC Directives
- b) Compliance with regionally derived River Quality Objectives - RQOs
- c) National Water Council (NWC) target classes (See Appendix 3).
- d) Biological target classes (see Appendix 5)

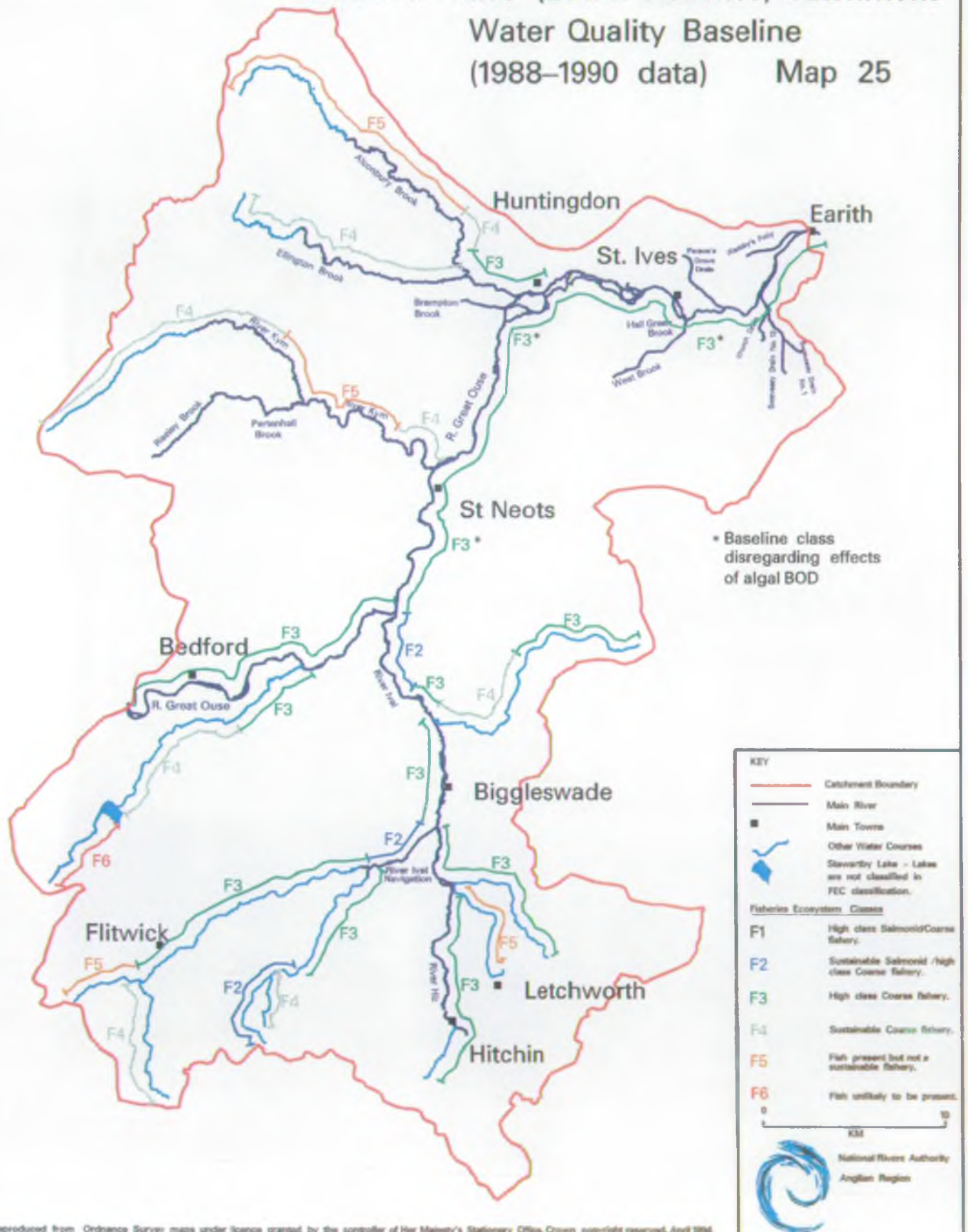
EC Directives set standards for relevant parameters which the directives seek to control, for example the Surface Water Directive (abstraction for drinking water) and the Fisheries Directive (protection of fish). The government is responsible for ensuring compliance with these standards.

In order to ensure that EC Directives are met and that water quality is maintained and where necessary improved, the Department of the Environment has published proposals for a statutory scheme of water quality objectives. This is based on recommendations from the NRA.

The scheme sets out the water quality requirements for various river uses:

- a) Fisheries Ecosystem (FEC)
 - Class 1: High class salmonid/coarse fishery
 - Class 2: Sustainable salmonid/ high class coarse fishery
 - Class 3: High class coarse fishery
 - Class 4: Sustainable coarse fishery
 - Class 5: Fish present but not a sustainable fishery
 - Class 6: Fish unlikely to be present
- b) Abstraction for Drinking Water Supply
- c) Industrial/Agricultural Abstraction
- d) Special Ecosystem
- e) Water Sport Activity
- f) Relevant EC Directives

Bedford Ouse (Lower Reaches) Catchment Water Quality Baseline (1988-1990 data) Map 25



The DoE have produced draft regulations for only the Fisheries Ecosystem Classification at this time. A summary of this is given in Appendix 4.

The Fisheries Ecosystem Use represents levels of water quality able to support not just fish, but other river life on which they depend. It does not directly relate to the actual presence or absence of any particular species of fish.

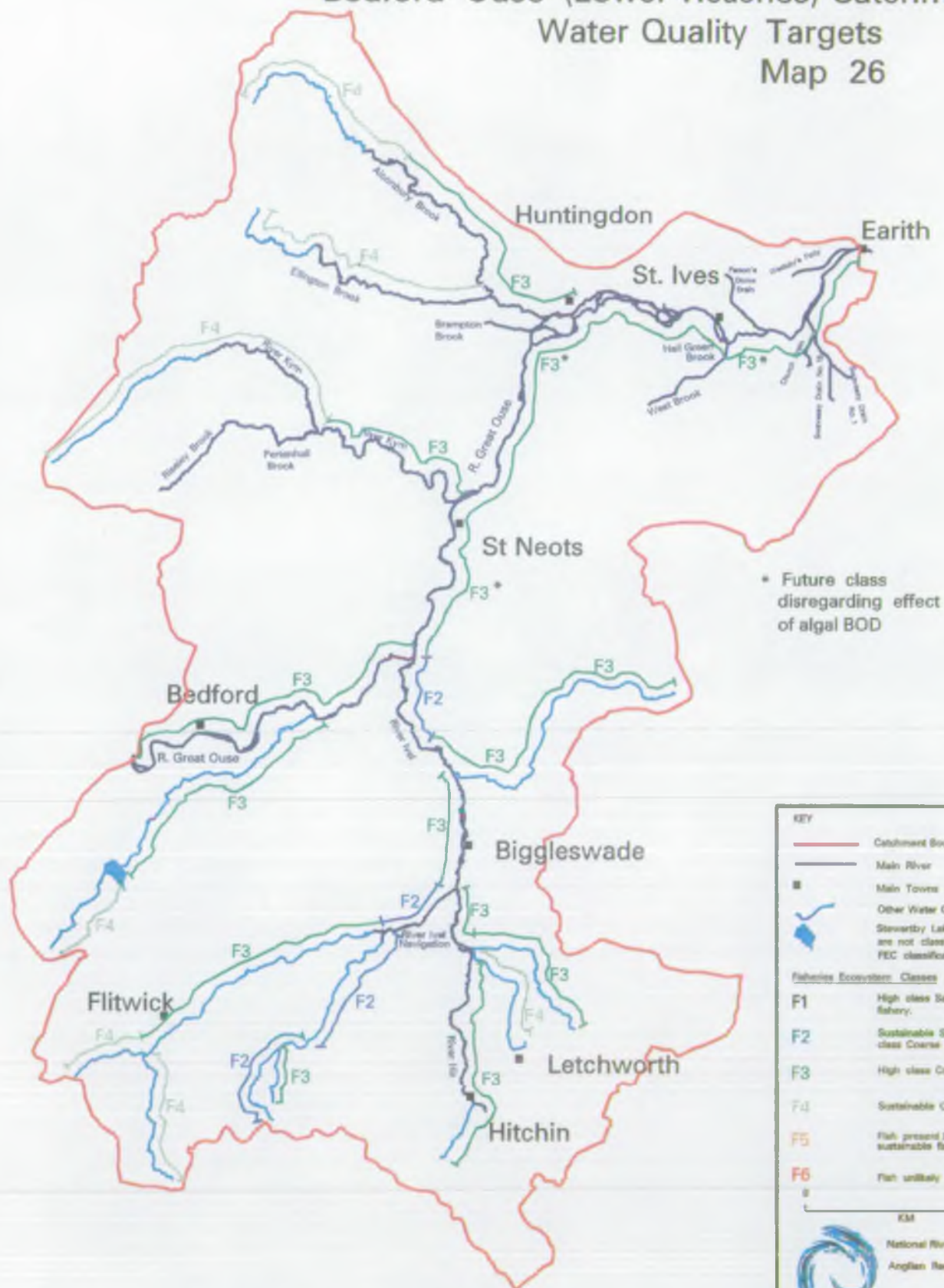
To enable long term trends in water quality to be identified, a reference point or baseline is needed. To establish this an assessment has been made using data from the routine monitoring programme. A three year period (1988-1990 calendar years) has been taken to minimise the risk of producing an unrepresentative baseline. The map opposite shows the river quality baseline for FEC's.

The NRA's proposals for target FEC's in the Catchment are shown on the accompanying map. The timescale for improvements to reach these targets will be considered within a framework of regional and national priorities. Only those rivers which appear in the National Water Council survey have been included at present; other rivers will have local water quality objectives applied.

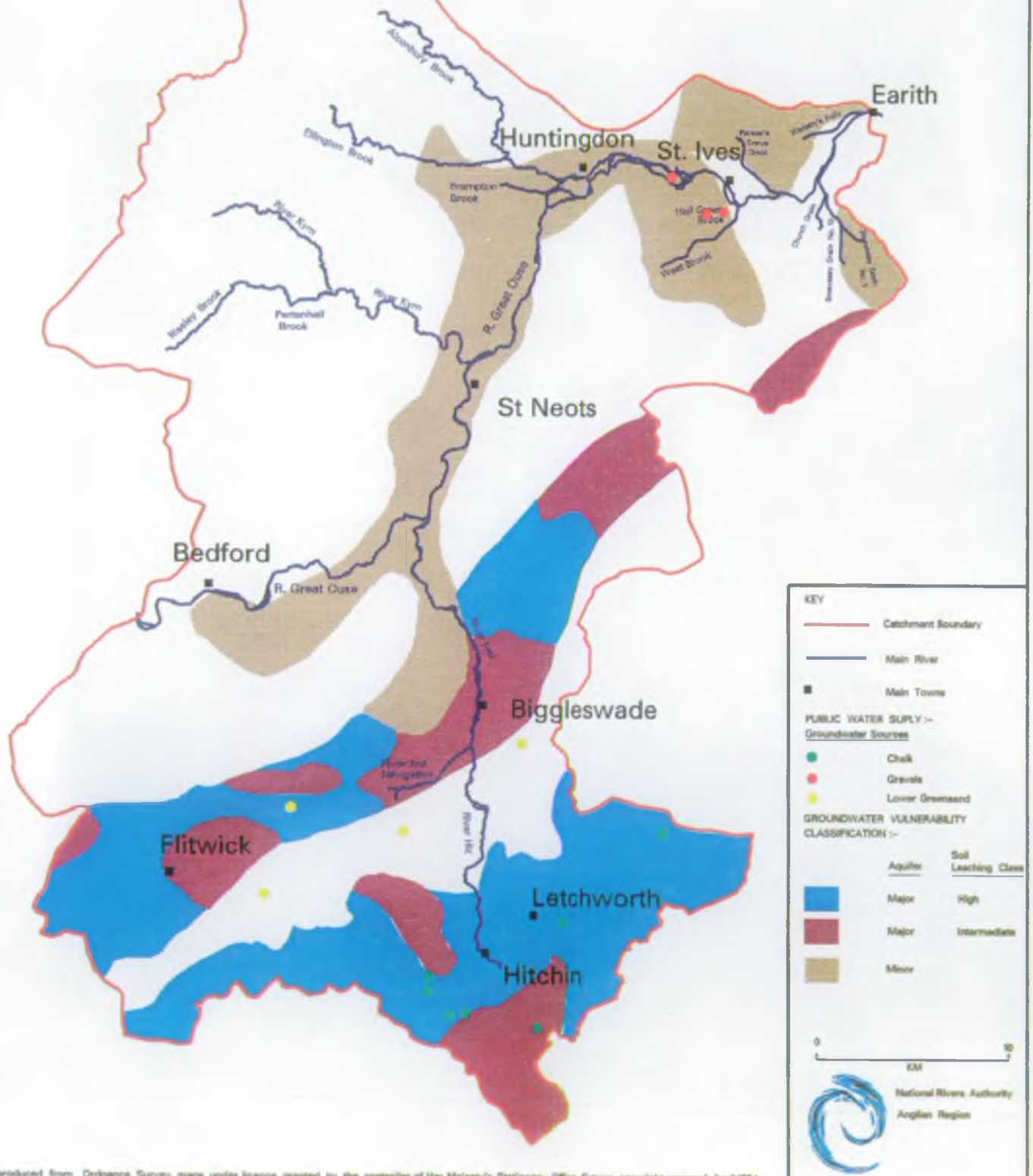
The agricultural abstraction classification, which will apply to stretches of river, the classifications for drinking water and industrial use will apply only at the point of abstraction. The criteria for Special Ecosystem and Water Sport Activity are not yet fully developed and hence there are no detailed proposals for these uses at present.

The classification will only become statutory following designation by the Secretary of State for the Environment, and will be introduced on a catchment basis.

Bedford Ouse (Lower Reaches) Catchment Water Quality Targets Map 26



Bedford Ouse (Lower Reaches) Catchment Outline of Groundwater Vulnerability Zones Map 27



4.2 Groundwater Protection

4.2.1 General

There are at present no general criteria for assessing groundwater quality. Where water is abstracted for potable supply many of the parameters in the EC Drinking Water Directive are used. However, in December 1992 the NRA introduced its Groundwater Protection Policy. Its key objective is to provide a framework on which to build individual policies covering all types of threat to groundwater from point and diffuse sources, and by both conservative and degrading pollutants.

The Groundwater Protection Policy covers the following aspects:

- Physical disturbance of aquifers affecting quality and quantity
- Waste disposal to land
- Contaminated land
- Disposal of sludges and slurries to land
- Discharges to underground strata
- Unacceptable activities in the inner protection zone
- Diffuse pollution

The various policies are related to the risk posed by the activity, thus maps have been prepared for the whole country identifying major, minor and non-aquifers. At a Regional level Source Protection Zones for major abstractions are currently being defined.

4.2.2 Local Perspective

The aquifers and public water supply abstraction points within the Bedford Ouse catchment are shown on the map accompanying section 3.4.

The aspects listed above are important considerations in terms of the identification of protection objectives in the region.

a) Physical disturbance of aquifers.

This includes activities such as mineral extraction and construction projects involving large excavation work. There are several mineral extraction sites in the area. The NRA can influence the proposals through its role as a planning consultee and, where appropriate, through its own licenses and consents.

b) Waste disposal to land.

This takes place at a number of locations in the catchment. Waste disposal sites have the potential to contaminate both surface and groundwaters with leachate if not carefully managed. The NRA therefore liaises closely with the Waste Regulation Authority to minimise the risk of pollution from landfills.

c) Contaminated land

No major problems of this nature have yet been identified in the catchment. However, it is likely that sites will be identified as redevelopments take place.

d) Disposal of sludges and slurries to land.

There are guidelines containing certain criteria that must be adhered to whilst spreading slurries and the like. Sludge or liquid waste disposal to land is subject to the provisions of Section 5 of the Control of Pollution Act 1974.

e) Discharges to underground strata.

This includes both surface water and effluents from agriculture and industry. Controls vary according to the nature and vulnerability of the aquifer and whether there are public water supply abstraction boreholes in the vicinity.

f) Inner source protection zones.

When identified these will be areas of land within a 50 day travel time of the source. Certain specific activities within this zone will be opposed through the planning process as a result of this policy.

g) Diffuse pollution.

This is pollution not attributable to a direct or point source and is therefore principally influenced by land use and land management. The EC Nitrate Directive requires the identification of groundwaters which have nitrate levels in excess of 50mg/l; this is currently underway. Plans to control the input of nitrate will then be required which includes the statutory imposition of Nitrate Vulnerable Zones.

