LOWER LEE
CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT

NRA
National Rivers Authority
Thames Region
March 1995

NATIONAL RIVERS AUTHORITY MISSION STATEMENT

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.

HOW YOU CAN HELP US

This Consultation Report is the first stage of the catchment management planning process for the Lower Lee and we would appreciate hearing your views.

Have we identified all the major issues ?

Have we identified all the practical solutions ?

Have you any comments on the appearance and content of the report ?

If you have any comments please write to:

Mr K Reid
Lower Lee Catchment Management Plan
National Rivers Authority Thames Region
The Grange
97 Crossbrook Street
Waltham Cross
Herts EN8 8HE

Further copies of the report are available.

All comments must be with us by Friday 16 June 1995

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CONTENTS LIST

CONTENTS LIST (Continued)

LIST OF MAPS

LIST OF TABLES

ACKNOWLEDGEMENTS

(1) All those organisations, groups and individuals who responded to the NRA during the period of informal liaison. A detailed review of this process is given in Appendix II.

(2) Ordnance Survey on whose maps some of the information shown on the synoptic maps is based. (Crown Copyright Reserved Licence No. WU29859X).

(3) Whilst every effort has been made to ensure the accuracy of information in this report, it may contain errors or omissions which we will be pleased to correct.

(4) Information from this report may be freely used provided it is acknowledged.

SECTION 1 MANAGING THE WATER ENVIRONMENT

This section highlights the importance of integrated management of the water environment and outlines the key role of the National Rivers Authority. It describes the Catchment Management Planning process and the purpose of this Consultation Report.

1 MANAGING THE WATER ENVIRONMENT

1.1 Our Water Environment

The quality of our water environment and the way in which it is managed matters to all of us.

Our health depends on the availability and purity of water supplies and the way we dispose of waste water. Thames Region is highly populated and sees the greatest use and reuse of water of any part of the country. These pressures call for the strict control of water abstraction and effluent disposal.

Many householders and businesses rely on flood alleviation works and flood warning schemes to reduce the risk of flooding. Visitors as well as local communities benefit from the amenity and recreational opportunities offered by the Region's rivers, canals and lakes.

The water environment also supports a wide variety of habitats which are home to a range of plants and animals. Conservation and enhancement of these is fundamental to the well being of the Region's natural resources.

This document is the first step in a process called catchment management planning initiated by the National Rivers Authority (NRA). It provides a focus for those concerned with the future health of the Lower Lee catchment's water environment. (A catchment is a discrete geographical unit based on natural surface water drainage areas. See Section 2.3 for further details.)

1.2 The NRA Role

Established in 1989, the NRA is the principal agency responsible for safeguarding and improving the water environment in England and Wales. Our role is defined in our Mission statement (shown on the inside of the front cover) and embraces statutory responsibilities for:

- water resources
- water quality and pollution control
- flood defences
- fisheries, recreation, conservation and navigation.

We place a particular emphasis on planning for environmental sustainability and improvement through an integrated approach to river catchment management. This approach recognises the need to influence and work in partnership with others.

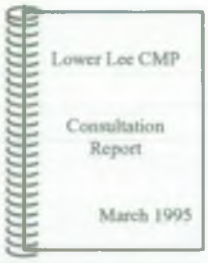
We therefore recognise the need to work with local communities, landowners, interest groups, industry and other agencies whose activities and interests interact with or include the water environment. The roles and responsibilities of some of the key agencies are described in Appendix I, as are the NRA's responsibilities, aims and objectives.

1.3 Catchment Management Plans

The water environment (e.g. estuaries, coastal waters, rivers, streams, lakes, ponds, underground water and springs) is subject to a wide variety of uses which invariably interact and sometimes conflict with each other. Our catchment management planning process is shown on the diagram opposite. It has been developed to help manage these interactions and conflicts for the overall benefit of the water environment and its users.

STEPS IN THE CMP PROCESS

STEP 1



The NRA produce a Consultation Report. This will include:

- a description of the catchment's resources, uses and activities
- a review of the status of the water environment
- identification of issues
- a draft vision and options to tackle the issues.

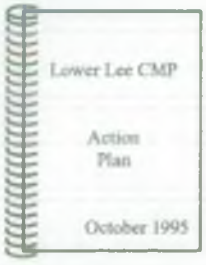
STEP 2

From March to June 1995 organisations, groups and individuals interested in the future of the catchment can make comments to the NRA.

STEP 3

During summer 1995 there will be discussions between the NRA and groups and individuals over key issues.

STEP 4



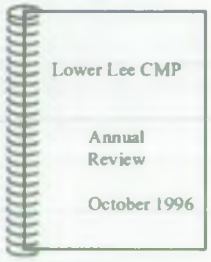
The NRA will produce the Action Plan in October 1995. This will include:

- a summary of the catchment's resources, uses and activities
- an agreed vision, strategy and detailed activity plans
- a description of future monitoring activity.

STEP 5

The NRA and others will work together to implement the activities in the Action Plan.

STEP 6



The NRA will produce a monitoring plan each year. This will include :

- an update on the status of the water environment
- progress achieved on the activity plans
- a review of the appropriateness of the Action Plan.

STEP 7

After 5 years (or sooner if circumstances dictate) the NRA will fully review the CMP

1.3 Catchment Management Plans (continued)

The purposes of a Catchment Management Plan (CMP), which is a non-statutory document, are to:

- focus attention on the water environment of a specific river catchment
- involve all interested parties in planning for the future well being of that catchment
- agree a vision for the catchment which helps to guide all our activities over the next 10 to 20 years
- establish an integrated strategy and plan of action for managing and improving the catchment over the next five years.

This document, the Consultation Report, is the first output from the process and not the finished Plan.

1.4 The Context of this Plan

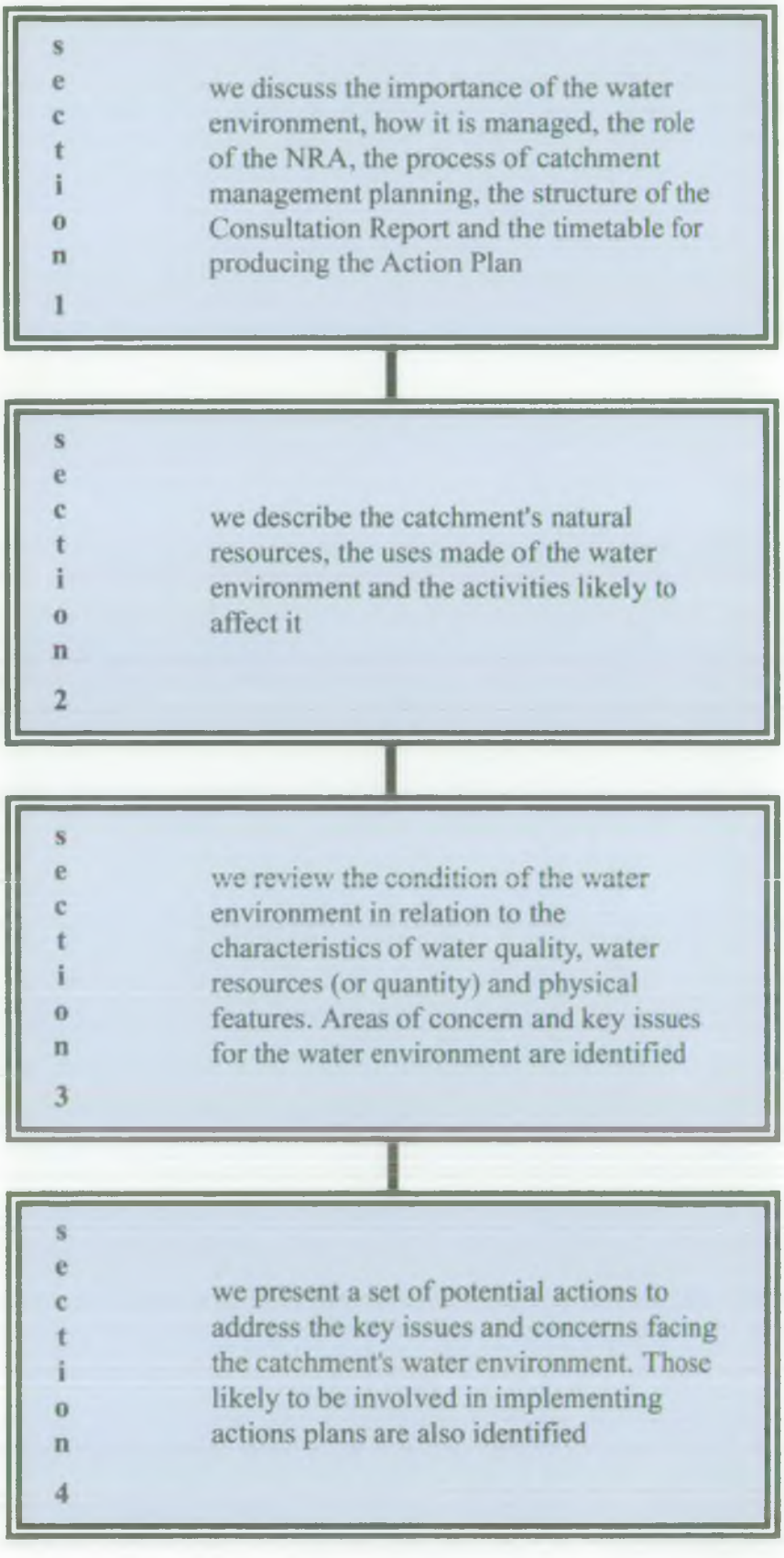
The River Lee is one of the major tributaries of the River Thames. Due to its size, the number of its tributaries, and the significant range of issues it has throughout its length, we have decided to split the catchment into three sections for the purposes of producing CMPs. These sections each have their own CMP and are the:

• Upper Lee CMP	Consultation Report (March 1994) Action Plan (September 1994)
• Middle Lee CMP	Consultation Report (September 1994) Action Plan (due April 1995)
• Lower Lee CMP	Consultation Report (March 1995) Action Plan (due October 1995).

Whilst each of the three sections is distinct and has definitive boundaries, it must be recognised that they interact. The most obvious example is that the water leaving the Upper Lee catchment area flows into the Middle Lee catchment area and the water from all the rivers in the Upper and Middle Lee catchments flows through into the Lower Lee catchment. Influences that arise from the Upper and Middle Lee CMPs will be taken into account in the Action Plan for the Lower Lee. It must also be remembered that the River Lee discharges into the River Thames. The relevant CMP for this part of the River Thames, Thames Tideway, is due to be published as a Consultation Report in January 1996 and as an Action Plan in June 1996. The conclusions from the Lower Lee CMP will be taken into account during its preparation.

The 1994 Advice on Strategic Planning Guidance for London advises London Boroughs to have regard to CMP as a means of setting priorities and allocating resources, both by the NRA and others, to solve the current problems and improve the future of the water environment.

CONTENT OF CONSULTATION REPORT



1.5 The Consultation Report

A summary of the contents of this Consultation Report is shown on the previous page.

This report does not seek to establish in a final form the vision and guiding policy objectives for the catchment, nor define in detail the activities necessary to tackle the key issues for the water environment. Rather it describes the catchment, reviews the state of the water environment and identifies the scope of a subsequent strategy, including a draft vision and options for tackling the key issues facing the Lower Lee catchment.

The draft catchment vision and potential actions we present in Section 4 will only be finalised and developed into a strategy once we have had an opportunity to review and consider your response to this Consultation Report.

We have produced this report through internal discussion, informal liaison with a wide range of organisations (see Appendix II for details) and a desk study of reports produced by organisations such as local authorities.

1.6 The Consultation Process

The NRA has a pivotal role to play in the management of the water environment and recognises the importance of liaison with all interested parties. Through this Consultation Report we want to help develop a consensus. We are particularly interested to hear your views on the following aspects of the Consultation Report:

- the accuracy of the descriptions of resources, uses and activities in the catchment
- the assessment of issues arising within the catchment
- the way forward for dealing with the key issues
- the draft catchment vision.

Our consultation phase includes:

- a formal launch to an invited audience on **28 March 1995**
- distribution of this report and a summary leaflet to key organisations, groups and individuals
- placing of information in libraries and other public areas
- publicity through contact with the local media and advertisements in the local press

1.6 The Consultation Process (continued)

- public open evenings (6 pm - 9 pm)

Thursday 6 April **Tottenham Green Sports Centre, Philip Lane, Tottenham**

Tuesday 11 April **Enfield Civic Centre, Silver Street, Enfield**

Tuesday 25 April **Wolsey Hall, Windmill Lane, Cheshunt**

Tuesday 2 May **Stratford Town Hall, High Street, Stratford**

Thursday 4 May **Waltham Forest Council Offices, The Ridgeway, Chingford**

Tuesday 9 May **Hackney City Farm, 1a Goldsmiths Row, Hackney.**

At the end of the consultation period we will consider all comments and produce an Action Plan. This will define a strategy for the future management of the catchment and a series of activity plans for the NRA and others to implement.

If you wish to comment please do so by **16 June 1995**. The Action Plan for the Lower Lee Catchment is programmed for publication in October 1995. However, we recognize that the responses we receive may influence the programme.

Please submit comments to:

Kevin Reid
National Rivers Authority Thames Region
The Grange
97 Crossbrook Street
Waltham Cross
Herts EN8 8HE.

For further information please contact Kevin Reid (Catchment Management Officer) or Craig Woolhouse (Catchment Manager) on 0992-645045.

SECTION 2 DESCRIPTION OF RESOURCES, USES AND ACTIVITIES

The purpose of this section is to describe the physical resources of the catchment, the uses we make of the water environment and the activities that affect it.

Bold text in italics on a shaded background indicates a matter that may justify further action. These matters are brought together in Section 4.

2.1 OVERVIEW OF THE CATCHMENT

The northern extent of the Lower Lee catchment is marked by the confluence of the River Stort with the River Lee at Hoddesdon; the River Thames marks the southern limit. The urban character of Greater London dominates the catchment, but there are also other significant urban areas including Waltham Abbey, Cheshunt and Hoddesdon as well as some more rural areas in Hertfordshire and Essex. Nearly all of the land outside the existing urban areas is designated Metropolitan Green Belt under Town and Country Planning legislation in order to prevent the further spread of London and the merging of settlements. Nearly 1.2 million people live in the catchment.

Major uses of water within the catchment include water abstraction for public water supply. This incorporates the system of reservoirs in the Lee valley between Enfield and Tottenham which are used for water storage. The River Lee is also used for sewage effluent disposal. There are two major sewage treatment works that affect the catchment; these are Rye Meads (near Hoddesdon) and Deephams (near Edmonton). NRA surveys indicate that river water quality is generally fair although the River Lee between Tottenham Locks and Lea Bridge is of poor quality.