4.3 Water Quantity

4.3.1 General

This section considers the requirement for meeting existing and future water abstraction demand in the catchment whilst protecting the existing uses and users of water

The Water Quantity targets constitute the general NRA statutory objectives

- (a) To protect aquifers and surface water from over-commitment and ensure water abstraction does not have an unacceptable effect on existing abstractors and on the environment
- (b) To ensure the proper use of water resources
- (c) To conserve water resources
- (d) To augment and/or redistribute water resources, where appropriate to meet water demands to appropriate standards of reliability

4.3.2 Local Perspective

The future targets for this region and this catchment have been listed under each target heading

- (a) To protect aquifers and surface waters from over-commitment and ensure abstraction does not have an unacceptable effect on existing abstractors and environmental waters

NRA Anglian Region is actively reviewing the methodology used for the allocation of water resources between human and environmental uses. In addition, the calculations are being reviewed in light of the 1989-1992 drought statistics

The Authority will ensure that if any proposals are made to change the MRF at Offord the environment, other abstractors and navigation levels in the Bedford Ouse will be protected.

The Authority will undertake a detailed resource assessment of the Lower Greensand aquifers to examine the current resource estimate in more detail and to continue to review estimates of groundwater available for abstraction.

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

There is a need to identify the water requirements for the washland and wetland sites of conservation interest in order to better regularise the protection of these sites.

In addition, Anglian Region will review and update the Great Ouse Resource Model, which covers this catchment. The model is a means of calculating the Naturalised Flow for a river stretch, ie, the flow that occurred before abstraction or effluents.

All these studies will enable the NRA to identify future River Flow Objectives for the catchments.

The NRA needs to ensure that water abstraction does not have an unacceptable effect on existing abstractors and on the environment.

Where there is a risk of environmental damage, the NRA will require the applicant to undertake an environmental assessment as part of the application procedure.

(b) To ensure the proper use of water resources

The NRA will give prior (and equal) priority to existing protected rights to abstract and to established environmental needs before allocating any further water for abstraction. The NRA will advise Planning Authorities on water resources aspects of their structure plans, in accordance with the Regional and National Water Resource Strategy. The NRA promotes the wise use of water.

The NRA must decide on whether the future requirement for water meets "reasonable needs". Water abstraction licence applications must show consideration of alternative supplies, demand management or recycling. Specific requirements according to each use, are as follows:-

Public Water Supply

The licensing horizon is currently year 2011; it is not considered reasonable to allocate water for needs beyond

this. The water company must have demonstrated that they have carried out effective demand management, reduced leakage to economic rates and, where water resources are under stress, considered metering of domestic use before extra water resources are allocated.

Spray Irrigation and Agriculture

For spray irrigation Licences the requirements of water needed with respect to the type of crops and soil conditions are taken into account. For agricultural licences the numbers and type of animals kept may be important in determining requirement.

Industrial

For industrial licence applications the process is considered as well as the expected life of the plant.

(c) To conserve water resources

Continue work to identify in-river flow needs and where appropriate define minimum acceptable flows and/or River Flow Objectives.

The NRA encourages the storage of winter surface water in reservoirs.

The 1989-92 drought has served to develop better practice of water resource management both by the NRA and the abstractors. The promotion of efficient water use will continue in the future, and to maintain a "watching" brief on climate change.

The NRA will set discharge consents appropriate to anticipated future flow regimes, rather than historic flow regimes and thus sustain pressure to improve river and groundwater quality.

There are benefits to water quantity (ie the impact of abstraction upon river flows will be minimised) if the discharge of water is made within the catchment and as far upstream as possible. However, water quality objectives often preclude this as an option.

(d) To augment and/or redistribute water resources where appropriate to meet water demands to appropriate standard of reliability

The Anglian Region Water Resources Strategy defines options for meeting future demand. Because of the timescale we think it premature to offer a judgment between these options. The NRA national strategy will better identify their relative costs.

The prime need in this area is public water supply, which is expected to remain in surplus well into the next decade.

The appropriate standards for each use are as follows:-

Public Water Supply

The NRA accepts the operational standards given by OFWAT for public water supply. These are:-

- A hosepipe ban on average not more than once every 10 years
- The need for voluntary savings of water on average not more than once in 20 years
- The risk of rota cuts or use of standpipes on average not more than once in 100 years

Spray Irrigation

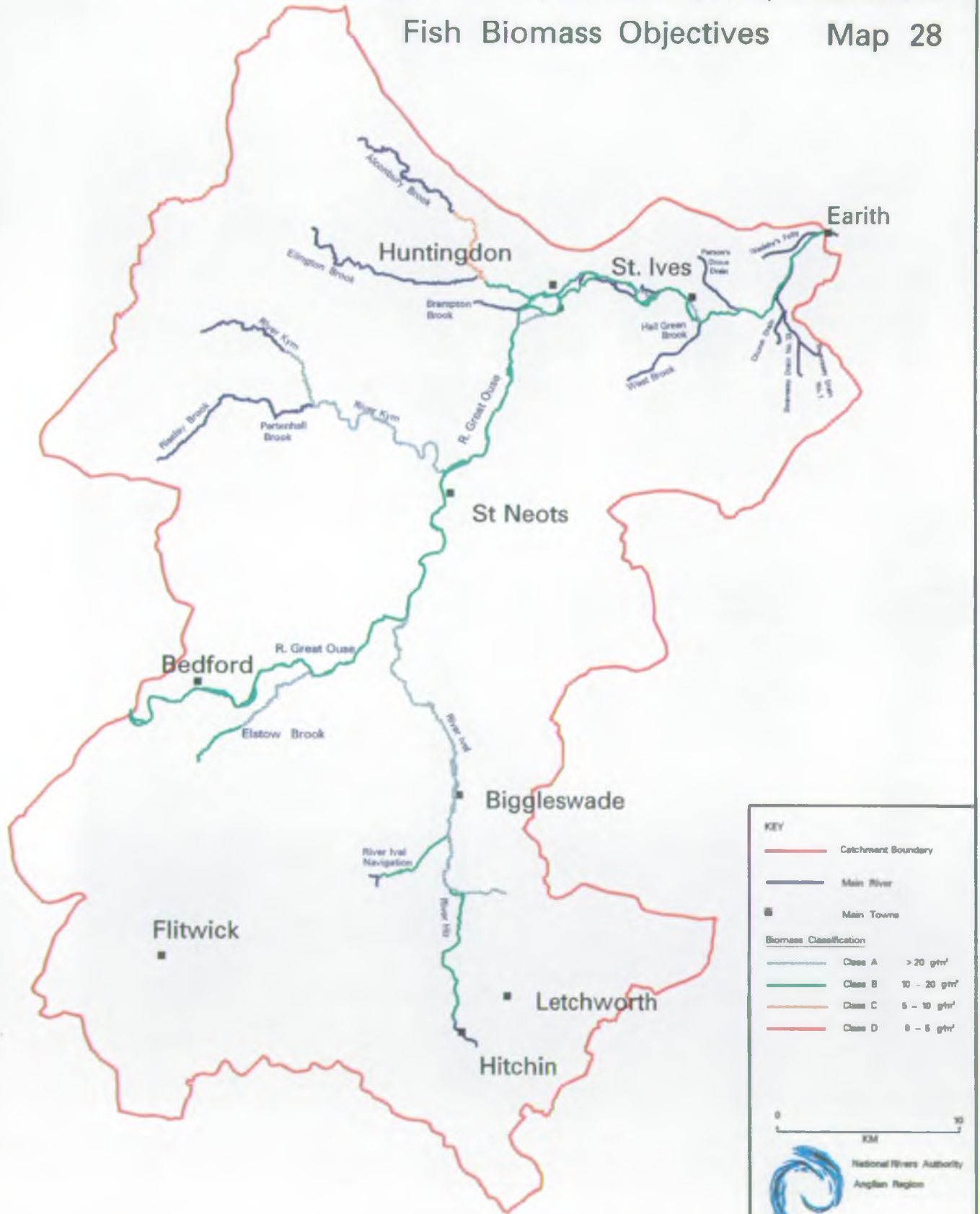
The Region's target level of service for spray irrigation is that there should be risks of shortages not more than once in 12 years on average

Others - Industrial, Agricultural etc

There is no specific target level of service for these uses

There is also a need to examine augmentation schemes in catchments with low flows.

Bedford Ouse (Lower Reaches) Catchment Fish Biomass Objectives Map 28



4.4 Environmental Features

4.4.2 Local Perspective

Conservation

- Establish a system of classification to identify conservation value of the river corridor. This will be carried out initially by the analysis of the Rivers Environmental Database.
- Target resources to conserve, enhance or restore rivers according to need as established within the conservation classification system.
- Provide an environmental assessment and recommendations to ensure the maintenance and enhancement of conservation interest to flood defence.

Fisheries

- To improve the fish biomass to the realistic potential carrying capacity for each channel, based on suitability of habitat and channel size.
- To maintain appropriate species diversity by the protection and suitable enhancement of in stream habitat, and by restocking.

Navigation

- To ensure that all locks and other NRA owned navigation structures are maintained to meet the appropriate standards of Health and Safety.
- To ensure that all navigations are maintained to the requirements of local legislation
- Seek to influence the strategic development of navigation facilities with District Councils, the Eastern Council for Sport and Recreation and boat user associations such as GOBA, GOBBOA, IWA.

Recreation and Amenity

- To promote public access to rivers and where appropriate, on land owned by the NRA.
- With others to promote the appropriate recreational use of waterways, balancing the needs of conservation with public access.

Angling

- With others seek to maintain and improve angler access, balancing the legitimate needs of all river users, and environmental sensitivity.
- Advise anglers on methods to minimise damage to river banks caused by illegal excavation, to comply with Land Drainage Byelaws.

Flood Defence

- To ensure that the river topography remains suitable for the efficient passage of high flows and that control structures are adequately operated and maintained.

Bedford Ouse (Lower Reaches) Catchment Flood Defence Objectives Map 29



4.5 Flood Defence

4.5.1 General

Existing maintenance standards are based on historically determined criteria return periods and frequencies. The NRA has commissioned a review of flood defence standards of service for watercourses, which will influence maintenance requirements for the future.

4.5.2 Capital

The NRA has identified areas of inadequate flood protection level which will be considered for improvement subject to the recommendations covered within the 1993 Ministry of Agriculture Fisheries and Foods (MAFF) Strategy for Flood Defence in England and Wales. This Strategy prescribes that improvement schemes are appraised on the criteria of technical, environmental and economic soundness. The MAFF Indicative Standards of Protection are used in conjunction with NRA Target Levels of Service (Appendix 6) to determine standards of design.

Flood defences do not provide absolute protection but alleviate flooding up to a particular level of severity. The standard of protection provided normally relates to the land use of the area concerned, where urban flood defence attracts a high priority.

4.6 Development Control

To ensure that flood plain integrity is maintained.

To ensure that no development takes place in areas of unacceptable flood risk.

To ensure that development does not increase the flood risk to others, including the cumulative effect of successive developments.

To ensure that no significant change in channel flow regime occurs due to development.

To ensure that development does not increase the risk of pollution to groundwater and surface water.

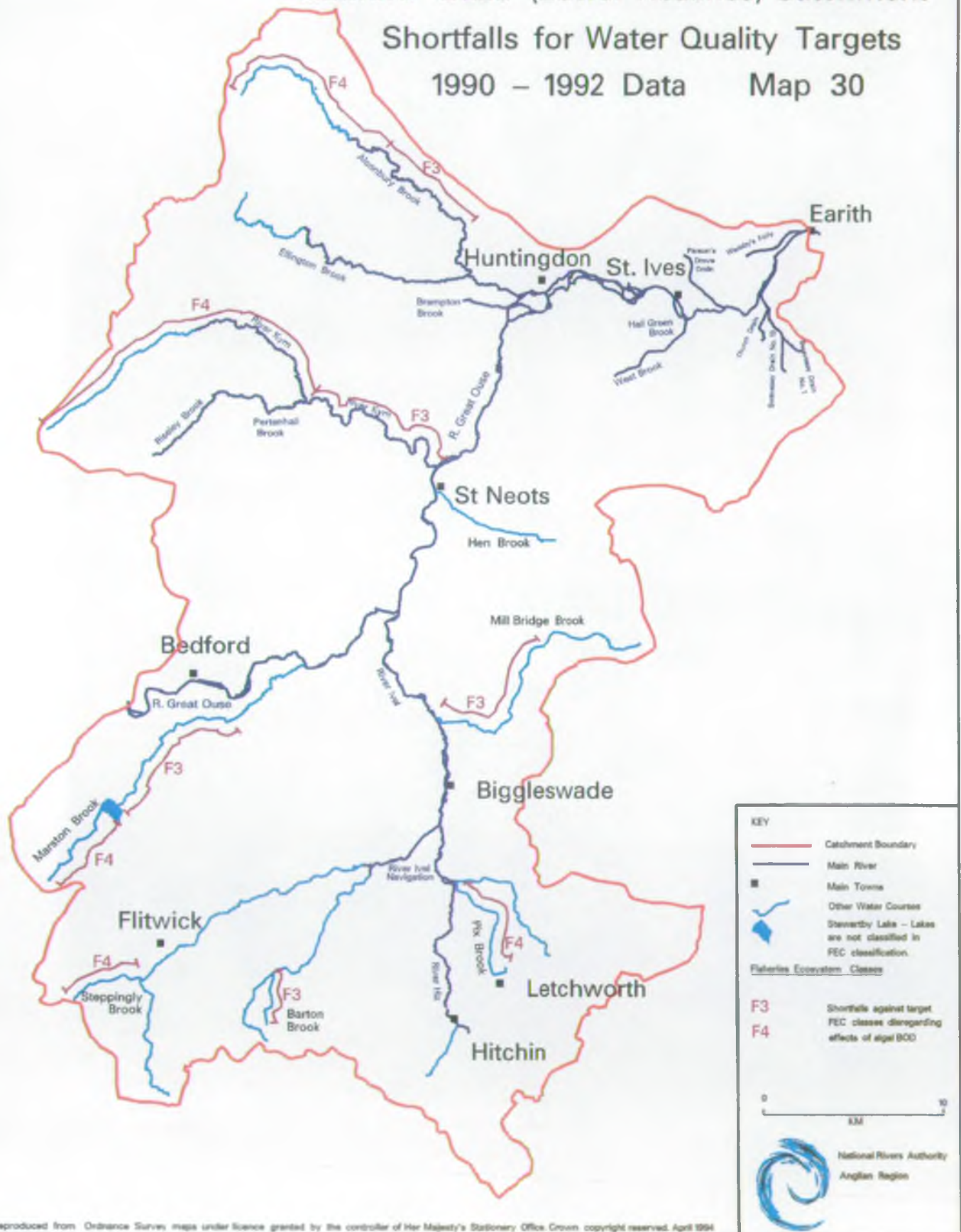
To ensure that development does not detrimentally affect the quantity of groundwater resources.

To achieve, where appropriate, provision for the enhancement of the water environment within development proposals.

Bedford Ouse (Lower Reaches) Catchment

Shortfalls for Water Quality Targets

1990 - 1992 Data Map 30



5. STATE OF CATCHMENT

5.1 Water Quality - Surface

5.1.1 General

To make an assessment of current quality a three year period (1990-1992 calendar years) has been taken. This quality has been compared to the river quality baseline (based on 1988/90 data, disregarding the effects of algal Biochemical Oxygen Demand (BOD) to identify any deterioration in river quality. Compliance with the proposed target Fishery Ecosystem Class (FEC) has also been assessed and the shortfalls are shown on the map opposite.

At present only NWC classified rivers have been considered for proposed FECs. The remainder have been assessed for compliance against existing River Quality Objectives (RQO) over a 3 year period (1990-1992 calendar years). Biological quality can not be averaged in this manner and therefore only 1992 data has been considered.

5.1.2 Failures to meet standards

a) Alconbury Brook: Headwaters to Ellington Brook

Fails to meet FEC 4 target for BOD and Dissolved Oxygen (DO) upstream of Alconbury Weston. In the downstream stretch to Ellington Brook there are occasional failures of the FEC 3 target for DO. Low DO levels occur under low flow conditions, usually in summer. These conditions are possibly related to land management and drainage practices in the Alconbury Brook catchment. The catchment geology is dominated by clay which results in rapid surface water runoff and minimal base-flow. The FEC targets may be unrealistic with the physical constraints imposed by geology and land drainage.

b) River Til and River Kym: Headwaters to River Great Ouse

Fails to meet RQOs for BOD, Ammonia (NH₃) and DO and target FEC 4 for DO upstream of Kimbolton. Here the biological quality is good. Below Kimbolton STW failures of RQO for BOD, NH₃ and DO occur. Target FEC 4 is again not met for DO, although failures are less severe than upstream. Biological quality is variable, poor to good.

The RQO failures for NH_3 in the upper reaches may be associated with sewage discharges in unsewered villages and intermittent discharges from farms in the catchment. Dissolved oxygen failures are typically associated with low flow conditions when the watercourse may become ponded and covered with duck weed. The problem is less severe downstream of Kimbolton STW which helps to maintain flows in summer.

- c) **Marston Brook: Station Road, Marston to Stewartby Lake**

This short length of watercourse fails to meet FEC 4 targets for BOD, total and un-ionised NH_3 and DO. The failures occur downstream of Marston Moretaine STW which is estimated to contribute over 90% of the flow in the watercourse in the summer. Biological quality is recorded as poor.

- d) **Marston Brook/Elstow Brook: Stewartby Lake to Wootton Brook**

Failure to meet FEC 3 target for total NH_3 . There are occasional failures that have occurred during the summer period. The reasons for the failures are not obvious. The biological quality is moderate.

- e) **Steppingley Brook: Station Road, Ampthill to River Flit**

Failure to meet FEC 4 target for total NH_3 downstream as far as the confluence with R. Flit. Investigations suggest that high ammonia concentrations occur upstream and downstream of Flitwick STW.

- f) **Millbridge/Common Brook: Gamlingay to River Ivel**

Failure to meet FEC 3 target for DO total and unionised NH_3 from below Gamlingay downstream to the confluence with the R. Ivel. The reasons for these failures are not clear but could be due to a combination of low flows and sewage effluent. The biological quality is good.

- g) **Barton Brook: Headwaters to Shillington Mill**

Failure to meet FEC 3 target for DO, total and un-ionised NH_3 . Biological quality is recorded as poor. These failures occur downstream of Barton-le-Clay STW.

h) Pix Brook: Headwaters to River Ivel

Failure to meet FEC 4 target for BOD upstream of Letchworth STW and total NH_3 downstream. Since 1992 there have been no ammonia failures downstream of the STW. Biological quality upstream of the STW was poor in 1992. This appears to be caused by contaminated urban runoff from surface water sewers.

i) Hen Brook:

Failure to meet RQOs for BOD, total and un-ionised NH_3 and DO. Biological quality is poor. These failures are attributed to poor quality surface water discharges from St Neots industrial areas and intermittent problems with the foul sewerage system.

j) Brampton Brook:

Failure to meet RQOs for BOD, NH_3 and DO. These occur downstream of Buckden waste disposal site and also downstream of Brampton STW. Recent data indicates improvements at Brampton STW and reduced leachate discharge from the waste disposal site are improving compliance.

5.2 Water Quality - Groundwater

The three major aquifers in the catchment are the Chalk, the Lower Greensand and the River Gravels. These provide sources of groundwater for public supply. Groundwater throughout the catchment is routinely monitored by the NRA. In addition data collated by water companies for public supply abstractions is also used to make assessments.

Chalk is a strategically vital source of water supply, which benefits from a high quality requiring minimal treatment prior to use; however it is susceptible to pollution which is very difficult to clean up. Generally the quality of groundwater in the Chalk aquifer is excellent, but there are areas where nitrate levels are increasing. As a result of this the NRA is involved in the designation of Nitrate Sensitive Areas (e.g proposed NSA at Slip End). Careful land use management may be required in future to ensure that nitrate levels remain below the maximum allowable concentrations of 50 milligrams of nitrate per litre of water. Organic solvents, cause significant local contamination (e.g in the industrial areas around Letchworth and Biggleswade).

The Lower Greensand aquifer is used for industrial and potable supplies. The water is less hard than the Chalk and generally has a much lower nitrate concentration. This low nitrate status makes it particularly important as often it can be blended with chalk waters to enable compliance with drinking water standards.

The river gravel aquifers provide industrial and potable supplies and current quality is within acceptable guidelines. However, they are generally in continuity with surface waters and prone to pollution.

Bedford Ouse (Lower Reaches) Catchment Contaminated Boreholes Map 31



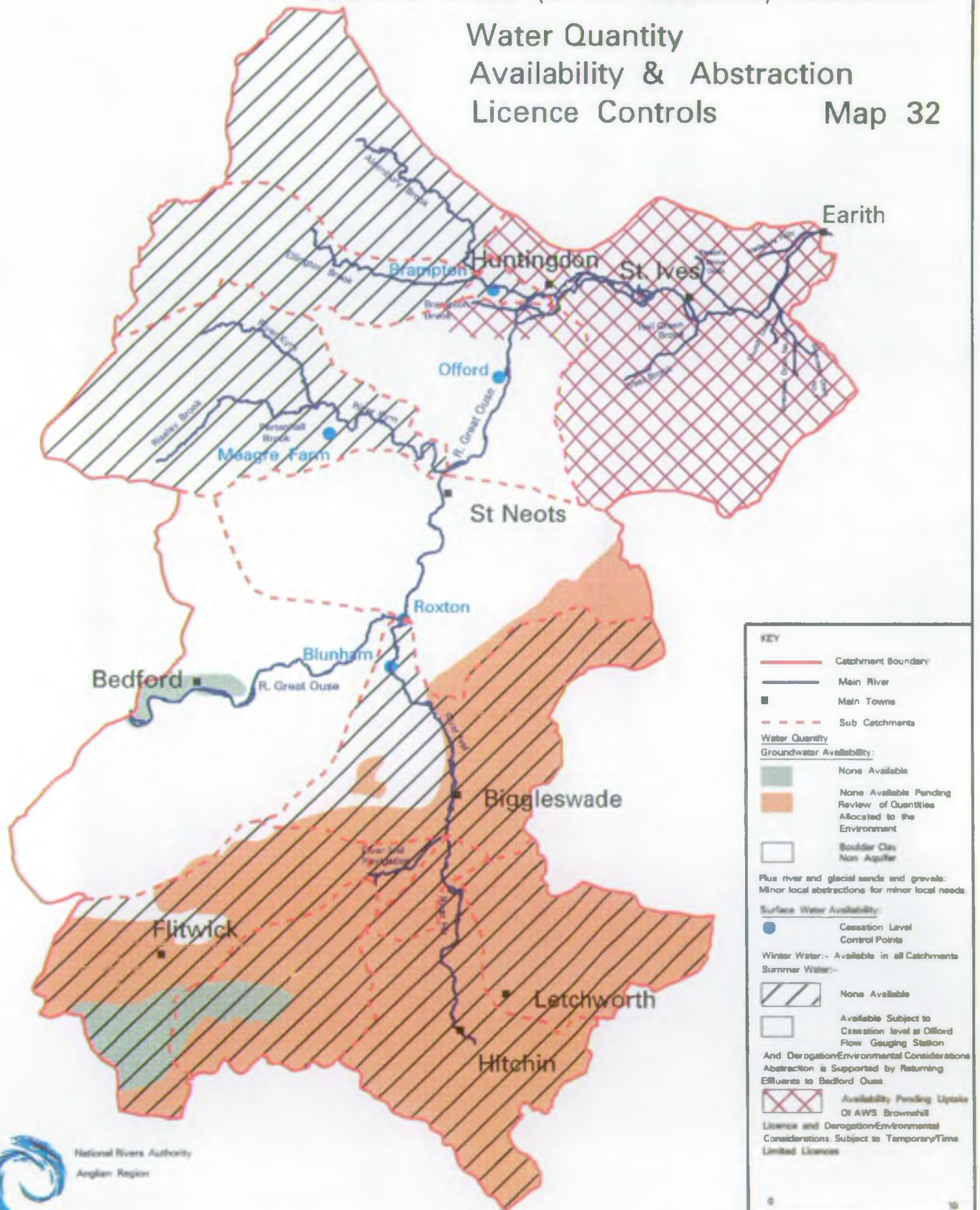
Bedford Ouse (Lower Reaches) Catchment

Water Quantity

Availability & Abstraction

Licence Controls

Map 32



National Rivers Authority
Anglian Region

5.3 Water Quantity

5.3.1 General

Where there are valid requirements for water abstraction and competition arises with other river uses, there is a need to strike a balance between the various interests to secure an optimum development of resources. This must be undertaken within a framework to satisfy proper protection of the natural environment.

There is an existing high demand for water use for drinking water, industry and agriculture and this demand is increasing. Future development must not cause any unacceptable detriment to the environment.

It is important to remember that as the population of the area continues to increase, so will the volume of water returned to the rivers through discharges from the sewage treatment works. Therefore as dry weather flows increase, there may be some future flexibility in the allocation of summer surface resources.

5.3.2 Surface Water Resources

The river flow in the catchment reflects rainfall, topography and surface geology.

The flows in the Rivers Hiz, Flit and Upper Ivel and their associated tributaries, are largely groundwater fed from the Chalk and Lower Greensand aquifers in the south of the catchment.

On average, the majority of the flow is sourced from the tributaries upstream of Offord. 62% of the gross flow at Offord is derived from outside of this catchment plan area i.e., upstream of Bedford. Approximately 19% is provided by the River Ivel, including the main sub-catchments of the River Hiz and River Flit which contribute 4% and 5% respectively. The remaining 19% of the flow is provided by the Bedford Ouse downstream of Bedford, the River Ivel downstream of Blunham and associated tributaries. This includes the sub-catchment of the River Kym which contributes 4%.

Downstream of Offord there are further contributions to the Bedford Ouse system from the Alconbury and Ellington Brooks and smaller tributaries of the main Ouse.

In the predominantly clay catchment areas where flows can be highly variable according to weather conditions and seasons, there are no further summer surface resources available. Low summer flows in this part of the Bedford Ouse are maintained by artificial discharges to the water courses. In these areas licence applications to abstract water would only be considered for winter storage schemes, whereby surface water was abstracted during periods of high winter flow and stored in an offstream reservoir for subsequent use.

The major abstraction in the catchment is from the Bedford Ouse, just upstream of Offord village to fill Grafham Water Reservoir for public water supply. Any allocation of resources upstream can only be granted subject to protecting this existing abstraction and the needs of the river.

In the River Ivel catchment downstream of Arlesey, applications from surface sources may be considered because of the base flow (i.e contribution from the groundwater areas to the south). There is already a lot of abstraction in the River Ivel corridor particularly for market gardening, any further availability is strictly limited.

All new licences are issued with cessation conditions to protect low flows, in river needs and other licence holders.

5.3.3

Groundwater Resources

The groundwater reserves in this area are the Chalk and Lower Greensand aquifers in the southern part of the catchment.

Rainfall which is able to percolate through the rocks refills the empty storage space in the rocks.

Recharge of the chalk occurs over the whole of its area and groundwater flows are generally towards the north. Water flows out of the aquifer at discrete springs or gradually along the River Hiz, Flit, Upper Ivel and their tributaries. Recharge of the Lower Greensand aquifer is impeded by the Gault Clay, resulting in recharge occurring only where the aquifer outcrops. The Greensand forms a south-west to north-east trending resistant ridge, with groundwater flow being generally to the south east.

There is some groundwater available from river and glacial sands and gravels along the main river corridors.

The current assessment for these areas shows that resources are fully committed, groundwater is not available for abstraction from the major Chalk and Greensand aquifers in the catchment. Groundwater is only available for abstraction from river and glacial sands and gravels for minor local needs.

5.4 Environmental Features

5.4.1 Fisheries

The NRA Anglian Region system of fishery classification indicates that five reaches are currently below their target biomass, two backchannel, two tributaries and one reach of the main Bedford Ouse.

Restocking, as appropriate, to increase fish biomass and species diversity. Species such as barbel could usefully be introduced into appropriate area.

A modest sea trout run is known to occur within the lower Bedford Ouse, regularly as far as St Ives. Consideration should therefore be given to the provision of fish passes to any structures where major capital work is proposed.

5.4.2 Conservation

It is recognised that the environmental value of certain channels have been adversely affected by past land drainage activities, both fisheries and general conservation value would be improved by appropriate habitat enhancement or restoration.

In rivers plant growth is an important habitat feature, weed control for flood defence and navigation requires careful balance with environmental needs. It is therefore appropriate to review weed control practices to ensure the correct balance is achieved to satisfy all uses.

Riverside trees are an integral part of the Bedford Ouse landscape, the replacement of trees lost by natural attrition therefore needs to be addressed if this traditional lowland river landscape is to be maintained.

5.4.3 Navigation

Congestion at certain locks is a common feature on the Bedford Ouse during the summer period. A survey is therefore required to assess lock capacity, waiting times, and appropriate mitigations if required to meet an acceptable level of service.

There is an ongoing programme of lock improvements, both to enlarge lock pens and to automate manually operated structures.

The River Ivel was used for navigation for part of its length and it has been suggested by boat owners that the navigation should be re-established.

5.4.4 Recreation

There is an increasing demand for public access to the countryside for various forms of informal recreation. The need is for increased circular and linear footpaths, bridle paths and more recently for cycle paths. In collaboration with others, NRA will support sensitive improvements in public access adjacent to and within the river corridor.

There is a demand for increased access to the River Ivel by canoe users.

Access for the anglers with disabilities and in some instances, for able bodied anglers, presents difficulties within this catchment. A review of facilities is therefore required.

5.5 Flood Defence

5.5.1 Maintenance

The formal system for assessing compliance with maintenance Standards of Service is not yet in operation as the levels of protection have not been fixed. When this has been achieved, the Authority's maintenance programme will be re-assessed and any necessary changes proposed will be discussed through the normal consultation process.

Both silt and gravel accumulations are of concern in the catchment and both its control and management within the river system needs to be constantly monitored.

The adoption of privately owned and maintained river control structures by the NRA needs to be completed, along with further improvements to the control of existing structures.

Dredging and weed control activities which are essential practices for flood defence can impact on the river environment and other uses.

5.5.2 Continuing Flood Risk

The presence of a flood allevation scheme does not remove entirely the risk of flooding. Thus schemes which protect urban conurbations to a return period of say 50 years should be considered still to have a medium risk of flooding, whilst a 100 year scheme will present a low risk. In addition, no matter what type of scheme has been implemented, a continuing programme of maintenance will be required to maintain the level of protection.

The locations on main river that are currently considered to be lacking suitable levels of protection are:

Bedford Town	Alconbury Village
Hemingford Flood Bank	Riseley Village
Kimbolton Village	River Ivel Flood Banks
Shefford	

There is an increasing number of non-Main River urban flooding difficulties that have been brought to the Authority's attention, the necessary powers to carry out works lie with the Local Authorities but with reduced levels of available public money relief for these locations may be seriously delayed. Internal Drainage Boards may also be involved with relief of flooding within their administrative areas.

Bedford Ouse (Lower Reaches) Catchment State of Catchment Flood Defence

Map 33



5.6 Development Control

All towns situated on the river system have areas which have been affected by historic floods. The 1947 flood, in general, is the largest recorded flood and defines the flood plain of statutory main river. The major population centres within the catchment with flood risk areas are Bedford, St Neots, St Ives, Huntingdon, Biggleswade and Shefford.

Flood plain is often under pressure from development. A consequence of flood plain loss is the reduction in flow or storage volume with a resultant rise in flood levels. Since 1947, it is estimated that some 360 ha of flood plain has been lost in the catchment due to development, equating to 6% of the total.

The impact of this loss will be greater than the overall percentage figure might suggest in the urban areas where the encroachment has occurred, and where the local effect will be significant.

It is considered that improvements effected to the 'main river' system since 1947 have been largely offset by the increased surface water run-off from development for major floods.

6. CATCHMENT ISSUES AND OPTIONS

6.1 Water Quality - Surface Water

6.1.1 River Quality Objective Failures

Nature of Problem

The 50 main STWs operated by Anglian Water Services Ltd (AWS) have received varying degrees of improvement since privatisation of the water industry. Significant capital expenditure has been made since 1989 and further investment is needed to maintain standards where residential and industrial developments take place. The NRA recognises that desirable water quality objectives cannot be immediately met as they require planned investment. To aid this process a regional list of priorities for investment has been compiled to target improvements where most environmental benefits will result. The priorities have been made using an assessment of compliance with existing River Quality Objectives (RQOs) and River Needs Consents (RNCs).

At present there are 12 STWs which have legal consent limits laxer than those needed to meet regional RQOs. All of these have complied with the current legal and RNC limits during the last year (up to September 1993). A number of these discharges have been improved due to extensions or modifications by AWS. The performance of these works is better than that needed to meet the current legal consent limits. There is potential for RQO failure if the performance of these works is allowed to deteriorate.