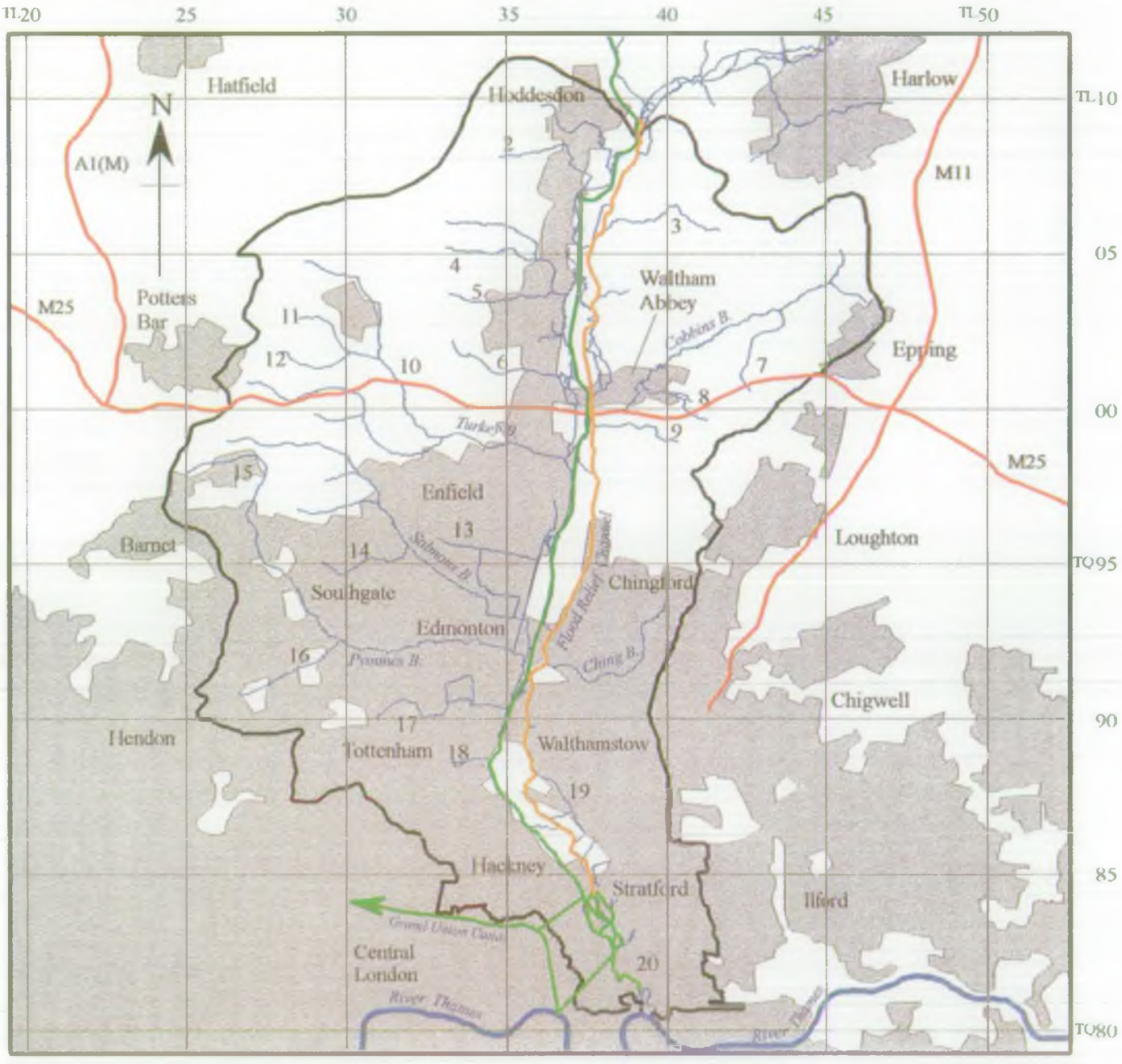
The rivers, reservoirs and associated areas of open land are also heavily used for recreation. The Lee Valley Regional Park Authority manage a major part of the Lee valley for recreation with a potential visitor population numbering millions from London, Hertfordshire, Essex and beyond. As such, the park is a regional recreation resource. British Waterways (BW) are responsible for the Lee Navigation. Angling on both the waterways and the reservoirs and gravel pits is very significant. In addition, these areas of open water, rivers, reservoirs and adjacent wetlands, offer important refuges for wildlife. The conservation value of several of these areas is recognised by both national (e.g. Sites of Special Scientific Interest) and international (e.g. proposed Special Protection Areas) designations. The Lee valley is an important route for migratory birds.

The low lying land along the Lee valley has historically been prone to severe flooding. The last major flood, in March 1947, inundated an area of some 3,500 hectares (8,500 acres) and flooded thousands of properties, closed main roads and contaminated drinking water supplies. Considerable human hardship, misery and inconvenience also resulted. The valley now has a high degree of flood protection due to the construction of the River Lee Flood Relief Channel which was completed in the 1970s. The southern-most rivers in the catchment are also tidal with considerable variations in their depth between high and low tide.

There are many tributaries joining the River Lee within the catchment. These rivers are critical as they are a local amenity and wildlife resource, as well as a means of storm water disposal. Furthermore, they are often key features for local communities with many streets and parks taking their name from the local watercourse. Many of these streams, but particularly those within urban areas, have also had a history of flooding problems. Pymmes Brook, Salmons Brook and Cobbins Brook have had flood alleviation works undertaken on them. Many stretches of smaller streams have been culverted (enclosed in a pipe) in the past to enable land to be built upon.

Downstream of the M25 areas immediately adjacent to the River Lee have been given "Objective 2" status by the European Union. This designation recognises the economic, social and environmental problems of the area. Several urban regeneration initiatives (e.g. City Challenge, Single Regeneration Budget) active within the area reinforce this point. The lower part of the catchment also falls within the Thames Gateway, a Central Government initiative to raise the development profile of East London.

MAP 1 CATCHMENT OVERVIEW



KEY

Catchment Boundary	Watercourse
Urban area	
Motorway	
Lee Navigation	
Lee Flood Relief Channel	

1. Woolens Brook
2. Spital Brook
3. Nazeing Brook
4. Turnford Brook
5. Rags Brook
6. Theobalds Brook
7. Copthall Brook
8. Honey Lane Brook
9. Quinton Hall Brook
10. Cuffley Brook
11. Hempshill Brook
12. Northaw Brook
13. Saddlers Mill Stream
14. Hounsden Gutter
15. Monken Mead Brook
16. Bounds Green Brook
17. Moselle Brook
18. Stonebridge Brook
19. Dagenham Brook
20. Bow Creek

Scale (approx) 0 5 km

TABLE 1: KEY STATISTICS FOR THE CATCHMENT

Catchment Area	380 km^2
Population	1 175 000
Length of main river (maintained for flood defence purposes by the NRA)	300 km
Length of navigable river/canal (including Bow Back Rivers)	47 km
Number of Local Authorities	16

Introduction

Actions affecting the water environment within the catchment are promoted, controlled and carried out by a multitude of agencies, authorities, groups, companies and individuals. These range from international influences like the European Union (EU) down to the very local level, for example an allotment society. Each of these have their own particular aims and objectives which added together create the framework for action and change in the catchment.

Statutory Bodies

The National Rivers Authority is the statutory body for the protection and enhancement of the water environment. Our mission statement is on the inside front cover of this document.

The Lee Valley Regional Park Authority (LVRPA) was established by an Act of Parliament in 1966 to develop, improve and manage, leisure and recreation facilities and nature reserves within the Lee valley. The Park covers an area of around 4,000 hectares (10,000 acres) (see Section 2.10) and the Authority has substantial land holdings within it. The Lee Valley Park Plan 1986 sets out the Authority's objectives, policies and proposals. This is currently being reviewed.

British Waterways (BW) is the statutory body responsible for navigation on the River Lee Navigation and the canals in the catchment. BW carry out maintenance work on these waterways. This includes dredging, lock repairs, bank protection, towpath works and sign posting. BW actively promote the use of canals and the River Lee Navigation for recreation.

The London Planning Advisory Committee (LPAC) came into existence in 1986 to replace the strategic planning functions of the Greater London Council. It advises London Boroughs on their approach to their Unitary Development Plans (UDP) and informs Central Government of Boroughs' policies and views. LPAC produced their guidance (Strategic Planning Guidance for London), after formal consultation, in 1994.

Statutory Bodies (continued)

There are 16 local authorities within the Lower Lee Catchment, two of which are the County Councils of Hertfordshire and Essex. These County Councils act in a similar way to LPAC in respect of land use issues by setting the land use context for District Councils, but they also have direct control over matters such as education, waste disposal and minerals excavation. The London Boroughs and District Councils have responsibility for a wide range of local services including land use planning, environmental health and waste collection for their own particular areas, although there is co-operation over specific issues that require cross boundary co-ordination.

There are also several Central Government departments which have a role to play in the water environment. The Department of Environment (DoE) sets the overall policy guidance for other bodies such as local authorities to work within. The Department of Transport (DoT) is responsible for transportation proposals and policies. The Ministry of Agriculture, Fisheries and Food (MAFF) and Department of Trade and Industry (DTI) are also active in mainly farming and economic regeneration respectively. These responsibilities are co-ordinated for the area by the Regional Government Offices for London and the South-East of England.

There are several other governmental agencies apart from the NRA which have responsibilities within the catchment. English Nature (EN) is concerned with nature conservation and there are several areas of particular value within the catchment (see Section 2.6). English Heritage (EH) are concerned with the conservation of the built environment (see Section 2.8). Other organisations such as the Sports Council (SC) and Countryside Commission (CC) also have specific interests in the catchment.

TABLE 2: DISTRIBUTION OF CATCHMENT AREA AND POPULATION WITHIN THE CATCHMENT

LOCAL AUTHORITY	PERCENTAGE OF CATCHMENT		LOCAL AUTHORITY	PERCENTAGE OF CATCHMENT	
	AREA	POPULATION		AREA	POPULATION
GREATER LONDON	**55.13**	**89.61**	**HERTFORDSHIRE CC**	**23.00**	**7.63**
LB Barnet	5.52	7.37	Broxbourne BC	13.54	6.64
LB Enfield	21.36	22.08	East Herts DC	3.14	0.13
LB Hackney	4.39	13.33	Hertsmere DC	1.06	0.42
LB Haringey	7.29	15.68	Welwyn Hatfield DC	5.32	0.42
LB Islington	0.03	0.04			
LB Newham	4.21	9.65	**ESSEX CC**	**21.79**	**2.75**
LB Redbridge	0.36	0.15			
LB Tower Hamlets	1.53	3.30	Epping Forest DC	21.79	2.75
LB Waltham Forest	10.44	18.01			

Clearly the number of local authorities within the catchment presents its own co-ordination and communication problems. Some authorities, like Broxbourne, Enfield, and Waltham Forest, are wholly within the catchment and can be expected to place great emphasis on the Lower Lee area. Other authorities such as Hertsmere, Welwyn Hatfield, Islington and Redbridge only have a small portion of their area within the catchment.

Statutory Bodies (continued)

These authorities are not likely to place such a high emphasis on the Lower Lee area. Furthermore, the concerns of inner London Boroughs are different to those covering Green Belt area.

Most county councils and local authorities have recently revised, or are currently revising, their statutory land use development plans. These documents give detailed policies for controlling development (i.e. how to treat planning applications). When considered in conjunction with Regional Planning Guidance for the South-East of England (prepared by Central Government) and LPAC's advice, these documents provide the best means of establishing possible future land use trends (see Section 2.13) which have an impact on, or interact with, the natural water environment.

The NRA and the other statutory consultees are consulted over planning applications which affect their interests. This gives these bodies the chance to make representations regarding each such planning application. The planning authority must have regard to the views of the consultees, but does not necessarily have to follow their advice. The following are the relevant land use development plans and guidance which must be used to judge planning applications against:

Regional Planning Guidance

RPG9 Regional Planning Guidance for the South East (DoE 1994)

County Plans

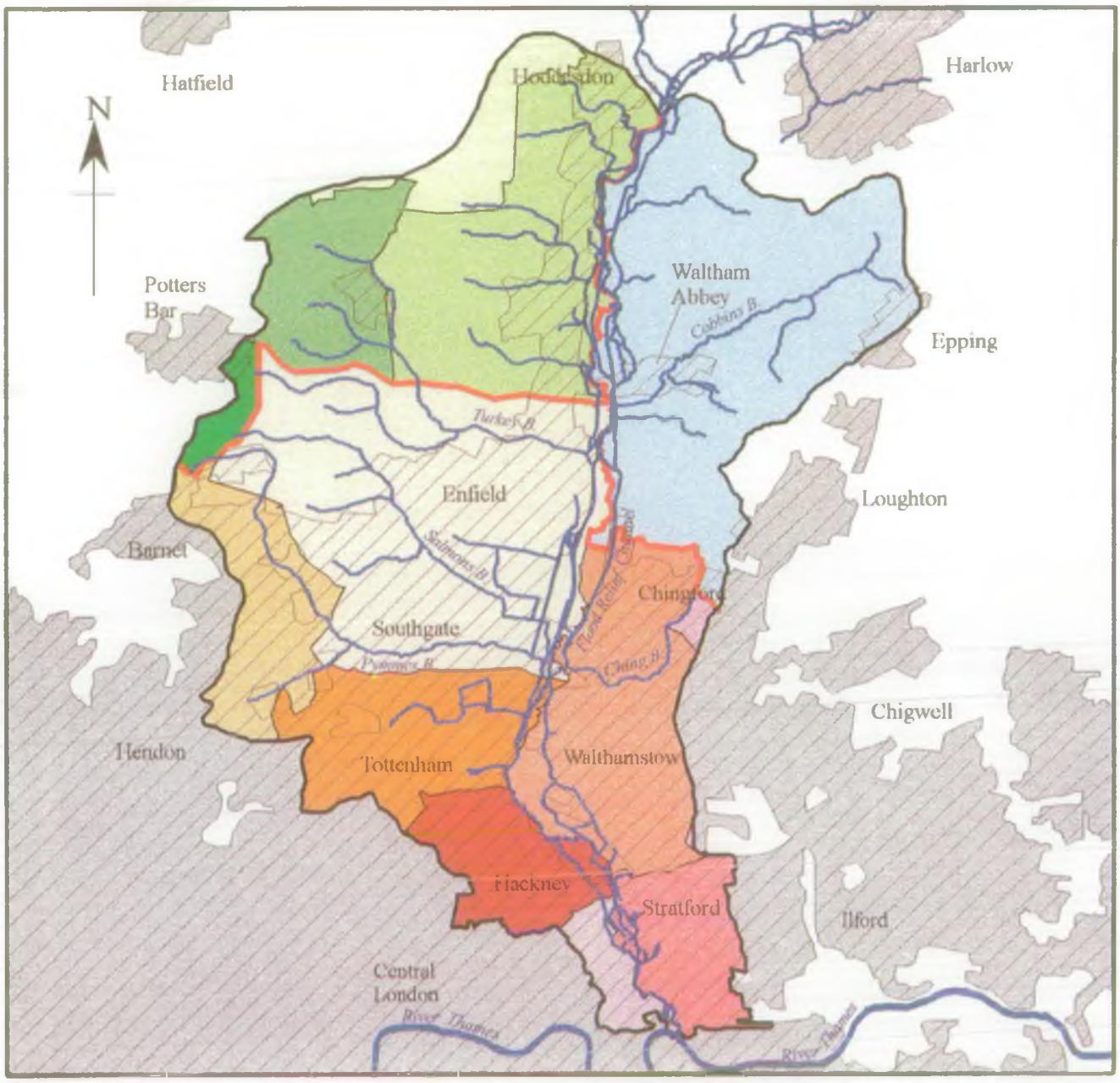
Hertfordshire Structure Plan	(2nd Alteration 1992)
Essex Structure Plan	(2nd Alteration 1995) (both plans currently under review)
Herts Minerals Local Plan	(Proposed Modifications 1994)
Essex Minerals Local Plan	(Consultation 1994)
Herts Waste Local Plan	(Discussion 1994)
Essex Waste Plan	(Consultation 1994)

District Local Plans/Unitary Development Plans

LB Barnet	(Adopted 1991)	LB Haringey	(Deposit 1993)
Broxbourne BC	(Deposit 1992)	Hertsmere DC	(1st Review 1991)
East Herts DC	(Adopted 1993)	LB Newham	(Deposit 1993)
LB Enfield	(Adopted 1994)	LB Redbridge	(Adopted 1994)
Epping Forest DC	(Deposit 1994)	LB Tower Hamlets	(Adopted 1992)
LB Hackney	(Deposit 1992)	LB Waltham Forest	(Deposit 1992)
		Welwyn Hatfield DC	(Adopted 1993).

Water Supply and Sewage Disposal

Thames Water Utilities Ltd (TWUL) operations are a significant land use within the catchment. TWUL supply fresh water and treat foul water from our homes, work, shops, etc. (see Sections 2.11, 2.12 and 3.2). The company use a significant proportion of the catchment for water storage, sewage treatment and water treatment works. Some of these areas also benefit other uses including recreation and provide valuable conservation and environmental areas. Three Valleys Water Services (TVWS) supply fresh water to some areas in the north-west and north-east of the catchment (see Section 3.2).