Specific Problems

KIMBOLTON STW:

The river Kym downstream of Kimbolton STW has low dissolved oxygen levels, elevated BOD and ammonia concentrations that cause failure of RQOs and proposed FEC 3.

BARTON-LE-CLAY STW:

Barton Brook downstream of Barton-le-Clay STW fails to meet the target FEC 3 for dissolved oxygen, total and un-ionised ammonia.

MARSTON MORETAINE STW:

Marston Brook fails to meet FEC 4 targets for BOD, total and un-ionised ammonia.

Solutions

KIMBOLTON STW:

This works has recently been extended and has met the RNC which should achieve RQOs and the FEC 3 target. The receiving watercourse continues to fail these objectives which suggests that flow information used for calculations may be incorrect. Further investigation, possibly including flow metering will be necessary to resolve this issue.

BARTON-LE-CLAY STW:

This works is currently being improved by AWS and is scheduled for completion by early 1994. The new works should result in significantly improved effluent quality and compliance of Barton Brook with target FEC 3.

MARSTON MORETAINE STW:

This works has been improved and complies with the current legal consent and RNC. If the proposed FEC 4 target is to be met the consent will need to be reviewed and further improvements carried out. Alternatively compliance with the RNC should achieve FEC 5.

Unsewered villages

Nature of Problem

The catchments of the River Kym, Alconbury and Ellington Brook include a large number of un-sewered areas. Many small settlements and individual houses rely on septic tanks for sewage disposal. The effluent soakaways for these frequently fail because of the poor drainage characteristics of the clay soil. Many discharge to "village drains" for example at Newton Bromswold and Tilbrook. Effluent from septic tanks and "village drains" cause odour problems and may impact locally on water quality.

Solutions

The NRA will encourage use of package treatment plants for isolated areas, investigate the impact of village drains on

water quality and liaise with local councils to encourage requisitioning of sewerage schemes.

Storm Sewage Overflows and Surface Water Discharges

Nature of Problem

In the past the problems associated with the discharge of dilute sewage and surface water runoff during storms have not been addressed. However, the effects of rainfall induced discharges are often significant and can lead to River Quality Objective failures.

Surface water runoff can be as strong and polluting as crude sewage in the first flush. In separately sewered areas the wrong connection of foul to surface drainage pipes is not uncommon and can greatly add to pollutant loads. In particular problems arise if surface water runoff discharges to watercourses which have a low flow.

Storm sewage overflows are occasionally the cause of public complaint. The overflow occurs when a certain flow is reached, usually 6 times D.W.F. (Dry weather flow). Old systems sometimes operate at lower flows than this thereby releasing untreated sewage at a greater frequency than is desirable.

Solutions

As a consequence of the problems arising from intermittent discharges such as those detailed above the NRA has conducted a series of biological surveys to assess the impact of the discharges on receiving watercourses. From the results a Priority List has been constructed listing those intermittent discharges causing the greatest environmental damage. Such lists have recently been compiled for AWS to enable them to target problem sites in need of improvement as part of their investment programme. In the catchment this includes the Boot pumping station at Langford.

In order to reduce the impacts from surface water runoff it is necessary to install effective oil interception and solids settlement measures on problematical surface water drainage systems.

Contamination of surface water discharges is a common problem in many industrial areas. Normally the problems arise from misconnection or illegal discharges. Spillages of oil and chemicals may also frequently cause surface water sewer contamination. Control of these pollution sources can be

improved by increasing pollution prevention site inspections. Many of the surface water sewers are controlled by AWS, and the NRA will liaise to ensure pro-active pollution prevention inspection is increased.

6.1.2 Ministry of Defence Bases

Nature of Problem

There are a large number of military bases in the catchment supporting hundreds of personnel and their dependants. The largest of these are located at Alconbury, Chicksands and Wyton.

There are a number of pollution problems associated with M.O.D. establishments in general. The use of de-icers on aircraft and runways has in the past led to contaminated surface water at various sites. However, these are being phased out with the introduction of more "environmentally friendly" substances. Large expanses of airfields are treated with pesticides and herbicides, again the use of less persistent chemicals is being encouraged.

Solutions

A majority of the M.O.D. bases have their own STWs. As Crown establishments the discharges are exempt from legal control under the Water Resources Act 1991. However, close liaison with the base commanders of sites and Defence Works Services has resulted in greater effluent control through the issuing of "pseudo-consents". Military sites are visited as part of the routine monitoring programme. A Priority List of works needing improvement has been drawn up which includes timescales for completion of works. A number of problem discharges have been terminated.

Improvements requested include a number of STW to be upgraded to meet more stringent standards. At some sites oil interceptors need to be installed on surface water drains to improve water quality before it is discharged to a watercourse or soakaway system.

Over the past 2 to 3 years there has been an increase in environmental awareness and a willingness to comply with standards set for discharges on military sites despite there being no legal requirement to do so. This has greatly diminished the number of potential pollution problems that previously occurred on bases. The NRA will continue to liaise with the MOD to ensure pollution control measures are fully implemented.

6.1.3 Landfill Sites

MARSTON-VALE

Nature of problem

The NRA recognises the importance of the development issues in the Marston Vale which have been defined by the County Council in the current Minerals and Waste Local Plan. The Local Plan issued in 1993 states in policy MW2 that very high priority would be given to the restoration improvement of the Marston Vale and the evolution of a strategy for the realisation of its long term potential. The NRA recognises that the mineral extraction for brick manufacture may continue, and more significantly the existing clay voids will require restoration often via landfill.

The Marston Vale lies on outcrop clay, which is up to 90m deep in places. The existing brick pit voids therefore lend themselves as natural sites for engineered containment landfill. There are no utilisable groundwater supplies within the immediate area. It is likely that further landfill developments will take place within this area.

Currently there are two very large landfill sites in the Vale, Brogborough and Stewartby. The licence at Stewartby provides for a wide range of waste to be deposited and represents the most significant site in the area for the deposit of special wastes. Currently the site is operated to a satisfactory standard, although further improvements in operations may be sought in coming years. Leachate is extracted on site and treated prior to discharge to a tributary of the Elstow Brook. Currently there is no active treatment of leachate at the Brogborough site, though gas management for power generation takes place.

Solutions

The NRA will seek to ensure that all waste disposal operations in the Vale are regulated to the very high standards in conjunction with the Waste Regulation Authority.

FLITWICK

Nature of problem

The former liquid landfill disposal site at High Street, Flitwick has long been regarded as a potentially serious threat to groundwater due to liquid waste disposal over a 20 year period.

The NRA undertook an investigation of the off-site impact of the landfill and identified that leachate was moving off site.

Solution

In consultation with the NRA the owners have proposed a scheme to contain the leachate by pumping contaminated water from boreholes on the site boundaries. Funding is currently being negotiated, and the NRA will review the results of the detailed monitoring to ensure the success of the scheme, together with the Waste Regulation Authority and local councils.

6.1.4 Eutrophication

Nature of Problem

Eutrophication is considered to be nutrient enrichment leading to increased algal and macrophyte (aquatic plant) growth, and reduced species diversity. Natural eutrophication is a slow process and beneficial as it increases productivity in a watercourse. In contrast accelerated eutrophication results in a number of undesirable symptoms including excessive algal and macrophyte (aquatic plant) growth which may restrict water uses.

Deterioration of night time oxygen levels is typically associated with eutrophication and may result in stress to fish. Another major cause of stress to fish is the release of gaseous ammonia at high pH that arises from excessive algal and macrophyte growth.

In the catchment, phosphate concentrations exceed the DOE criteria for identifying Urban Waste Water Treatment Directive (UWWTD) Sensitive Areas on the River Flit, Ivel and Great Ouse. Substantially elevated phosphate concentrations occur below major sewage effluent discharges. The significance is uncertain as limited information is available on the algal and aquatic plant communities.

The effects of eutrophication are most extreme in lakes and reservoirs with long retention times. Excessive growths of algae may give rise to blue-green algal blooms (see section 6.1.5) and may increase cost for treatment of water for public supply. Both Stewartby Lake and Grafham Water have been affected by algal blooms.

Solutions

The NRA has made a preliminary assessment of potential eutrophic sensitive areas for the UWWTD and has submitted proposals to the D.O.E. If a river is designated as a eutrophic sensitive area then discharges exceeding 10,000 population equivalent are required to meet limits for phosphate. There are potentially 12 major STWs (totalling over 400,000 pop. eq.) within the catchment which may require phosphate removal.

Further research is being undertaken before a final decision on designation of eutrophic sensitive areas is made by the D.O.E. The NRA will continue to monitor and investigate effects of eutrophication within the catchment to enable accurate assessment of Sensitive Areas.

6.1.5 Blue Green Algae

Nature of Problem

Blue-green algae are a natural part of lakes and reservoirs but under certain conditions, in particular high levels of nitrogen and phosphate, their numbers become excessive. Typically this can be recognised by the water turning green and "blooming" and by the occurrence of blue-green "scums" of algae along the shoreline. Both blooms and scums can produce toxins which are now recognised as a serious health hazard, to both animals and humans.

The major outbreaks of blue-green algal blooms which occurred in 1989 and 1990 led the NRA to address this issue.

Since the outbreak began in 1989 ten waters in the Bedford Ouse Catchment have been monitored for blue-green algae. Of these, eight have been found to contain excessive numbers of algae leading to both blooms and scums. These have tended to be recurrent, although varying in degree and severity.

The two most serious events were at Grafham Water in 1989 and at Stewartby Lake in 1991. Anglian Water Services closed Grafham Water to all recreational users for several weeks in 1989, until algal blooms and scums dispersed. In 1991 excessive numbers of blue-green algae overflowed into Elstow Brook from Stewartby Lake, posing a threat to livestock drinking from the brook. Immediate action was taken to warn all the farmers in the catchment of the danger and in the event no livestock were lost.

Solutions

In the short term the NRA is

- Carrying out reactive sampling and analysis to identify and quantify the problem.
- Producing "Action Plans" for specific bodies of water including Grafham Water and Stewartby Lake. These will provide guidance on the control operations and work needed to minimise blue-green algal blooms.
- Underpinning the "Action Plan" development with a research programme which includes determining the factors involved in
 - a) algal growth
 - b) toxin production and
 - c) the fate of toxins in the ecosystem

In the longer term the recommendations of the "Action Plans" will need to be implemented. These will include solutions a) to "alleviate the symptoms" and b) for dealing with the cause.

- Changing the management of affected waters can alleviate the symptoms. In particular the facility to artificially mix a reservoir or lake, when the weather is calm, should minimise the occurrence of surface blooms of algae and their associated scums. This is already possible, to some extent, at Grafham Water and Anglian Water Services plans to make further enhancements.
- Dealing with the cause would be through either nutrient reduction or removal. The technology is available for the chemical precipitation of phosphate (e.g using ferric sulphate solution). This could be achieved either by treating the input water to the lake/reservoir or by treating the phosphate at source, predominately sewage treatment works.

Any scheme using the former as a solution would require careful consideration by the NRA before granting consent. Significant damage to benthic invertebrate communities has been demonstrated when the precipitate has been allowed to settle out in reservoirs. This has been seen at Grafham Water. The preferred solution in such cases would be pre-reservoir/lake dosing and settlement.

Phosphate removal at source would have less risk to other biota but also perhaps less certainty of success. The strategy would require nutrient control catchment management and with so many potential sources of phosphate - not least that accumulated in river and lake sediments, it might be difficult to achieve. Such an approach would also need to be seen in the context of the NRA overall eutrophication control strategy and in particular the requirements of the Urban Waste Water Treatment Directive.

6.2 Groundwater Quality

6.2.1 Nitrate Sensitive Areas

Nature of Problem

The 1980 EC Drinking Water Directive sets a maximum allowable concentration of 50mg/litre of nitrate in drinking water. A number of drinking water sources exceed this concentration. Providing drinking water which meets this criterion is achieved by one or a combination of approaches - blending of low and high nitrate waters, chemical purification at the well head, and by designating zones in which the input of nitrate rich compounds is controlled. As far as the latter is concerned, under the EC Nitrate Directive Nitrate Vulnerable Zones are planned; under Agri-Environmental Regulations Nitrate Sensitive Areas are being established. The groundwater at Slip End is affected by nitrates to the extent that justifies protective measures being taken.

Solutions

With a view to effecting a reduction in nitrate level at source MAFF are organising the introduction of several Nitrate Sensitive Areas offering financial compensation for voluntary changes in agricultural practice. The one at Slip End is centred around the Three Valleys Water company source at NGR TL 2830 3705. Proposals have recently been presented to local landowners.

6.2.2 Groundwater Contamination

Nature of Problem

There are two significant cases of groundwater source contamination which are known within the catchment.

BALDOCK ROAD BOREHOLE SOURCE:

Water abstracted from the Baldock Road Borehole Source (operated by Three Valley's Water Company) has exhibited chlorinated solvent concentrations which exceed the water supply regulations standards.

BIGGLESWADE BREWERY SOURCE:

Water abstracted from a borehole serving the brewery in Biggleswade has also exhibited chlorinated solvent

concentrations occasionally in excess of the water supply regulation standards.

Solutions

BALDOCK ROAD SOURCE:

This source is currently out of use as a public water supply source. It is unlikely that a treatment plant for the removal of chlorinated solvents will be installed in the immediate future.

The most probable source of the contamination in this case is industrial usage in the local area. The NRA will continue to investigate possible sources in liaison with the Three Valley's Water Company. Substantial improvements to waste disposal systems and practices have been introduced at relevant sites in recent years.

BIGGLESWADE BREWERY:

The most probable source of contamination in this case is also likely to be industrial usage of solvents. The NRA is continuing with the programme to improve waste disposal systems and practices in the catchment.

6.3

Water Resources

6.3.1 Future demand for abstraction from groundwater and Summer Surface Water (Issue 1)

Nature of Problem

Future demands for water in the Anglian Region are progressively rising. Future demand for public supply is assessed by examining predicted changes in population and consumption habits as well as the potential for demand management practises such as leakage control and metering policies. Future growth in industrial and agricultural needs are also allowed for.

Solution

The NRA Anglian Region Water Resources Strategy identified a range of options

- (a) To augment supplies from the Trent, which is expensive and could have environmental consequences on carrier water courses, as well as implications in the Trent catchment.
- (b) Increase use of winter stored water for industrial and agricultural purposes
- (c) To augment the Grafham inflows by constructing Brownhill Tunnel, for which powers and abstraction entitlements already exist, subject to environmental assessment.
- (d) To relax the flow constraints on filling Grafham by reduction of the MRF, subject to environmental assessment
- (e) To examine increasing abstraction from gravel and other minor aquifers
- (f) To transfer water to the Ouse and the Nene via the canal system, which is under investigation, but is unlikely to be cheap.
- (g) Earth transfer, to relax constraints on the transfer of water with the aim of improving reliability for spray irrigation abstraction.

6.3.2 "In River Needs" are not quantified and river flow objectives need to be defined (Issue 2)

Nature of Problem

Extensive ecological and hydrological studies are required to define the existing ecology of the river system and to establish the appropriate water level, flow and quality (i.e. in-river needs) required to maintain the ecosystem.

The Water Resources Act 1991 requires the NRA to set Minimum Acceptable Flows (MAFS) on rivers. To date this requirement has not been fulfilled either Regionally or Nationally.

Solution

However, the Anglian Region NRA have set Minimum Residual Flow (MRF) targets at a number of points on rivers in the catchment. In essence these are similar to the concept of MAFS but without the legal status. MRFs are used for river management and to guide decisions on licence applications to protect other existing uses and users of the rivers within the catchment.

6.3.3 Water requirements for wetland and washland sites (Issue 3)

Nature of Problem

The wetland sites exist where the geomorphology, geology and land use allow a concentration of surface and groundwater flows and levels. The proportion of these contributing factors will vary for each site and hence this adds to the complexity of the study of wetlands. The area of groundwater contributing to the wetland site can be defined as the wetland catchment area.

Solution

Future abstraction boreholes will not be sited where they may cause detriment to wetland areas. Washland sites are dependant upon winter flood flows. Any increase in abstraction of winter flows or an increase in winter stored water may reduce the likelihood of their being flooded. The NRA will discourage any future abstractions that will cause unacceptable effects to a wetland or washland site of conservation interest.

6.3.4 Groundwater resources allocated to the environment (Issue 4)

Nature of Problem

The current water resources strategy identifies the need to review the allocation for the environment in the chalk and greensand aquifers of the Ivel and Hiz catchments.

Solution

A review of the Ivel resources is currently in progress.

6.3.5 Low flows in the River Hiz (Issue 5)

Nature of Problem

There is currently an investigation into the requirement for a flow support scheme.

Solution

Work has already started and includes an environmental assessment.

6.4 Environmental Features

6.4.1 Fisheries

Habitat Improvements to Tributaries and Backchannels of the Bedford Ouse (Issue 1)

Nature of Problem

As a result of previous land drainage and flood defence activities, many tributaries and backchannels, particularly in areas where flooding could be a problem, have become canalised and many of the in-stream features have been removed. Diversity of habitat, spawning areas and fish refuge areas have all been depleted as a result of these activities.

Areas that have been identified for fisheries habitat improvement include the River Ivel, the Alconbury Brook, the Lees Brook, the River Kym and the Houghton Trout Stream.

Solutions

Suitable and cost effective measures to restore damaged habitat can be easily achieved and previous similar activities in both this catchment and others have made an important contribution to the sustainable enhancement of cyprinid fisheries.

Habitat improvements such as riffle restoration using imported gravel, the creation of stone croys, and sensitive maintenance operations to create a two stage channel will all help to restore habitat diversity.

This will have a beneficial effect by increasing species diversity, creating spawning areas for gravel spawners such as chub, dace and barbel and generally increasing the fish holding capacity of these channels. The increased recruitment to the fish population will also help enhance the populations of species such as chub and dace in the main river channel where the majority of angling activity takes place.

Restoration of Bedford Ouse Dace Populations (Issue 2)

Nature of Problem

Recent fish population surveys have shown a marked decline in the Bedford Ouse dace population over the period 1989 to 1992. The dace populations of the River Kym and Alconbury Brook in particular have shown a significant decline over this period.

Bedford Ouse (Lower Reaches) Catchment

Fish Biomass Shortfalls Map 34



As dace spawning success is dependent upon the availability of clean gravel substrate, it is probable the observed population decline is related to the effects of the recent period of drought.

Solution

The immediate action recommended is to restock dace using fish reared by NRA. The introduction of small dace (7-10 cm) will ameliorate the impact of reduced natural recruitment.

Habitat enhancement as detailed in option tables will offer a long term solution to the problems associated with limited spawning substrate.

Enhancement of the Barbel Population (Issue 3)

Nature of Problem

Barbel are thought to be a native species of fish within the Bedford Ouse. The existing population of barbel is a result of introductions in the 1950's, the native populations are thought to have been lost many years before.

The introduced barbel have reproduced successfully and now support a good population in the Bedford Ouse between Milton Keynes and Bedford. Barbel occur within the lower Bedford Ouse covered by this plan, but are very localised in distribution. Barbel are also much prized fish by anglers.

Solution

With the habitat enhancements outlined in Issue 1, the habitat in back channels such as the Lees Brook and Houghton Trout Stream will be suitable for barbel. The chub stream and St Ives to Brownhill section of main river might also provide suitable habitat.

When habitat enhancements are complete, it is recommended in consultation with local angling interest young, NRA reared barbel are stocked at suitable sites.

Creation of Off-River Refuge Areas Between St Ives and Earith

Nature of Problem

Fish population surveys carried out since 1985 show a consistently poor fish population when compared to other parts of the Bedford Ouse (Lower Reaches).

The stability of the fish population in this section suggest strongly that the fish population is close to the current carrying capacity of the river.

Investigations suggest that the paucity of off-river areas which could provide a refuge to fish on this section of river may be an important factor in limiting the fish population.

Solution

The creation of backwaters or other off-river refuge areas. This might be achieved by excavation of new water bodies or by connecting existing ditches and dykes. Consideration might also be given to connecting one of the many gravel pits close to this section of river. It is however recognised that the latter option would require the co-operation of the gravel company and will also have implications for flood defence.

Provision of Fish Passes (Issue 5)

Nature of Problem

A modest sea trout run and a significant elver run are known to exist within the Bedford Ouse (Lower Reaches). Structures within the main river channel represent a significant obstacle to the upstream migration of these species, although restricted passage is possible via locks.

Solution

The provision of fish passes should be considered when major refurbishment of sluice structures is carried out. Modern fish pass design using modular units mean that a simple and cost effective solution is available to this problem.

6.4.2

Recreation

Improved Canoe Portage at Lock Structures

Nature of Problem

Canoeists are regular users of the navigable waterways of the catchment, but have little by way of facilities specific to their needs. In particular, the portage of craft around lock structures can present difficulties to all but the fittest of canoeists.

Solution

A programme should be initiated to provide canoe mooring and portage facilities at all locks. It is recognised that this work will require phasing, and priorities should be established in consultation with canoe user groups.

Facilities for Anglers with Disabilities (Issue 2)

Nature of Problem

Anglers with disabilities, and particularly those confined to wheelchairs have difficulty in gaining access to river fisheries. Such facilities as do exist tend to be of a one or two peg type, thereby prohibiting any group access. The need is therefore for a larger facility.

Solution

By selecting a site with an existing good pathway access, the cost of providing disabled angler facilities can be reduced and thereby enhance the possibility of a successful project. A survey of potential sites should be carried out to identify a suitable site. Sites such as the parks in Bedford and NRA land at Brampton are worthy of further investigation.

Access to the Countryside (Issue 3)

Nature of Problem

There is an increase in demand for public access to the countryside. Given the diversity of interests in outdoor recreation and the various authorities and individuals wishing to promote recreation, collaborative projects provide a useful vehicle by which progress can be made towards providing greater public access to the countryside.

Within the catchment there is an unmet need to provide circular or linear footpaths, bridleways and even cycle ways in rural areas.

Solution

In addition to nature conservation interests, the Ivel Valley Countryside Project also promotes sensitive recreational development within the project area. NRA currently supports a number of joint ventures, and with others would wish to continue to develop projects to provide greater public access.

Such collaborative projects would not be confined exclusively to the Ivel Valley but would include other suitable projects. It is also recognised that there is need to balance the demand for greater public access, with the need to protect the natural environment and those who live in rural areas.

Interpretation Boards for Recreation and Conservation (Issue 4)

Nature of Problem

It is important to educate and inform those who visit the countryside of the wildlife and historical interest to be seen within the area which surrounds them. Location maps, common bird and plant species, history of drainage or navigation, are all matters of interest to the visitors.

Solution

The provision of interpretation boards, either by NRA or in collaboration with others, at suitable sites. These might include footpaths, conservation areas or navigation structures.

Fishing Platforms (Issue 5)

Nature of Problem

Steep banks on certain river sections, notably on the River Ivel and mid-Bedford Ouse, present particular difficulties for angler access. As a result there have been many examples of unauthorised platform construction or excavation to aid angler access. Such activities are not only illegal under NRA Land Drainage Byelaws, but also present a real flood defence hazard and may also be dangerous to the user.

Solution

Develop within NRA suitable design and construction standards to meet flood defence needs and also provide a stable base for angling. Target known problem areas to ensure all access constructions comply with design standards and are consented.

6.4.3

Conservation

Possible Impact of Earlier Flood Defence Schemes and Dredging, Resulting in Degradation of the River Environment in some Locations (Issue 1)



Bedford Ouse (Lower Reaches) Catchment Conservation Objectives Map 35



Nature of Problem

It has been stated that past land drainage activities have adversely affected the environmental value of certain channels. The maintenance and enhancement of species diversity will therefore depend on future management regimes.

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

Solution

Analyse the Rivers Environmental Database (REDS) to help ascertain the environmental status of each of the rivers in the catchment and to identify conservation targets for the catchment. Conservation targets for each 500m section in the catchment are divided into the following three categories:

1. Conserve: contain rare plant or animal species and/or important plant communities and/or high plant diversity;
2. Enhance: may be poor for one element of river corridor ecology whilst maintaining good characteristics as well. Enhancement works may therefore need to improve the ecological shortfalls of a section whilst conserving the features of specific interest.
3. Restore: Ecologically degraded - low plant and animal diversity and no rare species present.

Of the 221 km of en-mained river in the catchment, 22% requires conservation measures, 64% requires enhancement and 14% requires restoration.

A standard, habitat-based River Corridor Survey (RCS) methodology has now been developed and appears as NRA Conservation Technical Handbook No. 1. It highlights important features which need protecting and identifies opportunities to rehabilitate and enhance degraded habitats.

The NRA at present is also developing a National River Habitat Survey (RHS) methodology which will classify the environmental conditions of rivers with respect to the physical features of wildlife value, for example, riffle pools, wet shelves or berms and cliffs.

RHS when completed will be used to aid and support decision making with respect to, in this instance, NRA operational activities (including river rehabilitation).

Both the RCS and RHS methodologies are essential if the NRA is to fulfil its statutory duties to further conservation.

Degradation of the Traditional Lowland Landscape (Issue 2)

Nature of Problem

Landscape imparts a sense of place, plays a fundamental role in our every day lives and is an immediate reflection of the ecology, habitat diversity and historical heritage.

Much of the aquatic environment and its associated lands as we see it today, have been subjected to a long history of change, increasingly so since the war. Activities such as land drainage, land clearance, mining, farming, industry, residential development and forestry have all played a part in landscape degradation.

Solution

Landscape conservation and management aims to increase and maintain diversity. This aim will be achieved through an assessment which will describe the landscape and progress appropriate management and enhancement. The NRA Conservation Technical Handbook No 2 on River Landscape Assessment will provide a consistent framework which will assist the NRA in contributing to the restoration and enhancement of impoverished river valley landscapes within the catchment.

Examination of the Weedcutting Regime (Issue 3)

Nature of Problem

On the whole, cutting is carried out only once a year and traditionally programmed between late May/early June and August. Previous practice has been to clear marginal and instream plants from the full width of the channel, but in recent years a margin of vegetation has been left against both banks. Failure to weed cut can result in choked channels which can act to impede flows, increase the risk of flooding, obstruct access to the fishery by fishermen and hinder passage in navigable waters.

Marginal and instream plants add to the ecological richness and habitat diversity of the river channel. They provide continuity between the land water interface and provide refuge areas to fish. In particular to the early life-history stages of coarse fish. With the possibility of flood meadow creation adjacent to non navigable channels, some weed may not need to be cut in future in order to raise river levels.

It is therefore important to ensure that the correct balance is achieved between the environmental needs and flood defence/navigation needs when routine weed cutting is carried out by NRA.

Solutions

The NRA will continue to follow its recently published "Code of Practice on Weedcutting" and to review its performance yearly every Autumn. It will also assess the function of the width of marginal plants in relation to the width of watercourse.

It is considered that there may be scope for reducing the adverse impact of weedcutting by later cutting, alternate cutting of margins, retaining wider margins and reducing intensity of in-stream cutting. Such action will consider the correct balance with the needs of flood defence, navigation and angling. The review should also consider the sensitive disposal of cut weed to protect uncut margins.

6.4.4

Navigation

Lock Congestion (Issue 1)

Nature of Problem

A feature of navigation in parts of the Bedford Ouse (Lower Reaches) during the summer months is congestion at locks. This problem can be particularly acute during summer weekends in the middle reaches of the river.

Solution

There is an ongoing programme of lock automation and lock pen enlargement to improve the movement of craft through the system. Whilst this will undoubtedly improve the situation in the short term, there is a need to establish level of service to protect the interests of existing boat users. A survey is required to assess current lock waiting times, boat density, and

to establish an acceptable maximum waiting time at any lock. Such information should be used to influence the development of permanent moorings in a manner to protect existing boat users from effect of overcrowding.

River Ivel Navigation (Issue 2)

Nature of Problem

The River Ivel was used for navigation as far as Shefford. Navigation has long since fallen into disuse and is not included within the Anglian Water Authority Act 1977 as a statutory navigation. The waterway does however continue to be used by canoeists and occasionally by other manually propelled craft. There is a demand within certain groups to reopen the navigation.

Solution

The problems associated with reopening all or part of the River Ivel navigation are formidable and expensive. Extensive lock reconstruction and extensive channel works would be required and it is therefore most unlikely that such work could be funded within the foreseeable future.

There may however be justification to carry out a preliminary feasibility study to scope the project and give an estimate of costs. It would also be of value to establish the current legal position with respect to navigation on the River Ivel and any implications that this might have for canoe use.

If it is not feasible to reopen navigation there may be scope to increase access to the River Ivel by canoe users, and NRA will discuss this issue with all relevant parties, subject to clarification of the legal position.

6.5 Flood Defence Issues

6.5.1 Capital Works

Nature of Problem

Flooding of urban areas has been identified over recent years together with additional sites where it is perceived that an inadequate level of flood protection exists.

Solution

Provision has been made in the medium term and Ten Year Needs Capital programmes for investigating and carrying out flood alleviation works.

6.5.2 River Maintenance

Nature of Problem

Correct identification of maintenance needs to achieve expected standards of service whilst offering best value for money will require a more structured and detailed method of assessment.

Solution

The system under review will assess "Land Use" by considering agricultural or urban content within the flood plain along lengths of river divided into 4-7km reaches. For each element (e.g, road, house, grazing) a score is given, with the score measured by a single unit called a "House Equivalent" and by the score achieved, the reach is placed into one of several Land Use Bands to guide assessment of priorities when determining maintenance programmes.

6.5.3 Non-Main River Flooding

Nature of Problem

There is a marked escalation in the number of non main river urban flooding events due principally to lack of maintenance or extreme weather patterns overwhelming the local surface drainage systems.

Solution

The NRA's duty is one of a general supervisory role over parties that have a responsibility for these watercourses. There is an increasing trend of lack of resources for these parties to be able to respond as riparian owners, or as local authorities deciding upon involvement by use of their discretionary drainage powers, to rectify these localised events. Internal Drainage Boards may also become involved where problems occur within their administrative area.

6.6 Development

6.6.1 Development Control (Issue 1)

Nature of the Problem

The broad objective of catchment management planning is to conserve and enhance the total water environment through effective land and resource management. The NRA, however, has very little control over the mechanisms which determine land use change on a catchment wide basis, this being the responsibility of local planning authorities through the implementation of the Town and Country Planning Acts. In its role of consultee, the NRA seeks to influence policies in statutory development plans such that they reflect the NRA's statutory conservation and enhancement responsibilities.

Solution

As the policies in statutory development plans set out the framework for land use change and will provide the key reference in determining development applications, it is essential that the NRA's aims for the water environment are fully represented by the planning policy statements.

Whilst the Structure Plans and Local Plans (in their various states, see Appendix No 1) have policies which in general cover the NRA's interests, the ultimate aim is for the adoption, by the planning authorities, of NRA Policy Statements as planning policies. National Model Land Use Policy Statements are at present under preparation. For the Anglian Region Policy Statements, see Appendix No 2.

None of the local planning authorities' planning application forms include a question on water supply. The NRA would welcome the inclusion of such a question so that water resource implications can be identified at an early stage.

6.6.2 New Roads and Bypasses (Issue 2)

Nature of Problem

A number of new roads, improvements and bypasses are proposed in the Catchment, these include the A1 widening, the Bedford Southern Bypass and the Baldock Bypass. The NRA's concern is the impact that road development has on water

quality, water resources, watercourses receiving surface water run-off, flood flows where the roads cross flood plains and the impact of the road on the water environment.

From a water quality point of view there are two concerns regarding highway drainage which cause pollution of watercourses and groundwaters:-

1. Diffuse contaminants, i.e. tyre rubber, brake wear, de-icer and vehicle emission.
2. The control of large spillages from road traffic accidents.

Water resources may be affected both during road construction and in the long term. The use of deep cutting to reduce the impact of the road can impact on a resource in terms of groundwater flow and dewatering. The installation of an impermeable barrier in the road construction can remove large areas of land from an aquifer's catchment. A new road across a green field site reduces groundwater recharge and therefore reduces resources.

Efficient surface water drainage from road carriageways and verges if discharged to a watercourse can cause or exacerbate flooding.

Roads crossing flood plains can result in a reduction of flood plain storage and can cause a constriction to flood flows causing increased flood levels.

New roads can have a major impact on the water environment. Intrusion, pollution and the change in watercourse flow regimes can drastically affect the ecosystem.

Solution

All of the above problems associated with road construction are addressed by the NRA in its consultation role with the road promoters. It is essential, however, that the NRA is consulted at an early stage of the road design and that sufficient detail is made available to enable a meaningful response to be made.

The water quality of highway run-off can be improved by settlement and flotation, by the provision of grit traps and petrol/oil interception. In certain circumstances, the use of

surface water attenuation ponds/lagoons may double up as a suitable means of quality control, provision should be made however for this dual purpose role.

To try to eliminate pollution from road traffic accidents the NRA is requiring a minimum of 20m³ of storage capacity on surface water drains of major highways. This is preferably provided on-line and, in non-urban situations, in open channels. It must be capable of being blocked off. The purpose is to allow the Fire and Rescue Service or NRA water quality staff to block the drainage system and in a 'worst-case' scenario to collect the contents of a tanker. This arrangement is intended to provide the opportunity under most circumstances to prevent river pollution. Pollution traps are even more important before discharge to soakaway as dealing with polluted groundwater is much more difficult than with polluted surface water.