KEY

	Watercourse	HERTFORDSHIRE		GREATER LONDON			
	Catchment Boundary		East Hertfordshire		Enfield		Hackney
	Urban area		Broxbourne		Barnet		Tower Hamlets
	County Boundary		Welwyn Hatfield		Haringey		Newham
ESSEX			Hertsmere		Waltham Forest	Scale (approx) 0 5 km	
	Epping Forest				Redbridge		

Non Statutory Bodies

A range of national and local groups also have an interest in the Lower Lee catchment. These include the Royal Society for the Protection of Birds (RSPB), the Lower Lea Project (LLP) and the Lee Anglers' Consortium (LAC). The LAC have carried out practical improvements to the waterways including clearing rubbish and combatting algal blooms. In the south of the catchment the LLP is concerned with the environmental regeneration of the network of tidal and semi-tidal rivers known as Bow Back Rivers. They have utilised voluntary labour, schools and the remand prison service to achieve environmental improvement.

Other bodies include environmental pressure groups such as Friends of the Earth (FoE) who have active local groups, the London, Herts and Middlesex, and Essex Wildlife Trusts and specific area based groups like the Walthamstow Marsh Society. Local amenity and interest groups such as Enfield Lock Conservation Group, angling clubs, canal users (e.g. Lea and Stort Planning and Amenities Forum) and boating groups are concerned with the water environment and have an important role to play.

Partnerships

Partnerships have been set up in response to a number of specific initiatives. Examples include: the City Challenge schemes in Stratford and Dalston; the "Lee Valley Objective 2" team; and, several European Union LIFE bid groups. These have all competed for UK government and European funds (see Section 2.13) for urban regeneration and environmental improvement. These groups tend to draw on representatives from already established groups, the private sector and statutory bodies to help formulate ideas and deliver joint action. In this respect, they provide an essential focus for agreeing local needs. However, these groups may only exist for a set timescale.

Existing Strategies

Several organisations have already developed strategies relevant to the water environment. These include:

1) Zone 4 Water Recreation Strategy (Eastern Council for Sport & Recreation, July 1994)

2) An Environmental Strategy for Hertfordshire (Herts CC, 1993)

3) Barnet Environmental Strategy (LB Barnet, 1993)

4) Heritage Protection Policy for Essex (Essex CC, 1992)

5) Essex Environment Report (Essex CC, 1992).

The NRA seeks to influence these strategies for the overall benefit of the water environment and to dovetail its own actions and policies as far as is possible to those put forward in such strategies. To this end these and other strategies have been considered during the preparation of this plan.

2.2 LOCAL MANAGEMENT

Sustainable Development

The NRA is committed to the principles of sustainable development and embraces the definition set down by the Brundtland Commission in 1987:

> "...development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

Sustainable development was given added impetus when the UK and other governments signed up to Agenda 21 at the Earth Summit in Rio de Janeiro. This is an environmental action plan for the next century which recognises the central role of local authorities in involving the community and the value of partnerships in achieving sustainable development.

Since the United Nations "Earth Summit" in June 1992 local authorities have been considering their response to Agenda 21 which encourages wider access to environmental information, greater community participation in decision making and adoption of sustainable development principles.

LPAC's latest advice to London Boroughs stresses the importance of sustainable development and the need to develop land use policies around sustainable development principles. LPAC recognize that London's rivers and their valleys form the city's greatest but most under used natural resource. The emerging structure plans of Essex and Hertfordshire also recognise the value of integrated land and water use management in accordance with Chapter 18 of Agenda 21.

For its part, the NRA has produced its own Agenda 21 consultation document "Thames 21" which was issued in 1994. This looks to establish a sustainable strategy for the water environment of the Thames Region area of which the Lower Lee Catchment is a significant part.

Thames 21 stresses the need for closer partnership between all the agencies involved in the local management of catchments and highlights the role of Catchment Management Plans in translating broad principles into local action.

Summary

Taken together this wide collection of bodies (there are many others not mentioned above which have been contacted during the compilation of this report - see Appendices II and V) make up the diverse and complex structure of management and for the Lower Lee catchment.

It is clearly desirable for the long term benefit of the water environment that the various actions and policies of these bodies firstly, do not conflict and, secondly, pull together where appropriate. This is obviously difficult as the organisations have varying aims, objectives, geographical areas and resource levels. (See Issue 4.3).

2.3 TOPOGRAPHY

We have defined the boundary of the catchment to include all land which drains surface water run off (i.e. rainfall which flows by gravity over the land surface to a watercourse) to the River Lee downstream of Feildes Weir. This includes the land drained by the tributaries of the River Lee. This is relatively easy to define in rural areas where the top of a hill will mark a divide in the direction of water flow.

However, in built up areas like London, much of the surface water goes into drains before being discharged into rivers. These drainage sewer pipes do not necessarily follow the lie of the land and so the catchment boundary has been defined by examining the direction of flow of the surface water sewers as well as using ground levels.

The main rivers drain in a general southerly direction towards the River Thames although some of the tributaries to the River Lee flow in from hills in the west and east of the catchment. The highest areas of the catchment are found in the north, with heights of up to 125 m Above Ordnance Datum (AOD) around Potters Bar and up to 115 m AOD in Epping Forest. Most of the London area is on lower lying land, typically 30 - 60 m AOD. Other high points include Alexandra Palace at 90 m AOD and Highgate Hill, which is on the western boundary of the catchment, at 130 m AOD.

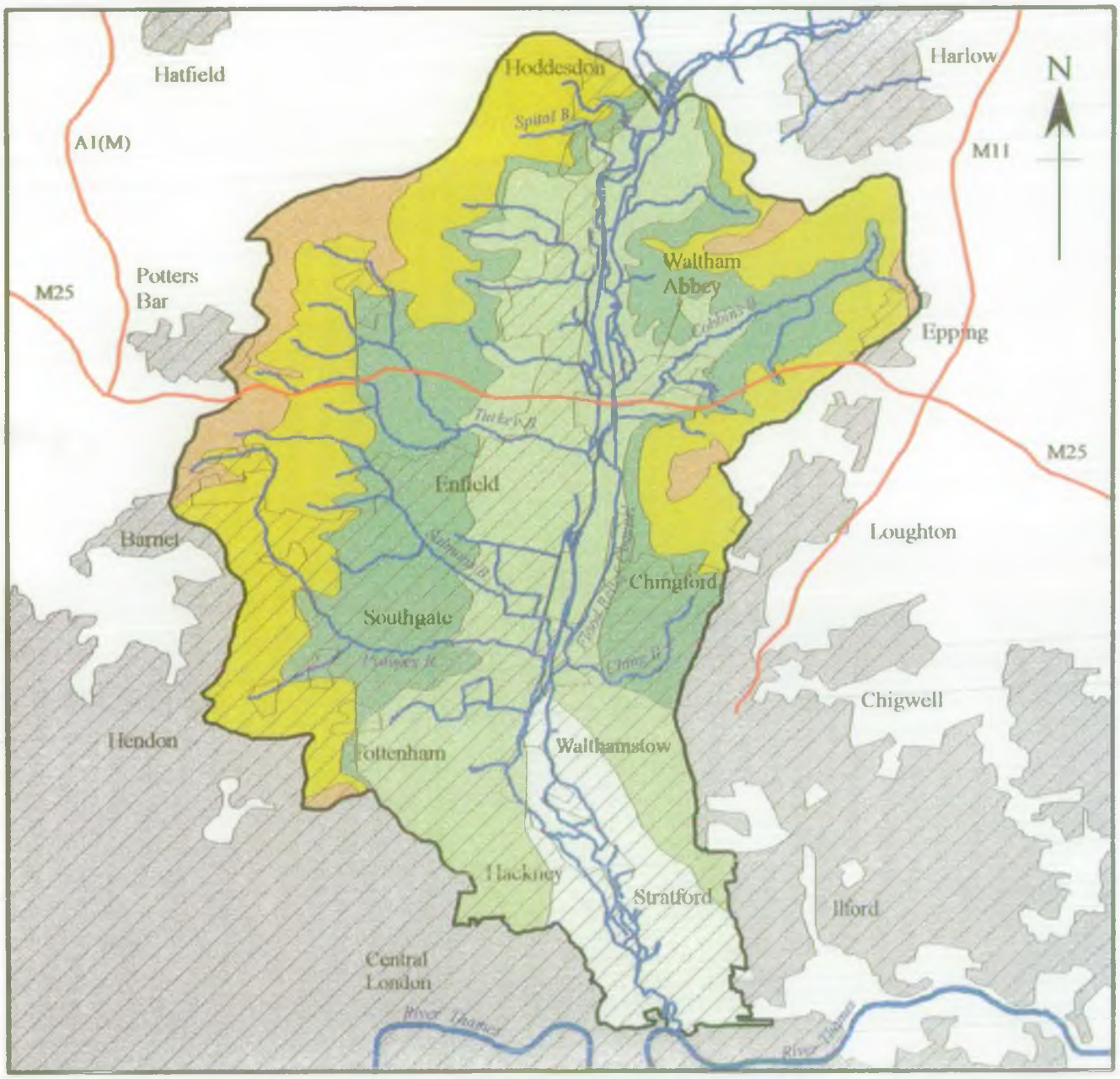
The land closer to the main River Lee corridor is considerably lower. Most of this land is low lying flood plain and is typically around 30 m AOD at Hoddesdon, 20 m AOD near the M25 and below 10 m AOD at the southern end of the catchment.

The River Lee itself falls approximately 25 m from Feildes Weir to its confluence with the River Thames. Given that this is over a distance of approximately 34 km this gives an overall gradient of about 1 in 1300, which is very shallow.

Most of the tributaries of the River Lee are considerably steeper, as shown by the following examples:

Pymmes Brook	1 in 150
Ching Brook	1 in 240
Cobbins Brook	1 in 170
Spital Brook	1 in 200.

MAP 3 TOPOGRAPHY



KEY

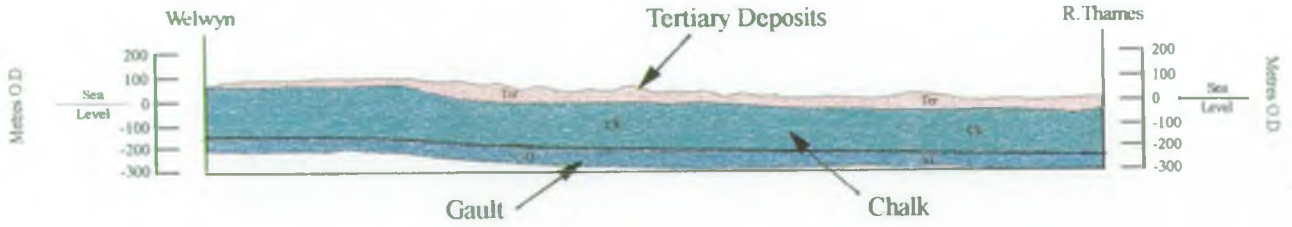
	Watercourse	GROUND LEVELS					
	Catchment Boundary		Under 10 m		70 to 100 m		
	Motorway		10 to 40 m		Over 100 m	Scale (approx) 0 5 km	
	Urban area		40 to 70 m	All values in metres AOD (Above Ordnance Datum)			

2.4 GEOLOGY AND SOILS

The underlying geology of the catchment is mainly a thick layer of London Clay (up to 70 metres deep in places). The clay is impermeable and contains virtually no groundwater. Below the London Clay lies a strata of Chalk. This strata is an important source of water (see Section 2.11), as the fissures in the rock hold large volumes of water which can be pumped out for public water supply. The London Clay protects the valuable Chalk aquifer from pollution caused by human activities on the surface (e.g. industry, waste disposal) which could seep through the ground.

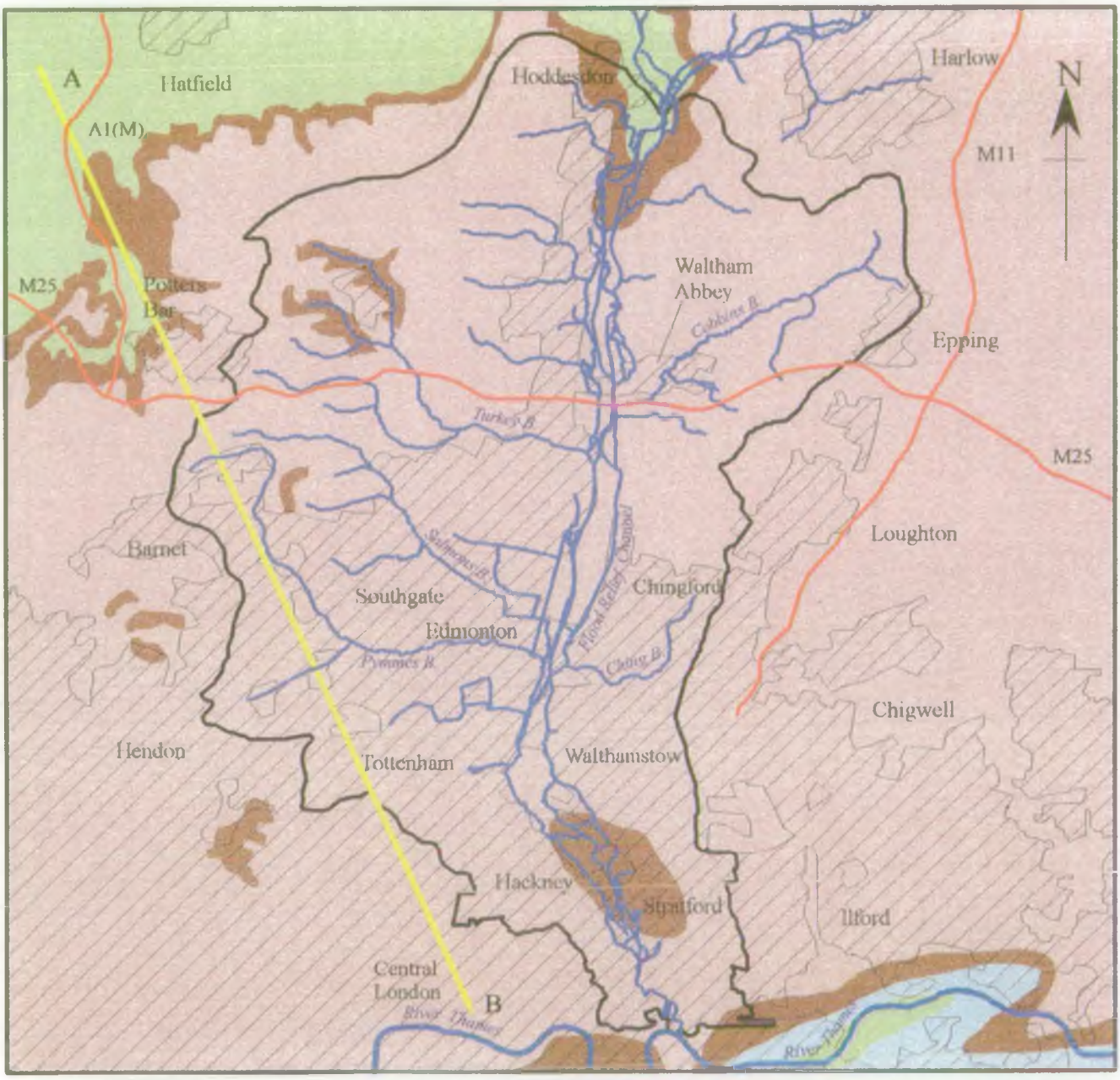
Nearer the surface there are deposits of river gravels and sands in the natural floodplains of the rivers, especially along the River Lee corridor. Additionally, there is a small 'window' in the London Clay, around Lea Bridge (Hackney), which exposes the 'Woolwich and Reading beds'. These are clayey, fine grained sands which are generally in hydraulic continuity (i.e. directly linked) with the underlying Chalk.

In the northern parts of the catchment, north of the M25, there are also deposits of glacial gravels and boulder clay lying above the London Clay. Much of the gravel has been extracted for building use. The diagram below illustrates the general geological sequence of the catchment.



Soil type influences how rainfall runs off the catchment surface. Permeable soils such as chalky or sandy soils allow water to infiltrate through the ground. Clayey soils are less permeable and water tends to run off into ditches and streams or collect on the surface (waterlogging) rather than soak into the ground. Most of the Lower Lee catchment consists of clayey soils. Paved surfaces (e.g. roads, roofs) are impermeable and their construction increases the volume and rate of surface water run off. The combination of many paved surfaces and clay soils means that the local watercourses respond very rapidly to rainfall.

Soils can be eroded and deposited by rivers. On the outside edge of bends in a river water travels faster and can erode banks and on the inside of the bend, where flow is slower, silt and soil being carried along by the river can be deposited. These are natural processes of geomorphology (changes to the earth's surface) but present problems in certain locations, like urban areas where peoples' gardens become eroded and buildings or road bridges become undermined. A case in point is the Salmons Brook near Latymer Road, Edmonton. Here erosion was exacerbated by a gravel trap that had been installed in the 1980s. An improvement scheme was implemented in 1992 which has stabilised the area by constructing a number of small weirs and a river bank timber revetment system.



KEY

	Watercourse	SOLID GEOLOGY					Geological Section
	Catchment Boundary		Reading / Woolwich Beds		London Clay		
	Urban area		Upper Chalk		Thanet Sand	Scale (approx) 0 5 km	
	Motorway						

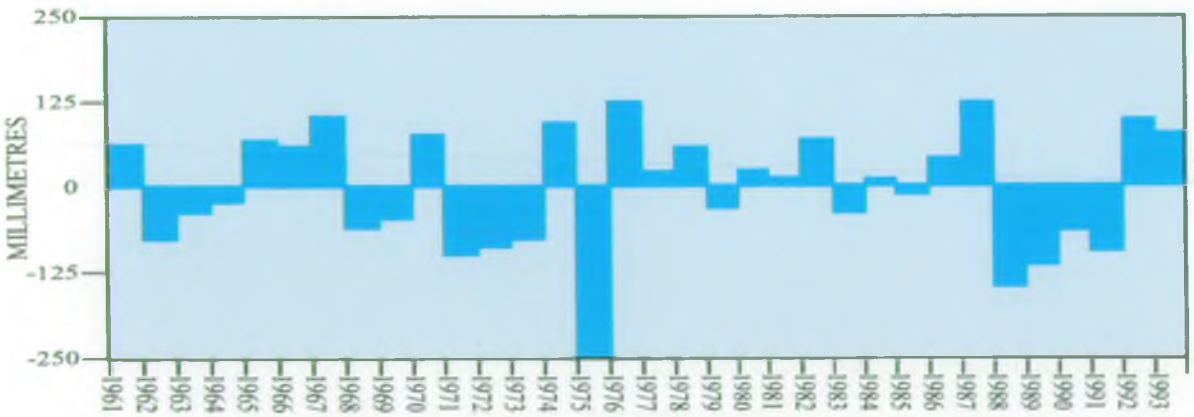
The catchment lies mainly on the London Clay and demonstrates the typically "flashy" nature of urban and clay run-off rivers. The graph below illustrates the response of the River Lee and Salmons Brook during a flood in October 1993.

The River Lee is gauged (i.e. the volumes of water flowing through are measured) at Feildes Weir, Ordnance Road and Lea Bridge. The river in this lower section is split into numerous channels and back-loops and has been further divided into the Lee Navigation and Flood Relief Channel. The Flood Relief Channel is gauged at Low Hall. The main tributaries of the catchment which are gauged are Salmons Brook, Turkey Brook, and Pymmes Brook. Gauged flow information can be used in conjunction with rainfall data to give flood warnings (see Section 2.15) during particularly wet weather. The average annual rainfall for the catchment is 584 mm (for the period 1961 - 1991). The variation in annual rainfall over the last 30 years is shown on the diagram below.

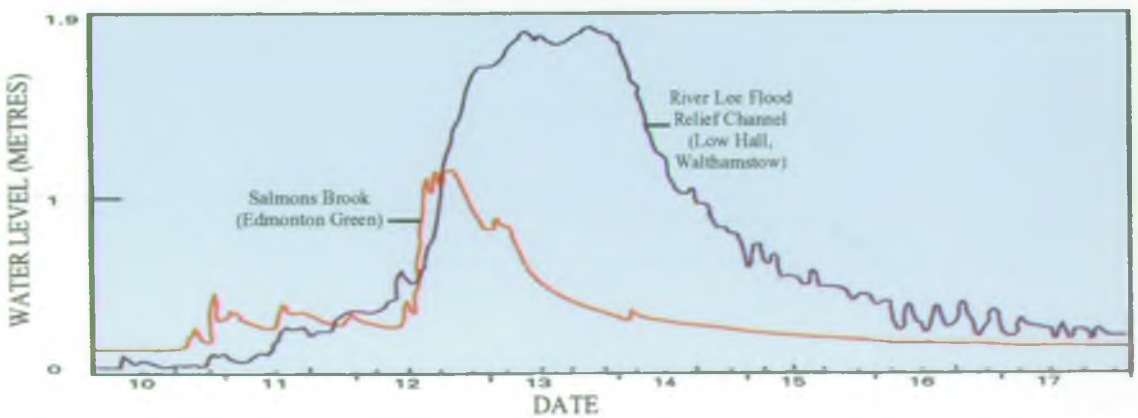
Much of the fluvial or river gravels have been extracted in the Lee valley and many of the workings now form lakes, some of which interconnect to the Flood Relief Channel. In addition to these old gravel pits, in the lower Lee valley there are several large reservoirs King George's, William Girling, Banbury, Lockwood and Warwick. The other main surface water feature of this area is the New River, which is an aqueduct dating from the 17th century which is still used to carry water to feed water supply reservoirs.

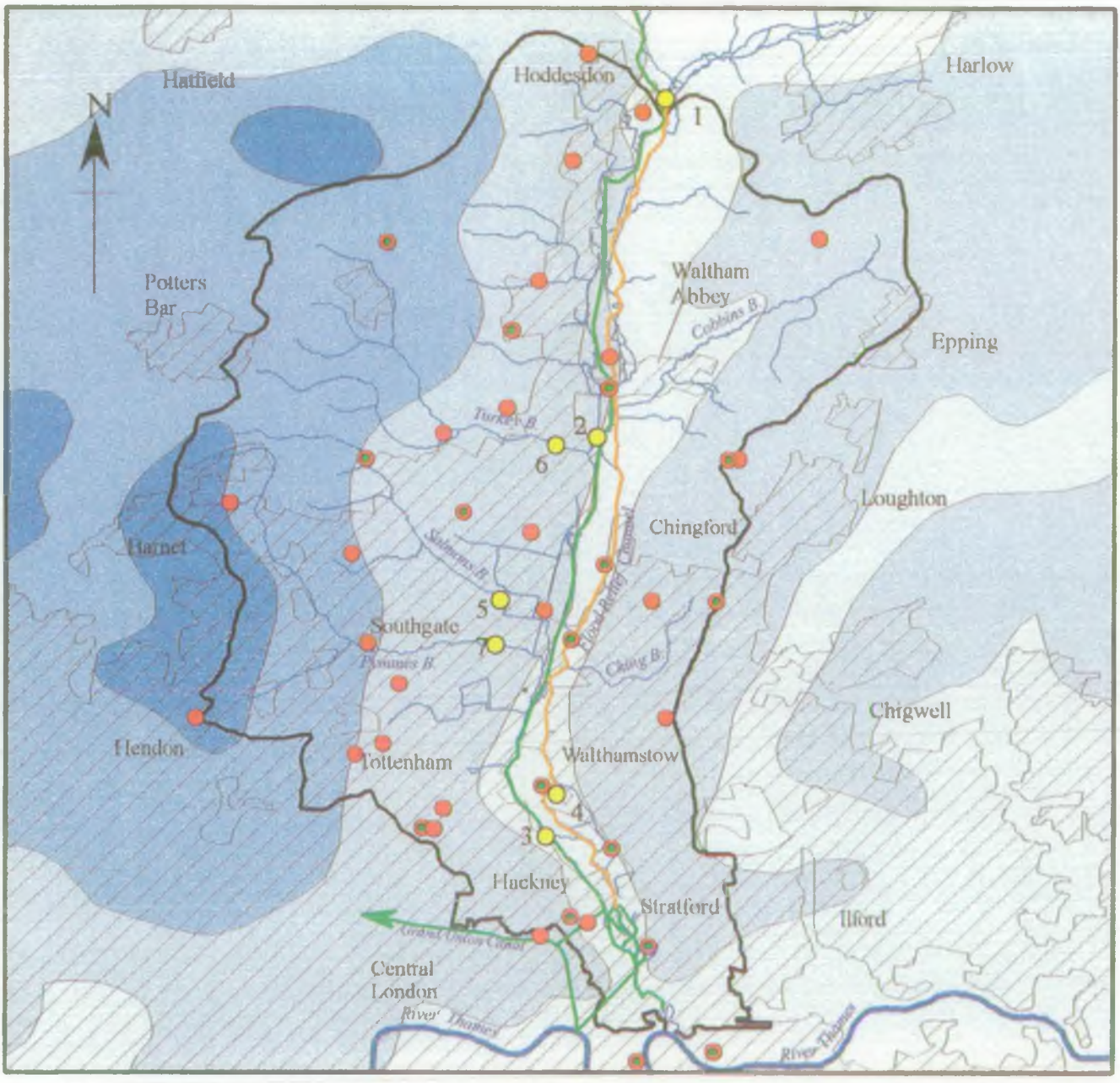
The other main addition to flows in the Lower Lee is sewage effluent and, in particular, discharges from Rye Meads and Deephams sewage treatment works (see Section 2.12). During dry weather, this water can make up the majority of flow in the River Lee.

RAINFALL FOR LOWER LEE
(ABOVE OR BELOW LONG TERM AVERAGE of 584mm)



WATER LEVELS DURING STORM EVENT (10-17 OCTOBER 1993)





KEY

	Watercourse	Annual Average Rainfall (mm)		River Flow Gauges		Met Office Recognised Rainfall Gauges
	Catchment Boundary		Under 600	1. Feildes Weir 2. Ordnance Road 3. Lea Bridge 4. Low Hall 5. Salmons Brook 6. Turkey Brook 7. Pymmes Brook		Daily Rainfall Gauges
	Urban area		600 to 650			
	Lee Navigation		650 to 700		Scale (approx) 0 5 km	
	Lee Flood Relief Channel		Over 700			

2.6 ECOLOGY

Introduction: The ecology of streams and rivers reflects both the natural influences associated with the physical and chemical characteristics of the catchment from which they derive water and the artificial influences resulting from human activities.

The smaller headwater streams draining the clay hills of this area are "flashy" which naturally promotes steep, eroding banks and in-channel debris dams (e.g. fallen branches of bankside trees). The fauna and flora of such streams is restricted by the severity of physical conditions but specialised macroinvertebrates, (e.g. nemounid stoneflies and leptophlebid mayflies), are found. Downstream, as their gradient and bank height reduces and their water width increases a greater variety of plants and animals are naturally found. In the larger brooks and river channels of the Lee valley floodplain a range of different physical environments (such as fast flowing riffle areas, less turbulent glides or runs and deeper pools) may be found within relatively short sections of river, particularly where a channel follows a sinuous course. These physical attributes of a river channel are a key influence upon the nature and variety of riverine habitats available for aquatic plants, macroinvertebrates, fish and other river corridor wildlife.

In the absence of significant human influences, the channels of the River Lee in the Lee valley floodplain once supported a variety of river habitats, with a tendency for wide river margins to grade into adjacent areas of wetland or wet meadow. Traditionally these floodplain areas supported a mosaic of sustainable land uses including cattle grazing, fishing and wildfowling with reed, sedge or willow growing for roofing basket making and other crafts.

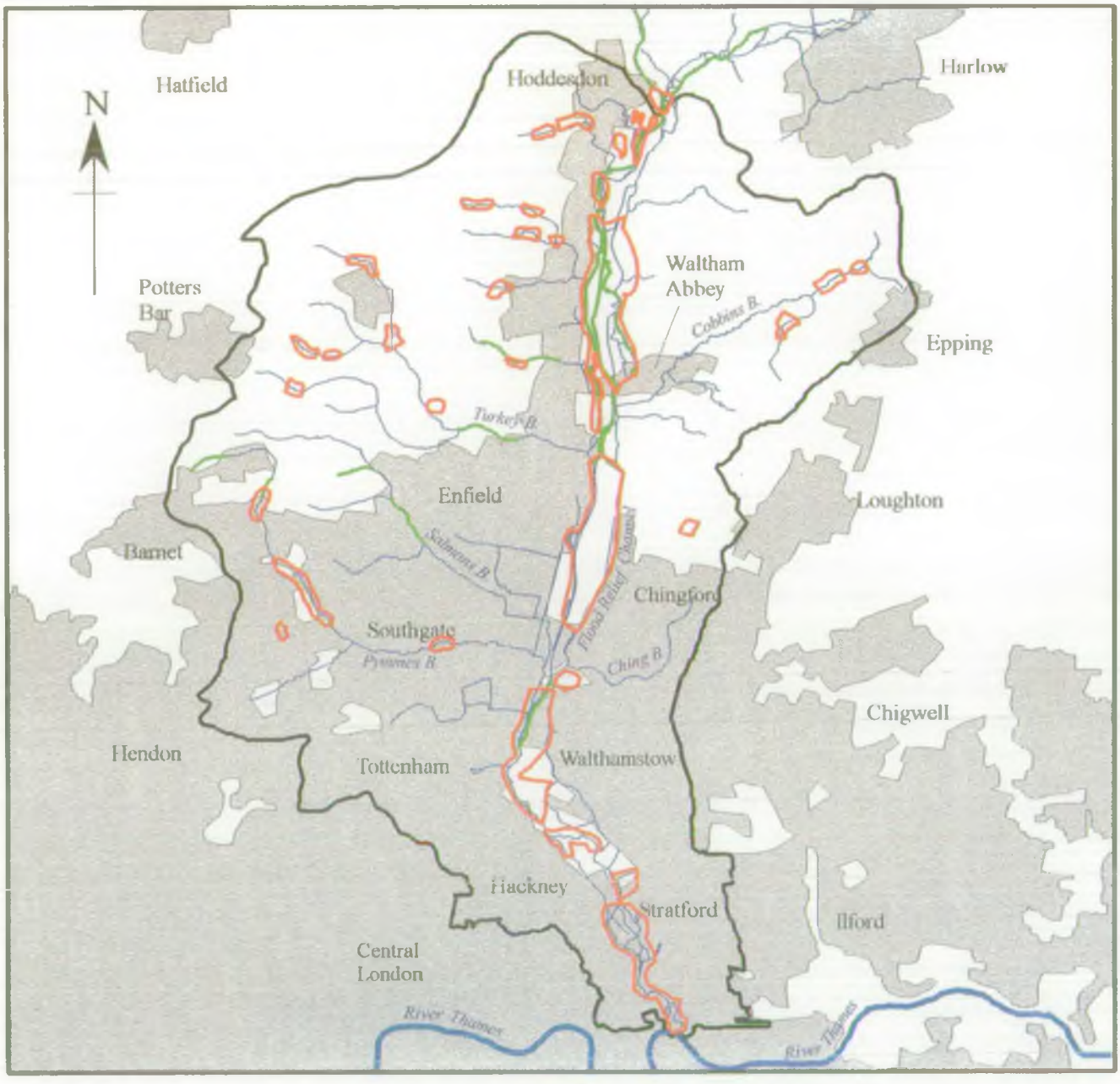
Key Human Influences

The ecology of the catchment has been altered by a range of human activities associated with the progressive urbanisation of this area over the last 100 years. These changes have caused physical changes such as a loss of floodplain to urban development and increased rates of surface water run-off and flashiness of rivers and streams. These changes have led to flood prevention measures including lowering of water levels through channel deepening, alteration to channel dimensions and the use of flow regulation structures and bank protection to prevent erosion.