From a resources and flood risk point of view the NRA prefers that highways drainage discharges to soakaway. From a water quality point of view, however, the use of soakaways is restricted and generally the disposal of highway water is via a positive system to a watercourse with attenuation often being required to prevent flooding. Attenuation can also be a requirement on environmental grounds to maintain the flow regime status quo in the receiving watercourse.

The requirement when watercourses and their attendant flood plains are crossed by roads is that the crossing will satisfy the NRA in terms of flood conveyance and where appropriate, navigation.

6.7

Visionary Issues

6.7.1 Water Quality

Powers provided in the 1989 Water Act allowed the Secretary of State for the Environment to introduce Statutory Water Quality Objectives. The proposals include maintenance of the 1990 quality as determined by "General Quality Assessment" and steady improvement in water quality to meet 'use' related target river qualities. In the future it is expected that new discharges will be required to meet standards which will maintain 1990 quality and meet target FEC's.

At present only NWC classified stretches have been considered for FEC classes. These are likely to be formally proposed for Statutory Water Quality Objective status and will be introduced on a catchment by catchment basis (by the Department of the Environment).

In the future it is anticipated that SWQO's will apply to the catchment. These will seek to prevent any deterioration in water quality and will bring about a long term improvement. Other use related classes will be introduced for special ecosystem, water contact activity and abstraction, and would be appropriate in various parts of the catchment.

In the short term (next 5 years) it is likely that there will be a small general improvement in water quality throughout the catchment.

6.7.2 Water Quantity

The management, allocation, and development of water resources in the Bedford Ouse were set out in the Water Resources Strategy for the Region.

(a) Water Resources Management Policy

The reasonable needs of all abstractors (public supply, industry and agriculture) will be met at reasonable cost up to appropriate levels of service. "Reasonable needs" must allow for the proper attention to demand management; for example leakage control and consideration of water metering. All applications for water abstraction licences are assessed for "reasonable needs".

Reasonable environmental water needs such as those of rivers, back channels and wetlands will be met. This includes the needs of navigation, fisheries and recreation in addition to maintenance of the river ecosystems itself. All new water developments will pay attention to the needs of the water environment and as far as possible give a net benefit to it. In granting new licences the NRA may specify a flow below which abstraction must cease. This will ensure that existing licence holders are protected and that the environment is safeguarded.

The NRA will continue to monitor available water resources with particular emphasis on the impact of possible climate change.

(b) The Availability of Water

We will investigate the scope for tradeable permits, and for incentive charging, as means of releasing entitlements to abstract for relatively low value uses.

In order to release unused resources the NRA will consider revoking unused abstraction licences. Where appropriate we will allocate minor local sources to minor local needs such as industry and agriculture, provided that any loss to downstream entitlements can be made good and that any appropriate financial arrangements are made. New abstractions for predominately non-consumptive users such as amenity cooling and gravel washing will generally be allowed, subject to consideration of local effects.

The NRA will continue to encourage the use of stored winter water in preference to summer surface or groundwater abstraction.

The NRA will encourage the maximisation of the yield of Grafham Water Reservoir rather than the development of new public water supply sources. This may include the use or modification of the existing abstraction licence at Brownhill.

(c) Demand Management

We advocate demand management by all water users to the extent which is economically justified. By this we mean to the point where the costs of saving water match those of making more available, taking account of all the

costs and benefits - financial, social and environmental.

Before any new sources are developed, it is essential that abstractors make sure they are doing all they can to reduce leakage and to carry out effective demand management. We support selective domestic metering, with an appropriate tariff, in areas where water resources are stressed.

Where proper attention has not been given to the introduction of selective metering we will not grant new licences.

6.7.3 Environmental

Conservation

Management of Water Levels to Improve Habitat for Nature Conservation

Nature of Problem

The years from the 1940's to the mid 1980's saw a determined national effort towards the continuing improvement of agricultural output. As well as the use of artificial fertilizers, there was a continuing programme of capital and maintenance works on rivers to reduce flooding frequencies and improve drainage of agricultural land. This was generally achieved by the lowering of water levels in the rivers, through channel realignment, dredging or alteration of water level control structures, as well as by intensive weedcutting. Whilst this was very successful in increasing the output of farms and also in allowing conversion of flood plain land to arable production, it has since been recognised that the resulting drier valley bottoms can bring about significant changes to the natural environment. Reductions in the numbers of wading birds have been recorded, and changes in vegetation types noted.

Flood meadows are an ancient system of agriculture involving the irrigation of low lying fields through overspill from rivers in times of high flow. This flooding can result in wet grassland conditions favoured by wading birds.

Solution

The direct reversal of a long-standing policy of water level reduction is not easily achieved. However, the Countryside Stewardship Scheme, operated by the Countryside Commission,

offers grant aid for certain works that will enhance the environment, which could include reinstatement of flood meadows.

Whilst the uptake of such schemes is outside the control of the NRA, nevertheless there will be an involvement for the Authority towards the achievement of water levels needed for implementation.

Buffer Zones

Nature of Problem

The concept of buffer zones alongside rivers has received considerable attention in recent years both within the NRA and amongst nature conservation organisations.

The concept basically involves the isolation of a suitably wide strip (10-100m) alongside rivers which is removed from intensive agricultural use and managed to provide appropriate habitat types.

A number of potential benefits of buffer zones have been cited and these include:

- enhances habitat diversity for nature conservation
- improved landscape appearance
- reduction of impact of soil erosion
- potential for management of weed growth by shading
- reduction of impact of farm livestock wastes
- reduction in nutrients entering rivers

The NRA is currently undertaking Research and Development (R & D) work to determine the value and efficacy of buffer zones.

The land use immediately adjacent to some parts of the Bedford Ouse is of a type which already provides a buffer zone but it is considered that some additional stretches, both on main river and tributaries, offer scope for development of buffer zones.

Clearly the development of buffer zones requires the co-operation of riparian landowners and would need to be encouraged by grants or other financial support. Potential sources of funding would be the Countryside Stewardship Scheme (operated by the Countryside Commission) and Set Aside arrangements (if the creation of buffer zones was accepted under this scheme).

6.7.4 Flood Defence

- 1) Maximise the use of existing flood plains as well as additional balancing storage systems to slow down the passage of flood flows before reaching areas of the constricted flood plain, which may cause urban flooding difficulties and prevents inadequate discharge from surface water tributaries.
- 2) The provision of a 1 in 100 year standard of flood protection for all urban and commercial property within the influences of statutory main river.
- 3) For all non-main river related flooding difficulties to be formally adopted by local authorities.
- 4) A revision of flood defence legislation to extend enforcement powers on designated flood plain areas that may be compromised due to encroachments from development.

6.7.5 Development

The installation of the total infrastructure requirements for all land included in local plans prior to any development taking place, this work to be funded and co-ordinated by the Local Authority with the cost recovered from landowners/developers. The works would include all necessary surface water attenuation facilities, watercourse improvements, environmental enhancements and pollution prevention measures as deemed a requirement by the NRA.

6. SUMMARY OF CATCHMENT ISSUES AND OPTIONS

6.1 Water Quality - Surface Water

6.1.1 RIVER QUALITY OBJECTIVE FAILURES			
a) Impact of Unsewered Villages - River Kym, Alconbury Brook and Ellington Brook Catchments			
Options	Responsibility	Advantages	Disadvantages
1. Investigate impact of "village drains" on water quality	NRA	Provide information to local councils for decision making	Uncertainty of positive outcome
2. Installation of private package sewage treatment plants	Householders	Improved water quality	Only appropriate to a small number, cost, increased monitoring by NRA
3. Installation of first time sewerage schemes	AWS/Councils/ Householders	Improved water quality and reduction in number of public complaints	Cost to householders and councils
b) Alconbury Brook: Headwaters to Ellington Brook - Failure to meet FEC 4 Target for BOD and DO			
Options	Responsibility	Advantages	Disadvantages
1. Investigate fully cause of low DO and high BOD	NRA	Provide data for decision making	
2. Adopt lower target FEC	NRA	Immediate compliance and no cost	Water quality could deteriorate

c) River Til/River Kym: Headwaters to Bedford Ouse - Failure to meet RQO's for BOD, NH ₃ and DO and FEC 4 target for DO			
Options	Responsibility	Advantages	Disadvantages
1. Investigate fully failure to meet objectives	NRA	Provide data for decision making	
2. Set lower FEC targets	NRA	Targets may be achievable	Failure to protect water environment
d) Impact on Kimbolton STW on river Kym - Failure to meet FEC 3 target			
Options	Responsibility	Advantages	Disadvantages
1. Investigate impact of Kimbolton STW	NRA	Provide data for correct decision making	
2. Collate/update river flow data	NRA	As above	
3. Review consent condition if necessary	NRA	Improved water quality	Cost to discharger
e) Brampton Brook: Buckden Waste Disposal Site to Bedford Ouse - Failure to meet RQO's for BOD, NH ₃ and DO			
Options	Responsibility	Advantages	Disadvantages
1. Improve leachate control at Buckden Waste Disposal Site	Waste disposal site operator	Improve water quality	Cost
2. Install leachate treatment system	As above	As above	Cost
3. Continue to review impact of Brampton STW	NRA	Provide data for decision making	

f) Impact of Marston Moretaine STW on Marston Brook - Failure to meet FEC 4 target			
Options	Responsibility	Advantages	Disadvantages
1. Determine more representative sample point downstream of discharge	NRA	Improved information on true quality of watercourse	Uncertain outcome
2. Improve STW to meet standard needed to achieve FEC 4	AWS	Improved water quality	Cost
3. Change target to FEC 5	NRA	Immediate compliance	Water quality remains moderate
g) Marston Brook/Elstow Brook: Stewartby Lake outfall to Wootton Brook - Failure to meet FEC 3 target for Ammonia			
Options	Responsibility	Advantages	Disadvantages
1. Investigate occurrence of high ammonia	NRA	Pin points source	Cost
h) Millbridge/Common Brook: Gamlingay to River Ivel - Failure to meet FEC 3 target for DO, total and un-ionised NH ₃			
Options	Responsibility	Advantages	Disadvantages
1. Improve monitoring/investigate failures	NRA	Better data for decision making	
2. Set lower target FEC	NRA	Immediate compliance with targets	Water Quality could deteriorate

i) Steppingley Brook: Station Road, Ampthill to River Flit - Failure to meet FEC 4 for Ammonia			
Options	Responsibility	Advantages	Disadvantages
1. Detailed investigation of impact of Flitwick STW on River Flit	NRA	Provide data for decision making	
2. Improve monitoring to investigate upstream quality	NRA	As above	Cost
3. Review consent if necessary	NRA	Improved water quality	Potential cost to discharger
4. Reset realistic sampling points and FEC targets	NRA	Immediate compliance with targets	No improvement to water quality
5. Improve upstream quality	NRA	Improved water quality	Uncertain of positive outcome
j) Hen Brook - Failure to meet RQO's and poor Biological Quality			
Options	Responsibility	Advantages	Disadvantages
1. Investigate impact of surface water sewers	NRA	Provides information for targeting sites in need of inspection	
2. Undertake pollution prevention visits at industrial areas in St Neots	NRA	Increases awareness of water quality issues	Cost
3. Carry out pollution prevention measures - bunding/ installation of oil interceptors	Industry/AWS	Improved water quality, reduced risk of pollution	Uncertain if targets will be met Cost

k) Impact of Barton-Le-Clay STW on Barton Brook - Failure to meet FEC 3 target			
Options	Responsibility	Advantages	Disadvantages
1. Monitor improvements to check compliance of river with objectives	NRA	Provide data for correct decision making	
l) Pix Brook: Headwaters to River Ivel - Failure to meet FEC 4 for BOD upstream and total NH ₃ downstream of Letchworth STW and poor Biological Quality			
Options	Responsibility	Advantages	Disadvantages
1. Fully investigate impact of industrial surface water runoff	NRA	Provides information for decision making	
2. Undertake pollution prevention visits at industrial areas	NRA	Increases awareness of water quality issues	
3. Investigate impact of surface water sewers	NRA	Provides information for targeting sites in need of inspection	
4. Investigate illegal connections to SWS's	AWS	As above	Cost

m) Impact of Storm Sewage overflows and Surface Water Discharges			
Options	Responsibility	Advantages	Disadvantages
1. Improve monitoring to identify problem storm sewage overflows and surface water discharges	NRA	Improved basis for decision making	
2. Uprate sewerage systems to eliminate unsatisfactory overflows	AWS	Improved water quality	Costs
3. Improve safeguards/treatment on problem surface water discharges	AWS/Industry	Reduced number of pollution incidents	Costs and maintenance problems
4. Ensure new surface water drainage systems for domestic and industrial developments have adequate safeguards and treatment	NRA/AWS/ Planning Authorities	Protection of water quality	Costs and maintenance problems

6.1.2 MINISTRY OF DEFENCE BASES			
Options	Responsibility	Advantages	Disadvantages
1. Improve STW's to ensure compliance with standards required in "pseudo consents"	MOD	Improved water quality	Cost
2. Continue to establish a close liaison with MOD sites and survey current pollution risks	NRA/MOD	Increases awareness of issues in MOD and improves information for decision making	
3. Improve pollution control practices	MOD	Reduction of pollution risks and improved water quality	Cost
6.1.3 LANDFILL SITES			
a) Marston Vale			
Options	Responsibility	Advantages	Disadvantages
1. Ensure high regulation of future developments and waste disposal operations	NRA/Waste Regulation Authorities	Protection of local environment	Cost and maintenance problems
b) Flitwick			
Options	Responsibility	Advantages	Disadvantages
1. Construct boreholes and contain leachate by pumping from eastern and southern boundary	SKF	Containment of leachate. Remediation of groundwater	Cost to SKF and DoE

6.1.4 EUTROPHICATION			
Options	Responsibility	Advantages	Disadvantages
1. Continue to review nutrient data	NRA	Provide basis for decision making	
2. Undertake investigation of algae and aquatic plant communities	NRA	As above	Cost
3. Consider designation as vulnerable zone or sensitive area under EC Nitrate or UWW Directive	NRA/DOE	Provide framework for control of inputs	Cost (AWS + agriculture)
4. Develop programme for nutrient reduction, possibly at STW	NRA/AWS/MAFF	Reduction in nutrient inputs	Cost
5. Treat water entering Grafham Reservoir	AWS	As above	Cost

6.1.5 BLUE GREEN ALGAE			
Options	Responsibility	Advantages	Disadvantages
1. Continue reactive sampling	NRA	Provide basis for decision making	Cost
2. Produce "Action Plans"	NRA	Provide basis for decision making	Cost
3. Research programme	NRA/AWS	Provide basis for decision making	Cost
4. Artificial mixing of reservoirs and lakes	AWS/Lake Owners	Minimise surface blooms and scums	Cost. Does not control algal production
5. Nutrient removal/reduction at reservoir/lake	AWS/Lake Owners/NRA	Minimise blue-green algae and other, and other algal	Cost and potential damage to reservoir/lake ecology
6. Nutrient removal/reduction of source	AWS/Lake Owners/NRA	Reduction in nutrient inputs	Cost uncertainty of outcome

6.2 Water Quality - Groundwater

6.2.1 NITRATE SENSITIVE AREAS			
Options	Responsibility	Advantages	Disadvantages
1. Designation of NSA's + implementation of restricted farming practices to reduce nitrate input to land	MAFF/NRA/ Farmers	Reduction of nitrate in groundwater	Cost - requires incentive compensation schemes
2. Encourage liaison between farmers and NRA	NRA/Farmers	Increases awareness and reduces pollution risks	
6.2.2 GROUNDWATER CONTAMINATION AT BALDOCK ROAD, LETCHWORTH AND BIGGLESWADE			
Options	Responsibility	Advantages	Disadvantages
1. Maintain liaison and data exchange between NRA and Water Companies	NRA/AWS	Exchange of information for decision making	
2. Investigate sources of solvent contamination	NRA	Improved data for decision making	Uncertainty of positive outcome
3. Review other potential sources of contamination	NRA	Improved data for decision making	
4. Improve waste disposal practices	NRA/Solvent users	Reduces risks, improves groundwater quality	Cost
5. Provide treatment where necessary	TVWCO/Greene King	Compliance with EC standards	Cost
6. Develop alternative sources	NRA/TVWCO/ Greene King	As above	Cost