These changes have resulted in a high proportion of modified channels and where conditions are highly artificial (e.g. concrete lined watercourses) this has resulted in severely degraded instream, river margin and bankside habitats and much reduced ecological value and potential. Loss of wetland areas through improved drainage and through abandonment of traditional, sustainable wetland management has also reduced the ecological value of particular areas.

Urbanisation has also had an influence on water quality. Increased use of rivers for sewage disposal has been accompanied by increasing volumes of polluted urban run-off entering watercourses. The reduced time of travel within modified channels and loss of natural river margin has also reduced the capacity of rivers and streams to self purify polluting loads. These water quality changes have also reduced the ecological value and potential of rivers.

Current Situation: The current ecological status of rivers, streams and canals is assessed by the NRA in the following ways: river corridor (instream and bankside habitat) surveys; biological (aquatic macroinvertebrate and habitat) surveys; and fisheries surveys. Further relevant information concerning chemical water quality, hydrology and geomorphology, for example, is also collected by the NRA.



KEY

~	Watercourse	□	Critical / Important Wetland / River Habitats				
~	Catchment Boundary	~	River Reaches with Good Biological Diversity				
	Urban area					Scale (approx) 0 5 km	

2.6 ECOLOGY

An integrated approach towards the assessment of ecological status and in the design and implementation of measures to restore or protect ecological value is recognised as the most effective approach.

The map on the previous page identifies sections of watercourse which retain ecological features of interest, identified by NRA river corridor surveys and/or biological surveys. Although the catchment is heavily urbanised, examples of critical/important habitats occur widely. Locations of these sites largely reflect the distribution of well preserved river corridors. Macroinvertebrate groups of high ecological quality tend to occur where there is a combination of semi-natural habitat features and relatively clean water. The greatest macroinvertebrate diversity is found within well preserved, fast flowing sections of the River Lee below Kings Weir and Enfield Weir. However, examples of faunas of high ecological value can be found in a range of watercourse types from small headwater streams to well established artificial channels providing naturalised habitats, such as parts of the Lee Navigation.

Designated Nature Conservation Areas

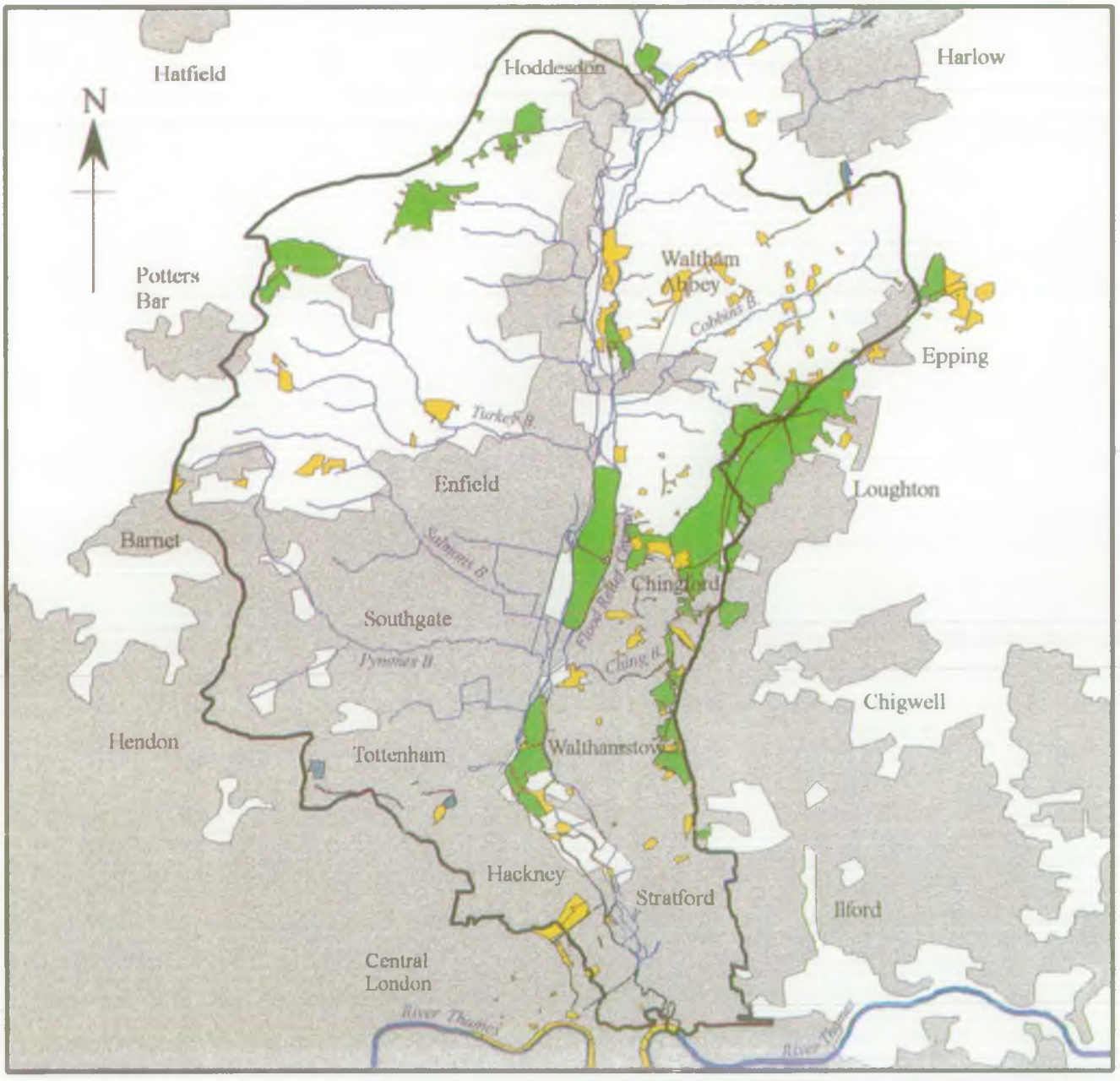
There are a number of designated nature conservation areas within the catchment (see maps 7 and 8) and the Lee valley is recognised as an internationally important north-south route for migratory birds. The long chain of rivers, reservoirs and associated wetlands provide areas for rest and feeding for birds. These areas are now recognised as a proposed Special Protection Area (pSPA) under the EC Birds Directive (79/409/EEC). The area of the pSPA is defined by the water based Sites of Special Scientific Interest (SSSIs) in the Lee valley as designated by English Nature (EN). There are also several other SSSIs within the catchment that are not water based, for example, Epping Forest. They are all particularly important areas of habitat which have statutory protection. Additionally, there are other sites of importance for nature conservation which are designated by Local Authorities. These areas whilst not as important as SSSIs are nevertheless key parts of the natural environment and worthy of protection from damaging impacts. Urban streams often act as Green Chains, linking up other areas of open land within towns and cities. This role has been recognised in several of the Unitary Development Plans (UDPs) recently published by the London Boroughs. It is essential that these streams are maintained and enhanced for their wildlife value, rather than becoming progressively more devoid of ecological value.

Two of the key factors in restoring and sustaining the ecological value of these rivers within a predominantly urbanised catchment are ***firstly, keeping the river open, i.e. preventing further culverting, and taking opportunities to open up existing culverts. Secondly, the successful promotion of riparian "buffer zones" for the conservation of bank side habitats. Such strips of land may offer benefits to recreation and amenity interests as well as nature conservation and pollution control. Issues 4.12 and 4.16.***

The designated Green Chains in the catchment include the Lee Valley, Ching Brook, Pymmes Brook, Salmons Brook, Turkey Brook, New River, Northern Outfall Sewer Embankment and Parkland Walk. Some of these are based on disused railway and other linear open spaces but they are generally only found in urban areas. ***These links need to be protected and enhanced in order to sustain their ecological value. Some may need ecological management as they currently provide minimal ecological value. Issues 4.12 and 4.16.***

MAP 7

NATURE CONSERVATION SITES CURRENT SITUATION



KEY

	Watercourse		Local Nature Reserve				
	Catchment Boundary		Site of Special Scientific Interest (SSSI)				
	Urban area		Site of Importance for Nature Conservation (SINC) (No data for LB Enfield)	Note : Where SSSI and SINC sites coincide, only SSSIs are shown.		Scale (approx) 0 5 km	

2.6 ECOLOGY

The southern most part of the River Lee, from Three Mills to the River Thames, is known as Bow Creek and is an important transitional area between the freshwater River Lee and the tidal River Thames and is likely to support unique habitats and species. ***No significant data exists for this creek. The potential pressures of urban development on the creek, due to its position within the Thames Gateway, makes it essential that ecological information is obtained. Issue 4.13***

This will enable an assessment of the importance of this creek to estuarine fish and other biota and understanding of the complex ecology of the area to be more fully appreciated. There is currently a £1.2M project on Limmo Peninsula which will create an important wetland habitat in the heart of Docklands.

Future Situation: The decision whether to confirm the proposed SPA as permanent will be taken by the Department of the Environment (DoE). If designated, this will give much greater protection to the birds and their habitat. This protection may, however, involve restrictions in the use of parts of the Lee valley of certain recreational activities, new building development and operation of water supply and sewerage infrastructure.

Four water related SSSI sites, Walthamstow Marshes, Cornmill Stream/Old River Lee at Waltham Abbey and Rye Meads, have been identified by EN and NRA as requiring research into the relationship between conservation value and water levels. ***This means that they will each be investigated so that a Water Level Management Plan (WLMP) can be produced in order to ensure that the water regime is managed to protect and enhance the habitat. These areas are likely to be examined during the period 1996-1997. Issue 4.7***

Modern day enhancement schemes and flood defence maintenance programmes incorporate a more sensitive approach to river channels. NRA Thames Region have produced "Flood Defence Guidance for Conservation in Watercourse Maintenance Works" (August 1994) for our own use and as a benchmark for external contractors.

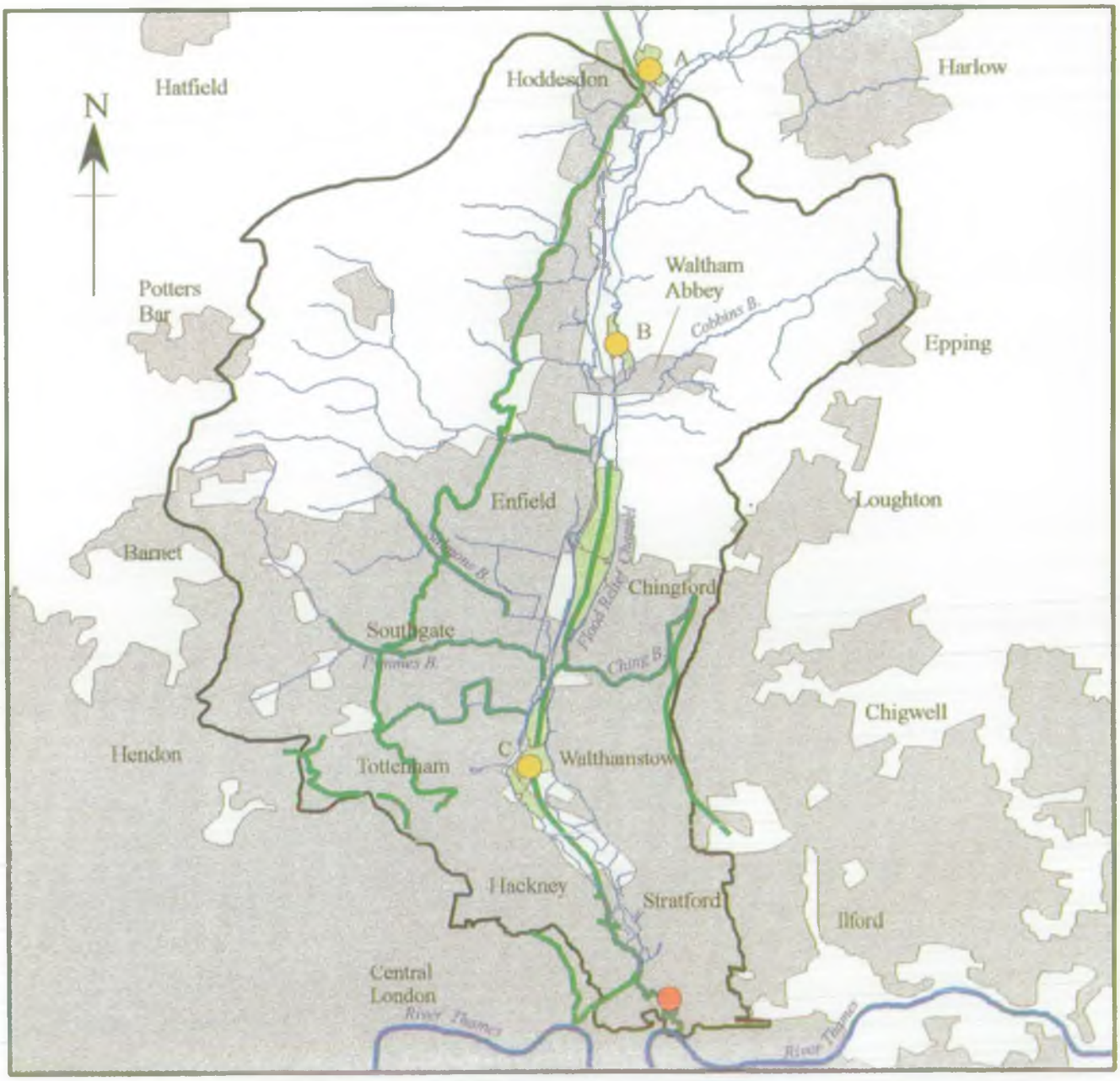
A sustainable future for natural and semi-natural habitats needs the co-operation of the key parties that shape development. These include all the groups mentioned in Section 2.2, landowners and voluntary groups as well as the NRA. Issue 4.3

It is also beginning to be recognised by several conservation bodies that natural features such as water meadows, ponds and natural river channels need to be created to replace those which have been lost over the past century, in order to redress the balance between built and natural environments. Issue 4.12.

In some parts of the catchment invasive or 'alien' plant species have taken over. River banks are a prime example with large tracts of Japanese knotweed, Giant Hogweed and Himalayan Balsam. ***Controlling the spread of these species needs to be tackled on the ground using best practice and in a co-ordinated way. Issue 4.9)***

MAP 8

NATURE CONSERVATION SITES FUTURE SITUATION



KEY

	Watercourse		Green Chains		Water Level Management Plan Sites		
	Catchment Boundary		Proposed Special Protection Area (SPA)	A Rye Meads B Commill Stream / Old River Lee C Walthamstow Marshes			
	Urban area		Limmo Peninsula Wetland Habitat			Scale (approx) 0 5 km	

2.7 FISHERIES AND ANGLING

Introduction: Fish populations are excellent indicators of the quality of the water environment. The European Community (EC) directive 78/659/EEC is used to classify the fisheries potential of rivers on the basis of the quality of the water. Rivers that support salmonid species (e.g. trout and salmon) are generally of a higher water quality than those that support cyprinid species (e.g. coarse). Cyprinid or coarse fisheries may include tidal as well as freshwater fish species.

Current Situation

River Lee Navigation: A survey of the navigation in 1993 found it to be a moderate quality coarse fishery. Upstream of Tottenham Lock, the Navigation is designated cyprinid in accordance with EC directive 78/659/EEC (see Section 3.1). Below Tottenham Lock to Bow Lock, the confluence with the tidal River Lee, the Navigation no longer supports EC designated status. ***Periodic fish mortalities occur, either during or shortly after storm events, from Tottenham Lock downstream to Lea Bridge. The causes of this need to be investigated and remedial action considered. Issue 4.4.***

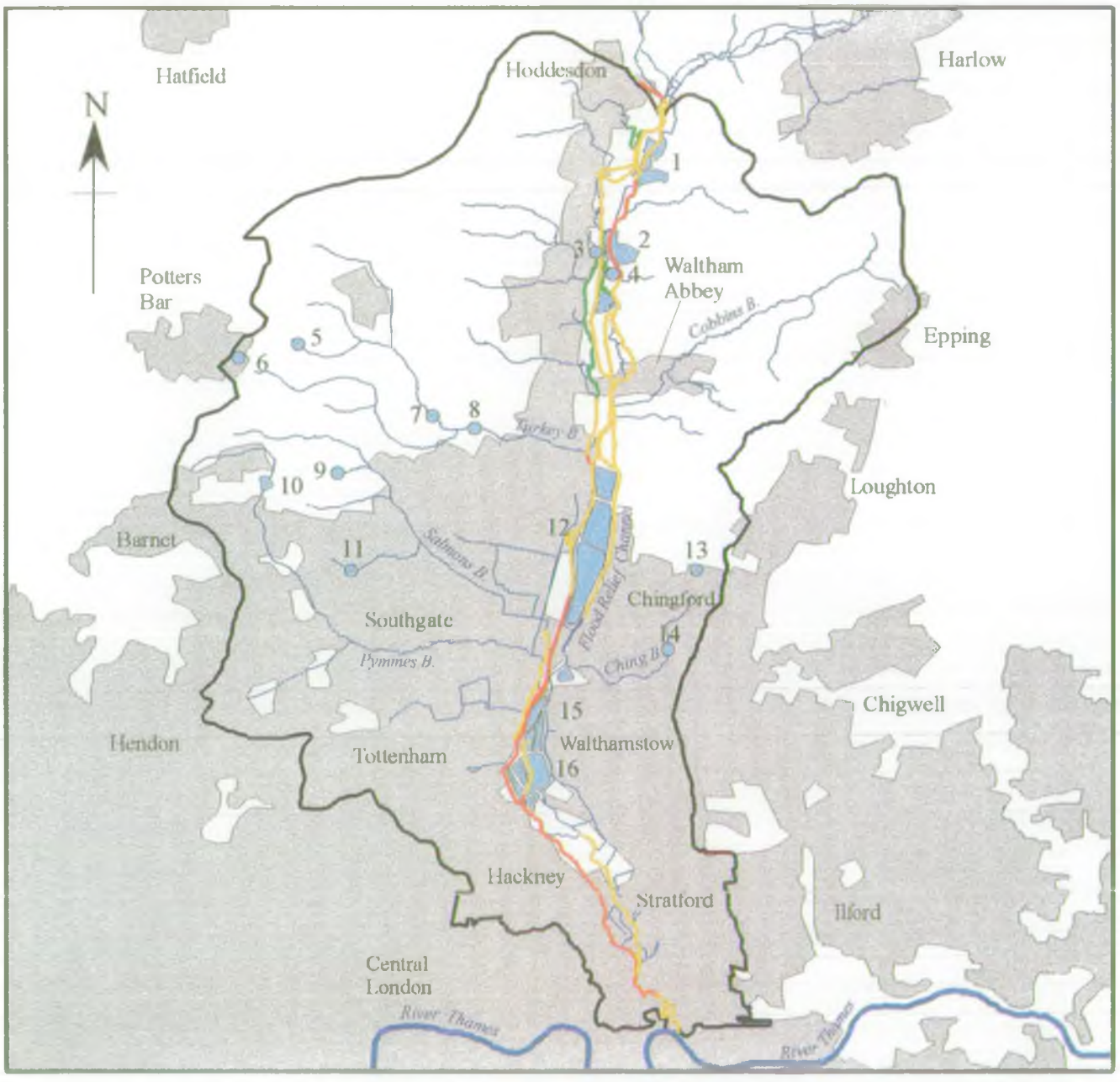
Fishery habitat on the navigation is generally limited (e.g. lack of marginal and instream habitat) influencing the fish populations found. Where good habitat or important features exist, either constructed or natural, improved fish communities are found. The survey of the system recorded a total of 19 different species with roach and pike being the dominant species. Good perch populations were also present.

A number of tributaries of the Navigation, such as the River Lynch, Broxbourne Mill Stream, Powdermill Cut, Small River Lee and Coppermill Stream, act as spawning and nursery areas for fish populations. Other lock and weir bypass channels at Dobbs, Carthagena and Kings weirs and the Flourmill loop at Ponders End, have been identified as good fish holding areas for species including chub, barbel, bream, tench, pike and carp. ***The water quality of the small watercourses is often not given formal protection through statutory standards. Issue 4.4.***

Angling on the Lee Navigation is mainly controlled by the Lee Anglers Consortium. There are many still waters alongside the navigation, the majority being old gravel pits. Angling is either controlled by a club or on a day ticket basis, providing both pleasure and specimen fishing. The King George V, William Girling and the Walthamstow complex of freshwater reservoirs also offer angling facilities.

Angling on the Lee Navigation and other notable watercourses such as the Flood Relief Channel, Cornmill Stream and Old River Lee is often constricted at several locations throughout the year due to the growth of floating duck weed (Lemna sp.). Issue 4.7 and 4.14.

River Lee Flood Relief Channel: The Flood Relief Channel (FRC) starts at Feildes Weir and passes through a series of lagoons and gravel pits, which act as balancing lakes, then follows the Lee valley down to the River Thames. The FRC down to Holyfield weir has earth banks, a fairly natural appearance and receives a 'sweetening flow' from the Lee Navigation. It is not designated as a cyprinid fishery under the EC directive. Species diversity is good with roach and perch being dominant and tench, eels, pike and dace present. The Nazeing lagoons are known to support large carp and pike along with roach, bream, tench and eels.



KEY

Watercourse	Fishery Quality		1 Nazeing Lagoons 2 Fishers Green 3,4 Police Pits 5 Hook Lane Lake 6 Oakmere Park Lake 7 Whitewebbs Park Lake 8 Forty Hall Lake 9 Trent Park Lake 10 Jacks Lake 11 Grovelands Park 12 King George V & William Girling Reservoirs
Catchment Boundary		Good	
Urban area		Moderate	
		Poor	
		Stillwater Fisheries	

12 King George V & William Girling Reservoirs
13 Connaught Water
14 Highams Park
15 Lockwood & Maynard Reservoirs
16 Walthamstow & Warwick Reservoir

Scale (approx)
0 5 km

2.7 FISHERIES AND ANGLING

The FRC from Holyfield weir to Tottenham Locks, including the section of the natural River Lee from Kings weir to below Holyfield weir is designated as an EC Cyprinid fishery. The latter section, which is faster flowing and quite natural, is one of the country's premier barbel fisheries.

Below Holyfield weir, there are several on-line sluice structures through Waltham Common. In-channel habitat favours multi-species utilisation, including barbel, tench, roach, perch, pike, bream and carp. Where the Old River Lee diverges towards Waltham Abbey to form the Cornmill Stream, problems of ***low flow have caused degradation of the fishery habitat and a decline in the amenity value of these old water meadows. Issue 4.7.***

The Cobbins Brook feeds into the FRC downstream of Waltham Abbey and supports populations of coarse fish. However, survey data does not exist for this watercourse.

The channel profile of the FRC changes from semi-natural to man-made below Newmans sluices (just south of Waltham Abbey), with a gravel/silt base giving way to a solid concrete trapezoidal channel where it runs alongside the King George and William Girling reservoirs.

The deeper impounded sections support larger specimens such as bream, pike, barbel and tench along with chub, eel and roach. Despite the impoverished habitat adjacent to the reservoirs, barbel and dace were noted as present. It is not known whether the populations are self-sustaining or supplemented by fish that are washed down the FRC or the Small Arms loop during flood events.

Water is abstracted from the FRC at Chingford for public supply and pumped to the adjacent reservoir, leaving the downstream channels with low flows for prolonged periods.

At Green Gates (Lee Valley Trading Estate, Edmonton) the New Cut diverges and returns water to the Lee Navigation at Tottenham Lock via the East and West Cuts. Tench and eels predominate with roach, chub and perch present in a semi-natural habitat flanked by the Lee Navigation on one side and the Walthamstow reservoir complex on the other.

Tidal River Lee: Diverging from the Lee Navigation at Lea Bridge weir, the lower tidal river runs through the industrialised areas of Hackney, Stratford and Bow and is of fair-good water quality but has no EC fisheries designation. At Hackney Marshes the channel is very wide with a semi natural aspect. In-stream habitat is good with alternating riffle/pool sequences. Species composition consists of roach, eel, perch, dace, bream, pike and tench with evidence of recruitment. This is the only location where general access to the river bank is permissible therefore angling is only possible at this point.

The presence of flounder at Stratford indicates tidal influence. Despite high sheet piled walls, fisheries habitat was considered good with varying pools and riffles and a good gravel substrate supporting instream plant growth. At this point and at Three Mills, eel and flounder were present along with dace and sticklebacks.

Near Bow Lock a large bed of Phragmites sp. offers natural habitat on one bank. At Bromley dock and Bow Creek, eels were the dominant species with estuarine species such as flounder, mullet and smelt present.

Still Waters: The catchment has many still waters in the form of lakes, reservoirs, ponds and pits. These provide angling on either a club membership or day ticket basis. Lee valley gravel pits (e.g. Nazeing, Fishers Green) are well known for their specimen tench, bream, carp and pike fishing and attract anglers from well outside the catchment.

Thames Water Utilities Ltd (TWUL) manage a number of their reservoirs for angling. The King George Reservoirs are coarse fisheries and can be fished from the bank by season ticket with large carp and pike recorded. Walthamstow Reservoirs 1, 2 and 3, West Warwick, High and Low Maynard and Lockwood Reservoirs are also coarse fisheries, with specimen catches of carp, pike and bream with other species such as perch, roach, barbel, chub and dace present. Day and season tickets are available which cover all these reservoirs (except Lockwood and West Warwick).

Future Situation

The NRA will continue to monitor fisheries using surveys. The feasibility of surveying the Cornmill Stream, Old River Lee, Pymmes Brook and Salmons Brook will be examined. Issue 4.7 and 4.16

Emergencies will continue to receive a high priority (response within 2 hours during workings hours and 4 hours outside these times). NRA staff attend incidents such as pollution events and water loss to rescue or transfer fish to safe areas or, where necessary, to install aeration equipment to keep fish alive which cannot be moved.

The NRA at a national level is investigating the issue of Cormorants, their impact upon fish populations and what can be done if they are proved to be a significant problem. In the Lower Lee catchment, the Walthamstow Reservoirs are known to be one area where cormorants are a concern.

There are currently many barriers to fish movements including locks, weirs and culverts. Opportunities for promoting movement by installing fish passes will be examined over future years with a view in the long term to enable migratory species to pass through the catchment to upper reaches of the River Lee and its tributaries. Issue 4.4.

Opportunities will be taken to create and improve refuges where fish can shelter, during pollution events, whilst polluted water passes by. Issue 4.4.

2.8 LANDSCAPE & HERITAGE

Introduction: Landscape can contribute greatly to the amenity of an area. In urban areas, natural landscape is particularly valuable. Heritage encompasses the elements of our history which still survive including examples of buildings and structures which date back to the industrial revolution and archaeological remains from further back in history.

Current Situation: Throughout the catchment, both within and outside Greater London, there are areas of valued landscapes. These are recognised by local planning authorities and are shown on the map opposite. It should be noted that in the Epping Forest District, landscape protection is district wide and not considered for specific areas.

The Lee Valley Park Plan 1986 identifies parts of the Lee Valley that are in need of landscape improvement. This has been brought about primarily because of previous gravel workings and derelict areas of glasshouses. Although this is not picked up in the statutory designations shown opposite, Lee Valley Regional Park Authority (LVRPA) is actively working towards landscape improvements within the park.

Within London there are several lines of protected views, for example the view of St. Pauls from Alexandra Palace. River corridors within London provide some of the main breaks from urban landscapes. The Lee valley is particularly valuable in this respect and many of it's tributaries such as Pymmes Brook, Salmons Brook and Ching Brook, are the backbone of urban open spaces. The NRA has also undertaken some landscape analysis in the catchment (see Section 3.3). ***Existing areas of importance need to be protected, particularly green chains in the urban areas. Issues 4.12 and 4.16.***

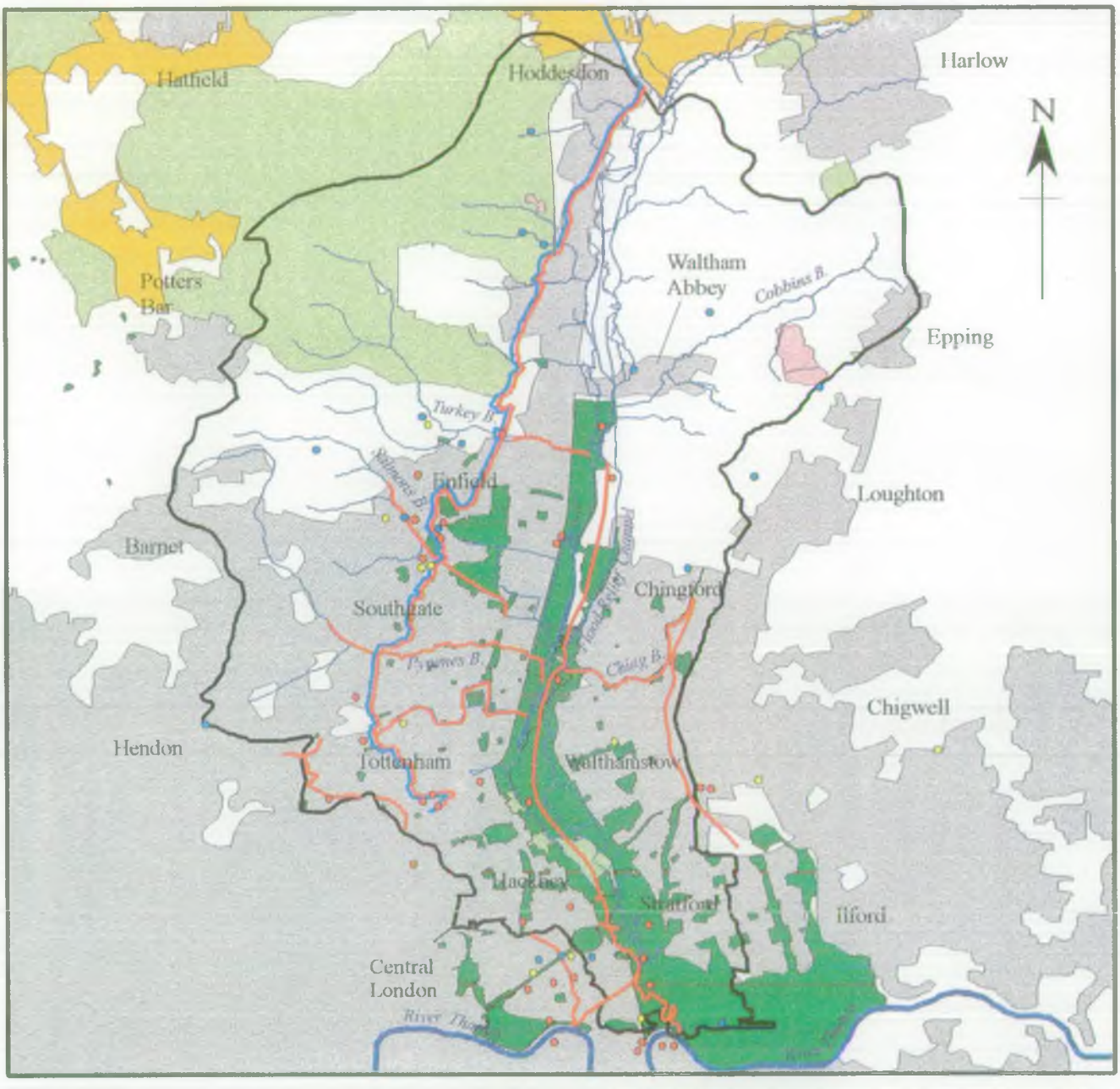
The catchment is a very rich heritage area. It has a history of settlement and human activity dating back to palaeolithic times around the early part of the stone age, particularly along the River Lee itself, and there are many areas designated as being archaeologically important.

There is concern that a number of potential archaeological sites may be drying out particularly along the Lee Valley. As a result of this, further investigation and monitoring may need to be undertaken to ascertain the extent of the drying out and any resultant actions to combat this: Issue 4.7.