6.3 Water Resources

6.3.1 a) Future Demand for Abstraction cannot be met from Surface Water (Issue 1)			
Options	Responsibility	Advantages	Disadvantages
Increase use of winter stored water	Licence holder	Reduce pressure on summer resources. Potential to create conservation habitat. Potential for development to commercial fishery	Cost to licence holder. Loss of agricultural land
Transfer water from British Waterways Canal system	NRA/BWB	No need to construct large-scale reservoirs. Recreational use of connections to BWB system	Quality problems in carrier rivers. Unknown costs. Unlikely to yield in periods of peak demand
Increase the return of effluent	PWS/industry	Under utilised source. Provide local solution to local problem	Public perception. Piping and treatment costs
Direct transfer from River Trent	NRA	Trent already of suitable quality for potable water supplies. Available resources in Upper Trent	May be quality changes in carrier rivers. Cost of new works. May not form reliable supply in a drought
Construction of Brownhill Tunnel	AWS	Increase Grafham yield by 100 tcmd. Some permissions already exist.	Cost of sourceworks. Possible environmental effect on lower Bedford Ouse. Possible effect on navigability of Lower Bedford Ouse

Reduction of Offord MRF	NRA/AWS	Requires minimal additional cost. Would increase reliable yield of Grafham works.	Possible environmental effect on Lower Bedford Ouse. Possible effect on navigability of Bedford Ouse. Possible environmental effects on backchannels of the river.
Earith Transfer Improve reliability by lowering cessation level.	NRA	Minimal cost Greater reliability for irrigation abstraction in Middle Level, less pressure on River Nene resources.	Perceived conflict with navigation in lowered level. Some small reduction in flow.

b) Future demand for Abstraction cannot be met from existing groundwater sources (Issue 1)			
Options	Responsibility	Advantage	Disadvantage
Re-evaluation of groundwater resource allocation to the environment	NRA	May yield additional water in some aquifers. Enable more accurate resource planning	In some areas the allocation may increase long-term availability. May show allocation to environment not sufficient. Technical complexity of study
Abstraction from existing and old mineral workings	Landowners/NRA	Extensive workings in valley bottoms. Local source. Replenishes in winter floods. Sites for winter stored water	Water quality (sulphates). Engineering stability. Many of the sites are quite small. May be hydraulically linked to rivers. Many pits are already allocated for other use
Increase abstraction from gravels and other minor aquifers	NRA	Marginally increase available resources in some areas	Yields may be low. May be hydraulically linked to rivers. Subject to drought

6.3.2 "IN-RIVER NEEDS" ARE NOT QUANTIFIED AND MINIMUM ACCEPTABLE FLOWS NEED TO BE DEFINED			
Options	Responsibility	Advantages	Disadvantages
Carry out extensive ecological studies throughout the catchment	NRA	Protects in-river ecology. Improved resource management. Verification of water resource availability. Satisfies local requirements	Cost and timescale. Possible restriction on existing abstractors
6.3.3 CATCHMENT AREAS FOR WETLAND AND WASHLAND SITES OF CONSERVATION VALUE NEED TO BE DEFINED (Issue 3)			
Options	Responsibility	Advantages	Disadvantages
Carry out hydrological, hydrogeological and ecological studies	NRA	Provide effective protection of existing sites. Improves water resource management	Cost. Technical complexity of study

6.3.4 RE-EVALUATION OF THE GROUNDWATER RESOURCES ALLOCATED TO THE ENVIRONMENT (Issue 4)			
Options	Responsibility	Advantages	Disadvantages
Carry out extensive ecological hydrological and hydrogeological studies throughout the catchment	NRA	Improved resource management. Verification of water resource availability. Satisfies legal requirements	Cost and timescale. May increase allocation in some areas
6.3.5 RIVER SUPPORT AND ALLEVIATION OF LOW FLOWS IN THE RIVER HIZ (Issue 5)			
Options	Responsibility	Advantages	Disadvantages
Carry out surveys to assess the extent of low flow problems and to establish the required "flow" regime	NRA	Improved resource management. Provides baseline data and a target to aim at	Does not 'solve' problem
Revoke unused abstraction licences and control use of new abstraction	NRA	May lead to a short-term gain in notionally available resource but unlikely to solve problem in long term	Unlikely to yield significant additional flow. May protect any additional flow gained
Install a river support scheme using boreholes	NRA	Will provide additional flow in river. Enable NRA to manage resources	Cost/timescale may lower water table in some locations

6.4 Environmental Features

6.4.1 FISHERIES			
Issue 1 Habitat Improvements to Tributaries and Backchannels of Bedford Ouse			
Options	Responsibility	Advantages	Disadvantages
1. Carry out fishery habitat improvements to tributaries such as the River Ivel, River Kym and Alconbury Brook and backchannels such as the Lees Brook and the Houghton Trout Stream	NRA	Increase habitat diversity and further the value of the rivers for fisheries and conservation in the area	Cost
Issue 2 Restoration of Bedford Ouse Dace Populations			
Options	Responsibility	Advantages	Disadvantages
1. Rehabilitation of the dace population in the Bedford Ouse Rivers which surveys highlighted had declined as a result of reduced recruitment in drought years	NRA	Maintenance of species diversity and increased angling potential	Cost
Issue 3 Enhancement of the Barbel Population			
Options	Responsibility	Advantages	Disadvantages
To increase the distribution of barbel within this catchment by re-stocking into areas of suitable habitat	NRA	Enhance species diversity and re-establish populations of this popular angling species	Cost
Issue 4 Creation of Off-River Refuge areas between St Ives and Earith			
Options	Responsibility	Advantages	Disadvantages
1. Poor biomass and densities of fish recorded between St Ives and Earith is linked to poor marginal cover and a lack of backwaters. Creation of off-river refuge areas should help enhance cyprinid production and provide shelter in flood conditions	NRA	Enhanced cyprinid production and hence greater angling potential in this area	Cost

Issue 5 Provision of Fish Passes			
Options	Responsibility	Advantages	Disadvantages
1. Consideration should be given to the provision of fish passes to any structures undergoing major refurbishment	NRA	Enhance the successful run of migratory species such as sea trout and eels	Cost, but this would be modest during any major refurbishment

6.4.2 RECREATION			
Issue 1 Improved Canoe Portage Facilities around Navigation Structure			
Options	Responsibility	Advantages	Disadvantages
1. To carry out works that will ease the handling of canoes around navigation structures improving the service provided by the NRA where they are the statutory navigation authority	NRA	Improving facilities for licence paying canoeists	Cost
Issue 2 Creation of an area for Fishing by Anglers with Disabilities			
Options	Responsibility	Advantages	Disadvantages
1. To create an area in which organised angling such as a small fishing match could be undertaken by disabled anglers. This could possibly be created in the Bedford Town area	NRA	Improved facilities for licence paying disabled anglers who currently have little provision for safe accessible angling	Cost
Issue 3 Demand for Wider Access to the Countryside			
Options	Responsibility	Advantages	Disadvantages
1. To work in conjunction with others on collaborative projects to improve public access to water based recreational activities such as footpaths, bridleways and cycle tracks. The work of the Ivel Valley Countryside Project is of particular relevance in this respect	NRA Ivel Valley Countryside Project Local Authorities	Improved public access to riverside recreational activities in line with NRA Recreation Strategy	Cost

Issue 4 Development of Interpretation Boards and Centres around Water-Based Recreational Areas			
Options	Responsibility	Advantages	Disadvantages
1. Construction of interpretation boards to provide general public with useful information to enlighten them as to the wildlife historical areas of interest and the NRA's involvement in these. These could be placed on existing Reserves or footpaths or any proposed extensions of footpaths or bridleways	NRA in collaboration with local conservation groups and Trusts	Better public information on NRA's activities and good publicity where collaborative projects have been undertaken	Initial cost
Issue 5 Creation of Safe Stable Fishing Platforms in Liaison with Angling Clubs			
Options	Responsibility	Advantages	Disadvantages
1.To construct fishing platforms which do not present a flood defence risk and will discourage anglers from creating swims in sensitive floodbanks. Particularly needed in Blunham Area of the River Ivel	NRA in collaboration with Angling Clubs	Reduced flood defence risk and provision of permanent accessible fishing areas. Reduced disturbance to other areas of bank and bankside vegetation.	Initial cost

6.43 CONSERVATION			
Issue 1 Possible Impact of earlier River Engineering Schemes and Dredging, Resulting in Degradation of the River Environment in some Locations			
Options	Responsibility	Advantages	Disadvantages
1. To develop and implement effective standard methods to describe, classify and monitor the conservation resource	NRA	Provide basis for decision making	
2. Identify areas with potential for restoration and enhancement and determine costs	NRA	Provide basis for decision making	
3. Undertake restoration and enhancement schemes (if identified and cost effective)	NRA/Mineral Companies	Improve habitats and landscape	Costs
Issue 2 Degradation of the Traditional Lowland Landscape			
Options	Responsibility	Advantages	Disadvantages
1. To develop and implement effective standard methods to describe, classify and monitor the conservation resource	NRA	Provide basis for decision making	
2. Identify areas with potential for landscape restoration and enhancement through replacement of, for example, riverside trees, increasing the areas of permanent flood meadow grassland and reed beds	NRA, EN, MAFF, Wildlife Trusts, Riparian Owner	Provide basis for decision making	
3. Undertake restoration and enhancement schemes (if identified and cost effective)	NRA/EN, MAFF, Wildlife Trusts, Riparian Owner, CC, District Council, County Council, LA	Improve habitats and landscape	Costs
4. NRA continue to develop a programme of riverside tree replacement within its maintenance operations	NRA, Riparian Owner	Improve habitats and landscape	Costs Possible conflict with Flood Defence Standards of Service

Issue 3 Examination of the Weedcutting Regime			
Options	Responsibility	Advantages	Disadvantages
1. Review code of practice on weedcutting	NRA	Monitor impact and performance of weedcutting practice	
2. Consider reduction of weedcutting programme	NRA	Raise water levels for lowland flood meadows, improve habitats for birds, improve habitats for coarse fish	Possible Interference with navigation and fishing Possible reduction of Flood Defence standards
3. Improve disposal arrangements for cut weed	NRA/Riparian Owner	Increase bankside plant diversity	Costs

6.4.4 NAVIGATION			
Issue 1 Boat Traffic Congestion at Locks during the Summer period			
Options	Responsibility	Advantages	Disadvantages
1. Lock automation	NRA	Reduces lockage times, part of ongoing programme	Initial cost, only a short term solution if boat numbers continues to rise in pressure areas
2. Lock pen enlargement	NRA	_____	_____
3. Set level of service for lock waiting times	NRA/District Council/ Boat users	Assist in strategic planning for the development of navigation facilities	Subjective - what is a reasonable waiting time. Determination of 'saturation point'
Issue 2 River Ivel Navigation Reopening			
Options	Responsibility	Advantages	Disadvantages
1. Feasibility study	NRA/Boat users/ Local authorities	Establish cost benefit	Initial cost with little prospect of the project progressing
2. Construction of locks and channel works to re-open navigation	NRA/Boat users/ Local authorities	Increase navigation potential and increase boat registration income	High cost, unlikely to commence within foreseeable future

6.6 Development

6.6.1 DEVELOPMENT CONTROL - ISSUE 1			
Options	Responsibility	Advantages	Disadvantages
1. Include relevant policies in structure and local plans	NRA/Planning Authorities	Protection and enhancement of the water environment	
2. Amend planning application forms to include water supply source i.e mains/borehole	Local Authorities	Will enable NRA to better assess planning proposals in terms of water resources and to advise accordingly	Initial cost of change of administration to councils
6.6.2 NEW ROADS AND BYPASSES - ISSUE 2			
Options	Responsibility	Advantages	Disadvantages
1. Incorporate flood protection measures into all road proposals	NRA/Highway Authorities/DOT	Avoid increased flood risk	
2. Incorporate pollution prevention measures into all road proposals	NRA/Highway Authorities/DOT	Avoid pollution	
3. Ensure nature conservation interests are protected and enhanced with all road proposals	NRA/highway Authorities/DOT	Protection and enhancement of water environment	Costs

6.5 Flood Defence

Options	Responsibility	Advantages	Disadvantages
Assessment and execution of main river works	NRA	Improved levels of urban flood protection	Costs
To assess the area at risk from flooding, the effective standard of service and the target standard of service	NRA	Improvements in identification of priorities. Utilises resources to best effect	Loss of Flexibility in maintenance activities. Does not cover non main river
Investigate non-main river flooding and implement alleviation works	Riparian Owners Local Authorities	Improved levels of urban flood protection	Costs. "Permissive" nature of available powers

APPENDICES

- 1 **Development Plans; structure, local, minerals and waste**
- 2 **NRA Model Policies**
- 3 **National Water Council Classification Scheme for water quality**
- 4 **Water Quality Criteria for Fisheries Ecosystem Classification**
- 5 **The Biological Classification System**
- 6 **Anglian Region Interim Levels of Service**

APPENDIX 1

DEVELOPMENT CONTROL

STRUCTURE PLANS	CURRENT STATUS
Bedfordshire County Council	Currently under review. Alteration No. 3 approved February 1992.
Cambridgeshire County Council	Currently under review. Consultation draft for alteration No. 1 produced in December 1992.
Hertfordshire County Council	Reviewed 1991. Alterations operative in July 1992.
Northamptonshire County Council	Alteration No. 1 approved in January 1992.

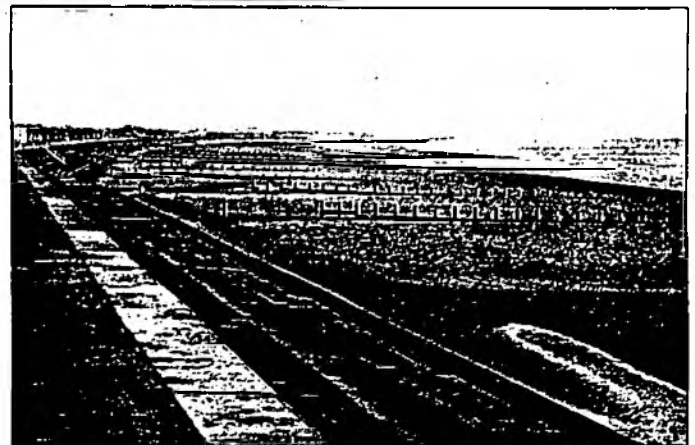
LOCAL PLANS	STATUS
Bedford Borough Council	Disposition to Adopt November 1993.
East Northants District Council	On deposit July 1993
Huntingdonshire District Council	Approved April 1990. Schedule of changes approved December 1990. Planning Department report 1992 issued January 1993.
Mid Bedfordshire District Council	July 1993. Modifications currently awaiting adoption.
North Hertfordshire District Council	Local plan No. 2 adopted July 1993.
South Bedfordshire District Council	Deposit draft adopted March 1993.
South Cambridgeshire District Council	Modifications adopted June 1993.
Stevenage Borough Council	October 1993. Application for approval of modifications to 1990 review of local plan.

MINERALS PLANS	CURRENT STATUS
Cambridgeshire County Council	Published April 1991
Northamptonshire County Council	On deposit April 1993.
Herts	On deposit September/October 1991.
Beds	On deposit 19th August - 30th September 1993.

WASTE PLANS	CURRENT STATUS
Northants	Public consultation. Draft preparation for March 1994.
Beds	As Minerals.

PROTECTING AND IMPROVING THE WATER ENVIRONMENT

MODEL POLICIES



NRA

*National Rivers Authority
Anglian Region*

The NRA, Anglian Region welcomes consultation with planning authorities during the development of Structure and Local Plans.

At this strategic level, liaison is a two way process with the NRA having input into structure and other plans and seeking input by the planning authorities into NRA's plans. The NRA will make recommendations to the local planning authorities for the inclusion of policy statements in their plans to protect the public interest and NRA assets in the longer term.

At local plan level, development of particular sites begins to be identified. This stage is possibly the most vital part of the planning process. The NRA will offer critical advice as to which areas suggested for development are subject to constraints such as flood plains, flooding problems, aquifers and sensitive catchments. The technical constraints will be clearly spelt out for each individual development whenever possible.

These model policies and explanatory notes are intended to assist Chief Planning Officers and their staff by explaining the reasons why it is necessary to include policy statements to protect and improve the water environment. NRA planning liaison staff will make further recommendations where appropriate during the consultation stage.

The policies are grouped under the following headings:

Flood protection

Conservation and enhancement of the water environment, including recreation, navigation and fisheries

Water quality and water resources



To ensure new development is not at risk from flooding and does not put other areas at risk of flooding which could endanger life and damage property.

To ensure any work which is needed to reduce the risk of flooding created by a new development is paid for by the developer and not the public.