Listed buildings, scheduled ancient monuments and existing water related archaeological sites in the catchment are shown on the map opposite. Of note are the tidal mills on Three Mills Lane (as depicted on the front cover), the castle at Stoke Newington Reservoir, the Monkfield Beam Engine, Tottenham, and the many lock keepers' houses along the River Lee Navigation. The New River is also a notable structure, being constructed in the 17th century to supply drinking water to London (see Section 3.2).

Future Situation: New developments will continue to be controlled by local planning authorities who should ensure that they will be sustainable by respecting and enhancing the landscape and preserving our heritage. ***Improvements to degraded landscapes, especially in the urban areas around the waterways of the Lee valley downstream of the M25, is increasingly being recognised as an essential element of urban regeneration. Many of the recent successful bids (see Section 2.13) for European and UK regeneration funds have included projects for the improvement of riverside landscapes. Issues 4.10, 4.12 and 4.16.***

It is hoped that a heritage strategy for the Lee Valley will be compiled by the relevant statutory archaeological authorities: Issue 4.7



KEY

	Watercourse		Areas of Archaeological Importance / Interest		Historic Parks and Gardens		Green Chains
	Catchment Boundary		Note : Only data within Greater London is shown		Scheduled Ancient Monuments		The New River
	Urban area		Landscape Conservation Areas and Areas of Great Landscape Value		Listed Buildings (water related)	Scale (approx) 0 5 km	
	Landscape Development Areas				Archaeological remains (still standing)	FILE REF : LLCCAB.PRE REV:3.0 03/02/95 (LANDSCAPE AND HERITAGE)	

Introduction: Rivers have long been utilised as a method of transport whether it be for pleasure or commercial purposes. Indeed, on the River Lee there is a Common Law public right of navigation. Canals have been constructed and rivers regulated specifically for this purpose and it means that British Waterways (BW) have a duty to provide facilities for boats and maintain a navigable channel.

Current Situation: BW is responsible for navigation in the Lower Lee catchment apart from the section of the tidal River Lee downstream of the A13 where the Port of London Authority are responsible (see map opposite). There are 47 km of waterway classified as navigable (under the 1968 Transport Act) within the catchment. This Act divides navigable waterways into three categories:

Commercial Waterways	The Lee Navigation and Limehouse Cut.
Cruising Waterways	The Hertford Union Canal.
Remainder Waterways	The Bow Back Rivers.

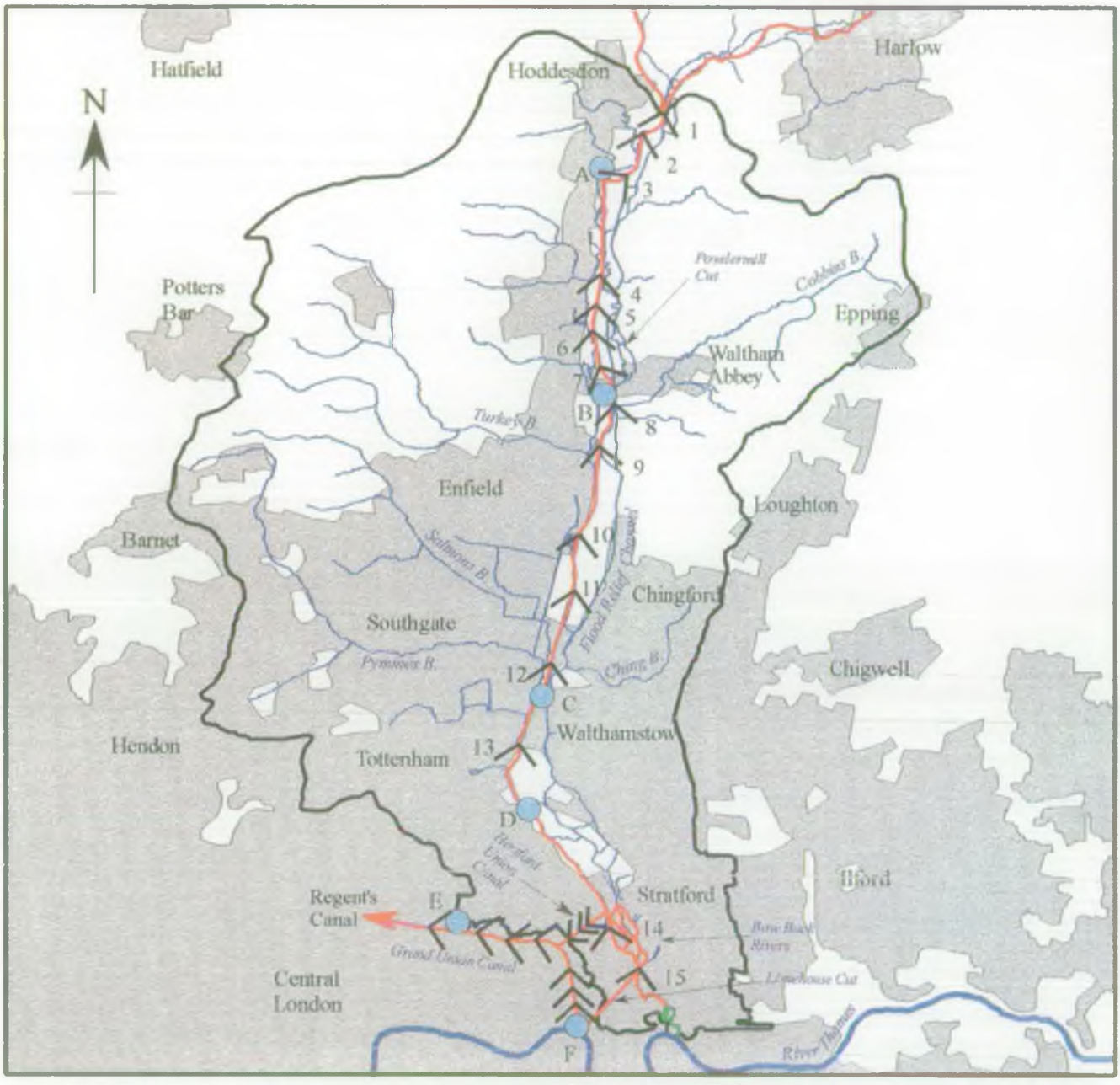
BW manage remainder waterways as economically as possible but can develop or dispose of them as cases dictate. BW have a duty to maintain and provide services and facilities on both commercial and cruising waterways. Since the 1968 Act, commercial traffic has dropped further and the majority of boats are now purely recreational. Under the 1995 British Waterways Act, BW now have a duty to conserve and enhance the heritage and natural value of sites through their operations. This represents a formalising of their previous practices.

The River Lee was used for navigation in Roman times and has been successively improved since, with significant improvements during the late 18th and early 19th centuries as the nation's canal network was constructed. Canals located in the Lower Lee catchment are the Hertford Union Canal which links the Lee Navigation at Hackney to the Regents Canal and Grand Union Canal, and the Limehouse Cut, which connects the Lee Navigation at Bow Locks to Limehouse Basin providing an alternative route to the River Thames.

The River Lee Navigation has 15 locks over its 34 km length from the River Thames to Feildes Weir. By continuing north Ware and Hertford can be reached by staying on the Lee Navigation, whilst the towns of Harlow and Bishop's Stortford can be reached by turning east on to the Stort Navigation.

Facilities for boating can be found at: Springfield Marina, Hackney; Hazelmere Marina, Waltham Abbey; and the Lee Valley Marina, Broxbourne. The river is also used by canoe clubs, rowing clubs, river cruisers and disabled users. Navigation users have experienced problems with excessive plant growth in some parts of the Lee Navigation. ***Duck weed and blanket weed can clog up engine intakes on motorised vessels and entangle paddles of canoes and rowing boats. Issues 4.7, 4.8 and 4.14.***

Lee Valley Regional Park Authority operate a fleet of narrow boats for river trips and day boats for hire on the River Lee during summer months. These are based at Lee Valley Marina and Springfield Marina and run at full capacity during peak times.



KEY

Watercourse	LOCKS :		MOORING SITES
Catchment Boundary	1. Feildes Weir Lock 2. Dobbs Weir Lock 3. Carthegena Lock 4. Aqueduct Lock 5. Cheshunt Lock 6. Waltham Common Lock 7. Waltham Lock 8. Rammey Marsh Lock	9. Enfield Lock 10. Ponders End Lock 11. Picketts Lock 12. Stonebridge Lock 13. Tottenham Lock 14. Old Ford Locks 15. Bow Locks	A. Broxbourne Cruising Club B. Hazelmere Marina C. Stonebridge Locks Page & Hewitts D. Lee Valley Marina, Springfield E. Labumam Boat Club F. Limehouse Basin
Urban area			
Navigable river / canal (BW)			
Navigable river (PLA)			0 Scale (approx) 5 km

Unregistered residential boats have caused problems in some locations with discharges of raw sewage and other waste products including motor oils. Licensed moorings all have proper services including water supply, sewage disposal, electricity and refuse collection.

Future Situation: Since 1989 BW have promoted the Lee and Stort Navigation to increase recreation including walking, cycling and the promotion of wildlife and heritage issues. This includes policies for increasing the number of moorings available. Any such proposals need to be carefully considered in light of their environmental impacts, effects on other users and navigational restrictions such as the width of the channel. Opportunities for marinas off line of the Navigation could be examined in this context as they generally have less impacts. ***A strategic view of areas which are and are not suitable for additional moorings should be taken with BW, LVRPA, NRA and Local Authorities being involved. Issue 4.8.***

The move toward sustainable development and the increase in road traffic could open up possibilities of increasing the use of waterways for commercial traffic in future years including the provision of river bus services. ***Investigation is needed into the potential impacts and benefits this could bring. Issue 4.7***

In many areas, particularly the southern part of the catchment, councils and local groups are seeking to promote greater use of riverside paths and towpaths as a recreational resource. Issue 4.8 This is particularly likely in areas that are deficient in accessible public open space.

There may, in the longer term, be opportunities for re-opening some stretches of river for navigation. For example, the Powder Mill Cut could allow access into the proposed Gunpowder Museum at Waltham Abbey. Another potential area for increasing the length of navigable river would be to re-open parts of the Bow Back Rivers in the south of the catchment. Some work has already been done on dredging the Bow Back Rivers but more and regular work is likely to be required to keep all the channels open. Any such initiatives would require extensive feasibility studies.

2.10 AMENITY AND RECREATION

Introduction: Leisure time is an important part of everyone's life. The water environment can offer amenity and recreation opportunities both in terms of formal activities such as sailing and informal activities such as walking.

Current Situation: Water based amenity and recreation within the catchment focuses on the Lee Valley Regional Park which embraces a string of lakes, reservoirs and the River Lee Navigation and other parallel channels of the River Lee. This area straddles the county boundaries of Hertfordshire and Essex and extends further down the catchment into Greater London. Recreational provision is coordinated by the Lee Valley Regional Park Authority (LVRPA) who own around one third of the Park. It is recognised as a recreational asset of regional significance.

One of the aims of the LVRPA is to increase access to and within the park by foot, bicycle, horse, car and public transport. This includes current improvements to the Lee Navigation towpath, including the provision of seats and clear signposts. The aim is to establish a physical link to unite the different sections of the Park. To this end the Lee Valley Walk has been established along the length of the River Lee from Luton to London. The Park also links into a network of other walks in and around London (see map opposite). Many people who use the Park do so informally for walking, picnicking or exercising dogs. ***The aesthetic appeal of some stretches of water is severely reduced by the amount of litter in some rivers. Issue 4.15.***

Angling and boating activities are covered more fully in Sections 2.7 and 2.9 respectively.

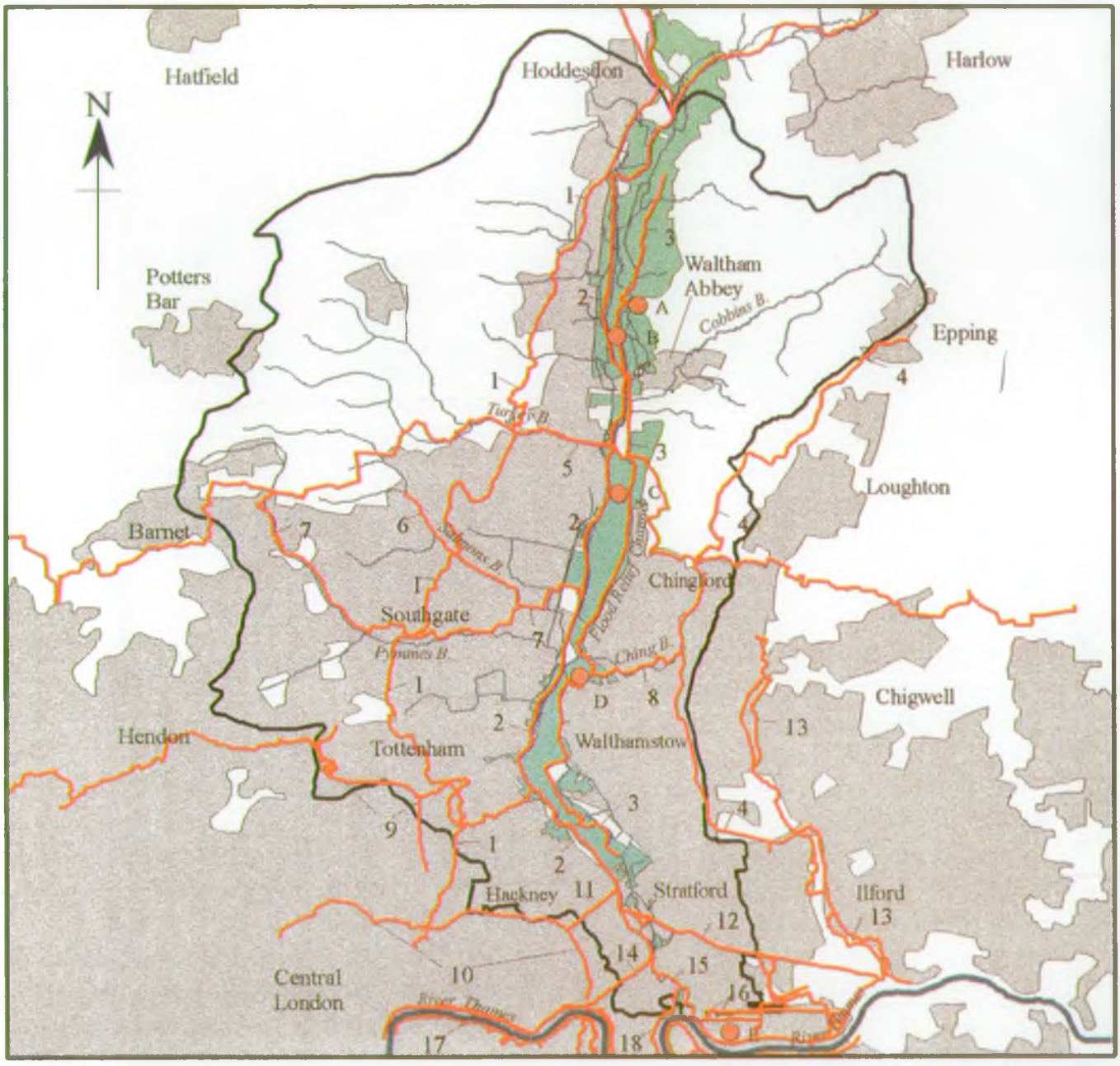
Thames Water Utilities Ltd (TWUL) operate Walthamstow No. 4 and 5 reservoirs and East Warwick as game fisheries and access is available with a day ticket.

Sailing and windsurfing are also popular on several water bodies within the Park including Nazeing Lakes, Holyfield Lake, King George Reservoirs and Banbury Reservoir. There are opportunities for boat owners and those wishing to hire vessels and partake in races. On Banbury Reservoir the Lee Valley Water Sports Centre offers courses in sailing, windsurfing, water skiing and power boating. There are also facilities and events for the disabled, youth groups and schools on Banbury Reservoir. Outside London, Cheshunt Lake is used extensively by youth organisations participating in water sports.