Flood Protection

Policy 1/1 There will be a presumption against development (including the raising of land) where, in the opinion of the Local Planning Authority after consultation with the NRA, such development would be likely to impede materially the flow of flood water, or increase the risk of flooding elsewhere, or increase the number of people or properties at risk.

Protection of the Flood Plain and Washlands

The floodplain is generally the area of low lying land adjacent to a watercourse which, by its very nature, is liable to flood under certain conditions. The floodplains are defined on maps held by the NRA. In addition some washlands, areas designed and maintained to provide storage of flood water, are defined in the NRA Anglian Region's Land Drainage and Sea Defence Byelaws. For a variety of reasons, some development has taken place on the floodplains of the region's rivers. Consequently people and property in these areas are at risk from flooding. These developments also reduce the capacity of the available floodplain and impede the flow of water, thereby increasing the risk of flooding elsewhere.

The Land Drainage and Sea Defence Byelaws specify a number of activities in the floodplain that require the prior consent of the NRA and inter alia give the NRA powers to protect an undeveloped strip of land along each main river bank.



Policy 1/2 In areas at risk from flooding (as defined by the NRA) there will be a general presumption against new development or the intensification of existing development. These areas will include defined washlands, natural floodplains and other areas adjacent to rivers to which access is required for maintenance purposes.

Policy 1/3 Appropriate flood protection will be required where the redevelopment of existing developed areas is permitted in areas presently having an unacceptable risk of flooding. The flood protection requirements for such redevelopments will be defined by the local planning authority in consultation with the NRA and funded by the developer.

Surface Water Run-Off

Unless carefully sited and designed, new development or the redevelopment of existing urban areas can exacerbate the problems of flooding in areas downstream through an increase in run-off from additional impermeable surfaces, such as roofs and paved surfaces. It is quite often the case that the effects of development in the upper parts of a river catchment are not apparent in the area within which such development occurs but have a significant effect in areas downstream.

Policy 1/4 Planning permission will not normally be granted for new development or redevelopment of existing urban areas if such development would result in an increased flood risk in areas downstream due to additional surface water run-off.

Policy 1/5 Where development is permitted which is likely to increase the risk of flooding, it must include appropriate attenuation or mitigating measures defined by the local planning authority in consultation with the NRA and funded by the developer. Works could be required at substantial distances from the development and the impact on conservation and recreation aspects will be considered.

Coastal and Estuarial Defences and Embanked Watercourses

A breach in the defences along an embanked watercourse, or coastal or estuarial defence can lead to significant flooding in areas of low lying land often well away from the location of the breach. In order to protect people and property from the effects of inundation, it is essential that the integrity of the defences and embankments is maintained. This should be determined in consultation with appropriate bodies, including the NRA. It is impracticable to prevent all flooding in extreme climatic

To protect inland, coastal and groundwaters from pollution and derogation arising from development.

Water Resources/Water Quality

Policy 3/1 There will be a presumption against development, including changes in land-use which in the opinion of the local planning authority after consultation with the NRA pose an unacceptable risk to the quality of ground or surface water.

Sewerage and Sewage Treatment Infrastructure

With increasing population and water use in the region, many sewerage systems and sewage treatment works are becoming overloaded. Where development continues despite overloading, pollution of watercourses will occur if additional infrastructure is not provided.

Policy 3/2 New development will only be permitted in locations where mains foul sewers, sewage treatment and surface water drainage of adequate capacity and design are available or can be provided in time to serve the development. Infill development where septic tanks are proposed will only be permitted where ground conditions are satisfactory and the plot is of adequate size to provide an adequate subsoil drainage system.

Surface Water Protection

The NRA has a duty to protect the quality and hence uses of inland and coastal waters. Currently recognised river uses are abstraction for potable supply, industrial water supply, fisheries, livestock watering, spray irrigation, and amenity and conservation. Statutory water quality objectives (use-related standards) are being introduced and the NRA will have a duty to ensure these are met. Discharge consents will not be granted where a proposed discharge is likely to cause a breach of the relevant standards.

Aquifer Protection

The groundwater reserves of the Anglian Region are an invaluable source for public water supply, industry and agriculture as well as sustaining base flows in the rivers. The clean up of contaminated groundwater is difficult, expensive and sometimes impossible. It is therefore better to prevent or reduce the risk of groundwater contamination, rather than deal with its consequences.

The NRA has published an aquifer protection policy which contains a statement of the policy adopted to minimise the risks of contamination of underground water resources from the effects of development or land use policy.

Policy 3/3 Development will not be permitted within areas around potable groundwater sources or over vulnerable areas of aquifers which, in the opinion of the local planning authority after consultation with the NRA, pose an unacceptable risk to the quality of the underlying groundwater.

Availability of Water Resources

The development of water resources for water supply is becoming increasingly difficult in the Anglian Region. The NRA has a duty to ensure that provision of water for new development does not have a detrimental impact on existing users, nature conservation or recreation. Abstraction licences will not be granted in areas where water resources are fully developed and further abstraction would affect existing users or damage the environment. Consequently there is a growing need to transport water over long distances.

Policy 3/4 The provision of water resources will be coordinated with development plans to prevent a detrimental impact on existing users, nature conservation and recreation.

Mineral Abstraction and Waste Disposal

Mineral abstraction and waste disposal activities can affect the water resources and the environment if appropriate measures are not taken. The NRA may specify measures which will help to preserve the water resources in the area including ensuring protection to adjacent licensed sources, and preserve sites of conservation interest.

Policy 3/5 New mineral workings or waste disposal sites will not be permitted where, after consultation with the NRA, it is considered there would be adverse effects on water resources or rivers and other waters.

Large Coniferous Forests

Large coniferous forests situated on aquifer outcrops significantly reduce the amount of aquifer recharge. The result is a reduction in the available groundwater resource. The NRA discourages the planting of new large forests in such locations in order to protect and ensure maximum groundwater recharge.

Policy 3/6 The planting of new large coniferous forests on aquifer outcrops will be discouraged.

conditions. The NRA's aim is to protect people, property and land to standards which are practical and appropriate. A 'residual flooding hazard' is left after completion of any flood alleviation scheme.

The NRA Anglian Region Land Drainage and Sea Defence Byelaws specify a number of activities on sea defences that require the prior consent of the NRA and inter alia give the NRA powers to protect the sea defences from interference or damage.

Policy 1/6 Planning permission will not be granted for development which would adversely affect the integrity of tidal or fluvial defences.



Policy 1/7 In order to minimise the effects of tidal flooding, there will be a presumption against development on land to the seaward side of sea defences, including the siting of temporary holiday chalets and caravans. On land between a first line sea defence and the main defence, the siting of holiday chalets, caravans and camping sites may be permitted following consultation with the NRA. Time-limited occupancy conditions will be imposed and enforced preventing occupation during the period from November - March inclusive when the risk of tidal inundation is greatest.

Policy 1/8 On the landward side of sea defences and behind embanked watercourses, there will be a presumption against development in areas liable to flood unless the standard of defence is appropriate to the development proposed.

Policy 1/9 Where development is permitted in areas having substandard protection, appropriate increased protection must be provided in advance of the development as defined by the local planning authority in consultation with the NRA and funded by the developer.

Funding of Works

Lack of money means the NRA can only undertake flood defence schemes which are of the highest priority, those designed to protect life and property. Others, such as projects which would enable new development to take place, have the lowest priority and will not be carried out unless the developer pays for them. The NRA strongly recommends that if any work is needed to reduce the risk of flooding, the developer enters into a formal agreement with it or the local planning authority to provide the necessary flood protection work.

Policy 1/10 Developers will meet the cost of the physical infrastructure and facilities within the sites and the off site costs occurring as a direct result of the development. Developers and landowners will normally be expected to enter into a legally binding agreement with the NRA or local planning authority to provide the necessary flood protection work.

To protect the water environment from any detriment due to development.

To enhance the water environment in conjunction with development.

Conservation of the Water Environment

Policy 2/1 The conservation and enhancement of wildlife, landscape and archaeological features associated with rivers, ponds, lakes, estuaries etc will be encouraged.

Water Environment

The NRA has a statutory responsibility under Section 16 of the Water Resources Act 1991 to manage the water environment so as to:

- further the conservation and enhancement of the natural environment;
- promote facilities for sport and other forms of recreation, including public access;
- further the conservation of buildings, sites and objects of archaeological, architectural or historic interest.

The NRA also has a duty under the Water Resources Act 1991 to maintain, improve and develop fisheries.

Policy 2/2 The Planning Authority, in consultation with the NRA, will seek to promote river corridors as important areas of open land by:

- conserving existing areas of value within river corridors and, wherever possible, seeking to restore and enhance the natural elements of the river environment;
- supporting initiatives which will result in improvements to water quality;
- where appropriate promoting public access in river corridors;
- and
- identifying appropriate locations for water related recreation along river corridors.



Policy 2/3 There will be a general presumption against any development which will have an adverse environmental impact on the water environment, particularly in relation to rivers, ponds, wetlands, public access in river corridors, and appropriate water-related recreation.

Environmental Assessment

All types of works in, under, over and adjacent to watercourses and sea defences need to be properly evaluated since uncontrolled works may lead to effects such as an increased risk of flooding, erosion of the watercourse or defence, increased danger to the public, restricted access for maintenance purposes, and damage to the water environment. The particular sensitivity of watercourses to drainage works is recognised by Statutory Instrument No. 1217 'The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988'. This SI states that the drainage authority — NRA on main river and the District Council on non-main river — should not carry out any improvement works unless they have first completed the procedure prescribed by these regulations.

Policy 2/4 The planning authority, in consultation with the NRA, will seek to ensure that all works in, under, over and adjacent to watercourses and sea defences are appropriately designed and implemented. There will be a general presumption against the culverting of watercourses except those to enable reasonable access over a watercourse. When acting as the drainage authority, the planning authority, in consultation with the NRA, will consider the likely impacts of drainage proposals in accordance with the provisions of Statutory Instrument No. 1217 'The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988'. Where works are proposed by an interested party which is not the drainage authority, the planning authority consultation with the interested party, will consider the likely impacts of drainage proposals in accordance with the same regulations.

APPENDIX 3

NATIONAL WATER COUNCIL CLASSIFICATION SCHEME

RIVER CLASS	QUALITY CRITERIA	REMARKS	CURRENT AND POTENTIAL USES
1a VERY GOOD QUALITY	<p>5 percentile DO saturation greater than 80%</p> <p>95 percentile BOD not greater than 3mg/l</p> <p>95 percentile Ammonia not greater than 0.4mg/l</p> <p>Where water is abstracted for drinking it complies with requirements for A2*</p> <p>Non-toxic to fish in EIFAC terms (or best estimates if figures unavailable)</p>	<p>Mean BOD probably not greater than 1.5mg/l</p> <p>No visible evidence of pollution</p>	<p>Water of high quality suitable for potable supply abstractions</p> <p>Game or other high class fisheries</p> <p>High amenity value</p>
1b GOOD QUALITY	<p>5 percentile DO saturation greater than 60%</p> <p>95 percentile BOD not greater than 5mg/l</p> <p>95 percentile Ammonia not greater than 0.9mg/l</p> <p>Where water is abstracted for drinking it complies with the requirements for A2*</p> <p>Non-toxic to fish in EIFAC terms (or best estimates if figures are unavailable)</p>	<p>Mean BOD probably not greater than 2mg/l</p> <p>Mean Ammonia probably not greater than 0.5mg/l</p> <p>No visible evidence of pollution</p> <p>Water of high quality which cannot be 1a due to the effect of physical factors such as low gradient and eutrophication</p>	<p>Water of less high quality than Class 1a but usable for substantially the same purposes</p>

RIVER CLASS	QUALITY CRITERIA	REMARKS	CURRENT AND POTENTIAL USES
2 FAIR QUALITY	<p>5 percentile DO saturation greater than 40%</p> <p>95 percentile BOD not greater than 9mg/l</p> <p>Where water is abstracted for drinking it complies with A3* requirements</p> <p>Non-toxic to fish in EIFAC terms (or best estimates if figures not available)</p>	<p>Mean BOD probably not greater than 5mg/l</p> <p>Water showing no signs of pollution other than humic colouration and a little foaming below weirs</p>	<p>Water suitable for potable supply after advanced treatment</p> <p>Supporting reasonably good coarse fisheries</p> <p>Moderate amenity value</p>
3 POOR QUALITY	<p>5 percentile DO saturation greater than 10%</p> <p>Not likely to be anaerobic</p> <p>95 percentile BOD not greater than 17mg/l</p>	<p>Fish are absent or sporadically present</p>	<p>May be used for a low grade abstraction for industry. Considerable potential if cleaned up</p>
4 BAD QUALITY X	<p>Water inferior to Class 3 in terms of DO. Likely to be anaerobic at times</p> <p>DO greater than 10% saturation</p>		<p>Waters which are grossly polluted and are likely to cause nuisance</p> <p>Insignificant watercourses and ditches which are not usable. Object is simply to prevent nuisance</p>

* See note (e)

NOTES FOR APPENDIX 3

- a) BOD = Biochemical Oxygen Demand
DO = Dissolved Oxygen
- b) Under extreme weather conditions (eg. flood, drought, freeze up), or when rivers are dominated by plant growth, or by decaying of aquatic plants, rivers usually in Class 1, 2 and 3 may have levels of BOD and DO, or Ammonia outside the stated levels for those classes. When this occurs the cause should be stated along with the analytical results.
- c) The BOD refers to the 5 day carbonaceous determination performed in the presence of allythiourea (ATU). Ammonia is expressed as the ammonium ion, NH_4^+ .
- d) In most instances the chemical classification given above will be suitable. However, the basis of the classification is restricted to a finite number of chemical determinands and there may be a few cases where the presence of a chemical substance other than those used in the classification markedly reduces the quality of the water. In such cases the quality classification of the water should be downgraded on the basis of biota actually present, and the reasons stated.
- e) The definition and the requirements of A2 and A3 are those specified in the Directive on the Quality of Water Intended for Abstraction for Drinking Water.
- f) The standards set up to protect freshwater fisheries by the European Inland Fisheries Advisory Commission (EIFAC) should be expressed as 95 percentiles.

This classification has also been used for the 5 yearly national Water Quality Reports in 1980, 1985 and 1990.

This system will be superseded by a new classification system associated with the framework being developed by the NRA for a General Quality Assessment.

APPENDIX 4

FISHERIES ECOSYSTEM CLASSIFICATION

CLASS	DO %SAT 10%ile	BOD mg/l 90%ile	NH ₃ -N mgN/l 90%ile	UN-IONISED NH ₃ -N mg/N 95%ile	pH	HARDNESS mg/l CaCO ₃	DISSOLVED Cu ug/l 95%ile	TOTAL Zn ug/l 95%ile
1	80	2.5	0.25	0.021	6-9	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
2	70	4.0	0.6	0.021	6-9	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	30 200 300 500
3	60	6.0	1.3	0.021	6-9	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
4	50	8.0	2.5	-	6-9	≤10 >10 and ≤50 >50 and ≤100 >100	5 22 40 112	300 700 1000 2000
5	20	15.0	9.0	-	-	-	-	-
6	-	-	-	-	-	-	-	-

NOTES:

- a) DO = Dissolved Oxygen BOD = Biochemical Oxygen Demand
- b) % SAT = % Saturation
- c) %ile = Percentile
- d) pH: Lower limit as 5%ile, upper limit as 95%ile

APPENDIX 5

THE BIOLOGICAL CLASSIFICATION SCHEME - THE "5M" SYSTEM

This classification is defined by the Environmental Quality Index (EQI) for each of the three summary measures - BMWP score, Average score per taxon (ASPT) and Number of Taxa. Although all these three measures are related (ASPT is the ratio of Score to Number of Taxa) they provide slightly different insights into biological quality and so it is often most informative to consider all three together. Under the 5M system there are four biology classes as shown in the table below.

BIOLOGICAL CLASS	EQI _{ASPT}	EQI _{Taxa}	EQI _{BMWP}
A	>0.89	>0.79	>0.75
B	>0.77	>0.58	>0.50
C	>0.66	>0.37	>0.25
D	<0.66	<0.37	<0.25

Three biological samples are taken in a year, one in each season. In the 5M system the results from these three samples are averaged to produce, in effect, a single sample for the whole year. A site is placed in a class by calculating the values of the three EQIs for this single sample and assigning a class for each EQI based on the table above. The overall biological class is then taken to be the middle one of the three individual classes, unless the EQI for ASPT has the worst class of the three, in which case this class defines the overall class.

APPENDIX 6

ANGLIAN REGION INTERIM LEVELS OF SERVICE

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

Band A

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

Band B

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

Band C

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

Band D

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

Band E

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