Canoeing is also a popular activity in the Park with particular emphasis on white water runs downstream of weirs on the River Lee. LVRPA are currently examining options for additional sites which could be utilised for this.

There are also opportunities for bird watching at King George V reservoirs, the Walthamstow Group of Reservoirs and at the RSPB Rye House Marsh Reserve which is just north of the catchment boundary in Hoddesdon. Common Terns, Kingfishers, Herons, Tufted Duck, Goldeneye, Black Necked Grebe and a wide selection of Waders all frequently visit these sites as well as rarities like the Grey Phalarope, Sabines Gull and Little Egret

Outside the LVRPA area of the catchment, the water environment still provides a valuable recreational resource. Lakes and ponds are common features of many parks and gardens, and are often the most accessible areas of open water for many residents of this catchment. They can act as important areas for informal recreation, just to sit beside, walk around or even feed the ducks.



KEY

	Watercourse		Water Recreation Sites		Footpaths and Riverside Walks (Including ones being researched and proposed)
	Catchment Boundary	A. Fishers Green B. Cheshunt Lake C. King George's Reservoir D. Banbury Reservoir E. Royal Docks		1. New River Walk 2. Lea Valley Walk 3. Lee Valley Park Path 4. Centenery Walk 5. Turkey Brook 6. Salmons Brook 7. Pymmes Brook Trail 8. Ching Way 9. Parkland Walk	10. Regents Canal Towpath 11. Hertford Union Canal Towpath 12. Greenway 13. Roding Valley Routes 14. Limehouse Cut 15. River Lee / Bow Creek Towpath 16. Royal Docks Links 17. Thames Path 18. Isle of Dogs Riverside Walk
	Urban area				
	Lee Valley Park				

Responsibility for the maintenance of such lakes in public areas usually lies with the Local Authority. The long term health of such features must be kept under review.

The catchment has also been host to a number of water based events over recent years. Waltham Abbey hosted the National Waterways Festival in 1989 and 1994. The Broxbourne Water Festival is held every summer, and last summer the Limehouse Festival celebrated the reopening of the Limehouse Marina on the edge of the Lower Lee catchment in East London. This is intended to become an annual event.

Future Situation: The Eastern Council for Sport and Recreation (ECSR) believe that many of the currently available facilities for formal water-based recreation have reached full capacity in terms of both levels of use and membership. ***There is therefore a need to create new opportunities for water recreation in the area, particularly as the Lee Valley Regional Park is designed to serve the needs of a much larger catchment population than is presently possible. Issue 4.8.***

LVRPA believe that the pattern of using former gravel pits is likely to continue and are investigating the feasibility of using the extensive mineral extraction site at Glen Faba near the northern catchment boundary. The site is still being worked at its southern end and will not be fully available until the end of the decade, although recreational uses could be introduced to parts of the site on a phased basis. The ECSR believe that a full range of water sports could be accommodated on a series of lakes, the largest being about 40 hectares which constitutes one of the few remaining opportunities to develop water sports in the catchment. As the River Lee is suitable for canoe touring, the LVRPA also proposes to develop a campsite for canoe tourists here.

The development of a 2000 m international rowing course at the Victoria and Albert Docks on the southern fringe of the catchment has been proposed, as has a 150 m canoe slalom course downstream from Dobbs Weir on the River Lee. The City Challenge project in the Stratford area includes plans for a waterside museum and tourism development at Three Mills.

Whilst amenity use of the water bodies within the Lee valley is restricted in places by both poor water quality and the desire to minimise disturbance to breeding birds, the increased use of time and space zoning could help alleviate some of the problems of 'overcrowding'.

2.11 WATER ABSTRACTION

Introduction: Water is abstracted (removed) from rivers and groundwater to provide for the needs of agriculture, industry and public supply. Abstractions are controlled by a system of licences introduced in the 1960s and now administered by the NRA. Licences restrict the amount of water which may be taken and can include further conditions to provide enhanced environmental protection. Some small abstractions (e.g. to supply a single household) do not require a licence.

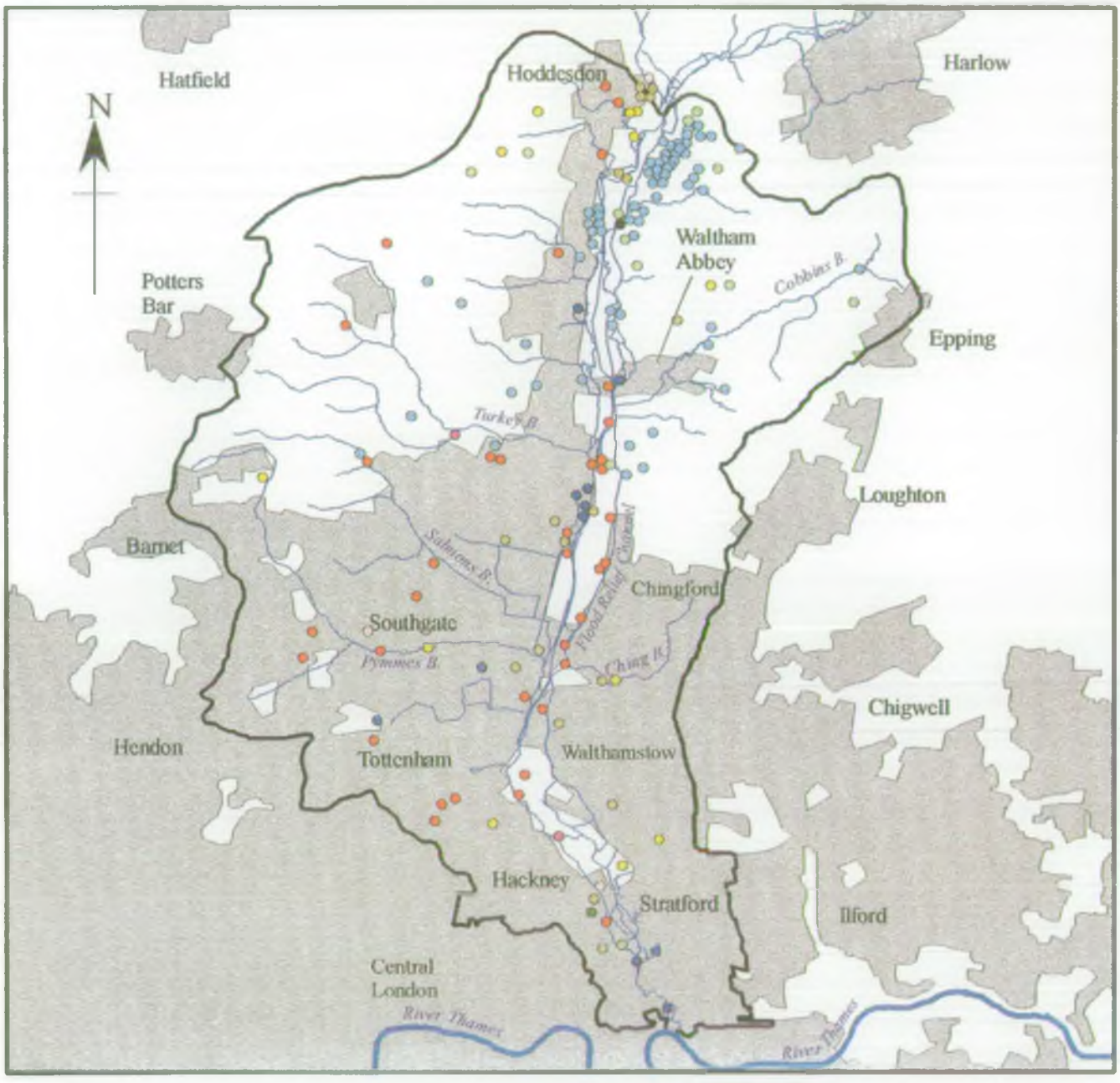
Current Situation: Abstractions can vary in quantity from the very small amounts needed from a garden well to supply a single household, to the large quantities needed, for public water supplies. In the Lower Lee catchment licences for public water supply abstractions account for 97% of the total volume of licensed abstraction. Of this 97%, 74% is from the Thames Water abstractions at Chingford/ Enfield. Surface waters provide the main resource for abstraction (72% of the total volume abstracted).

There are currently 140 licences in force within the plan area. These are summarised as follows:

TABLE 3: DISTRIBUTION OF WATER ABSTRACTION LICENCES

Purpose	No. licences	Total Authorised Volume (Ml/year)
Public Water Supply	15	271,614
Private Water Supply	10	1,030
Agriculture (inc. horticulture)	66	796
Industry/Minerals	20	2,527
Transfer	2	134
Spray Irrigation (agriculture)	10	130
Spray Irrigation (non agriculture)	4	83
Power Generation Cooling	1	1,750
Cooling	12	1,908
Total (All Purposes)	**140**	**279,972**

MAP 13 WATER ABSTRACTION LICENCES



KEY

	Watercourse	LICENSED ABSTRACTIONS					
	Catchment Boundary	●	Public Water Supply	○	Industrial and Mineral Washing	●	Cooling
	Urban area	○	Private Water Supply	●	Water Transfer	●	Cooling (Electricity)
		○	Agricultural	⊘	Spray Irrigation / Agricultural	Scale (approx) 0 5 km	
		●	Corporation / Authority Use	○	Spray Irrigation / Non - Agricultural		

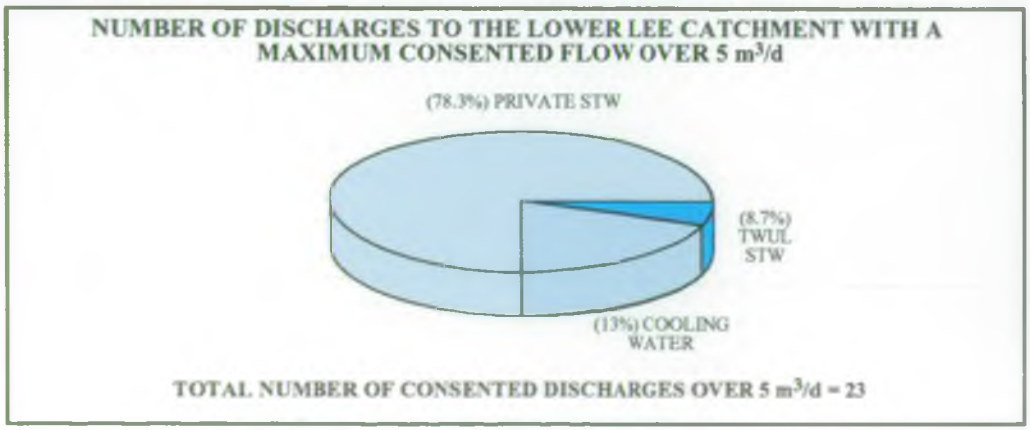
Introduction: Effluent is the treated waste water from sewage treatment works or industry which is discharged in a receiving water body. All such discharges in the catchment are controlled by means of either NRA consents or Her Majesty's Inspectorate of Pollution (HMIP) authorizations. Consents and authorizations are legal documents issued by the regulator which impose conditions on the quantity and quality of a discharge in order to protect the environment. The regulator has powers to monitor the consents and if the conditions are not being met, to take action to ensure compliance.

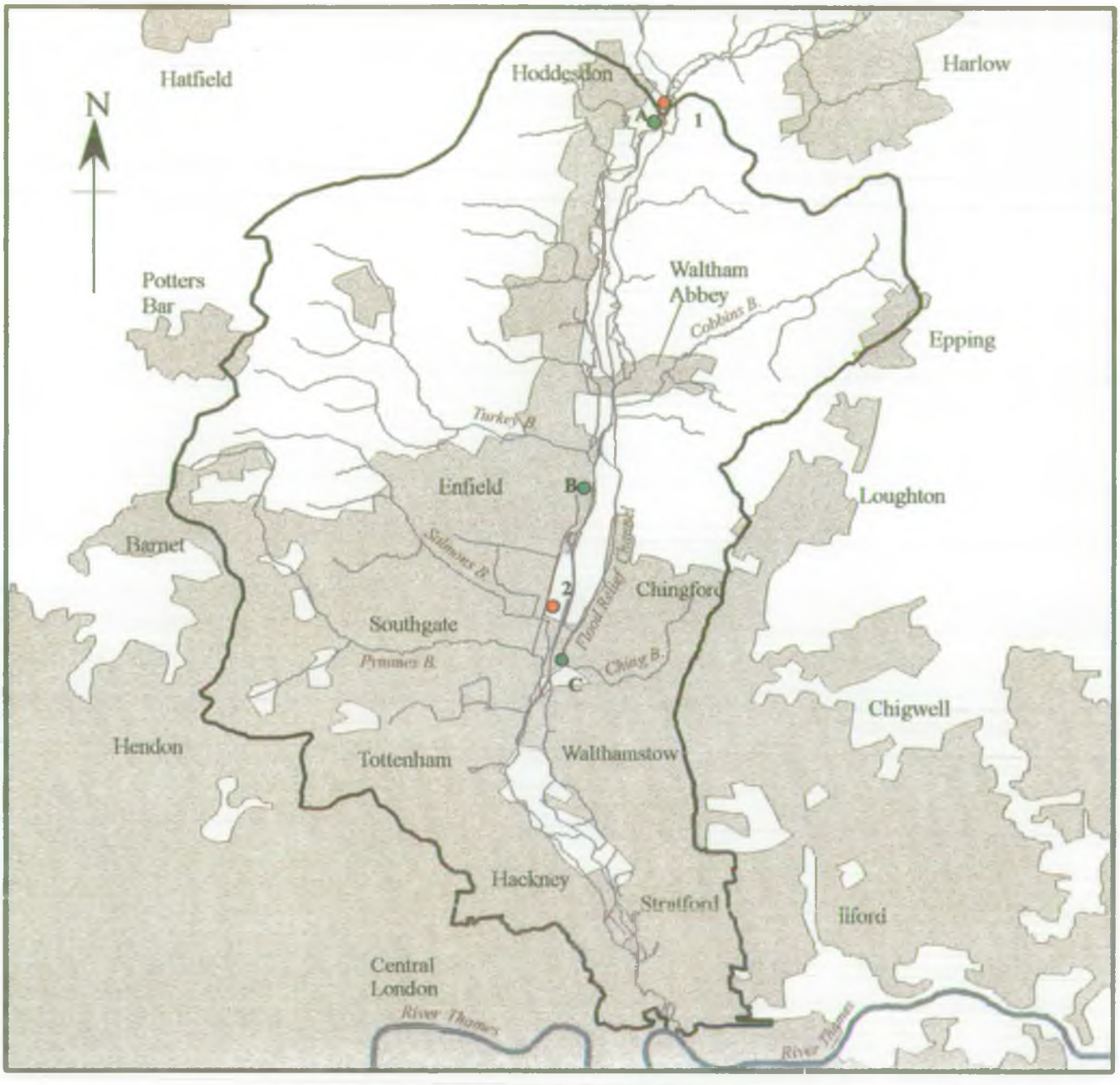
Current Situation: There are 103 consented discharges into the Lower Lee catchment, 23 of which have a maximum consented volume of >5 m^3/d. The majority of these effluents are from private sewage treatment works (see diagram below). The largest discharges by volume are those from the two Thames Water Utilities Limited (TWUL) sewage treatment works, Rye Meads and Deephams which together comprise 99.5% of the volume. The location of these works is given on the map opposite and their importance is shown in the table below. There are three HMIP authorised discharges from prescribed processes to the rivers of the Lower Lee catchment. These are Powergen PLC, Hoddesdon; Delta Enfield Metals, Enfield; and North London Waste Authority, Edmonton.

TABLE 4: SEWAGE TREATMENT WORKS' DISCHARGES

	Discharge m^3/day		% of River Lee flow (approximately)		
	Maximum Consent	Usual dry weather	Dry weather	Average	Peak Flows
Rye Meads	330 000 m^3/d	110 000 m^3/d	65-70	25-40	8-15
Deephams	600 000 m^3/d	200 000 m^3/d	75+	40-50	15-20

Future Situation: The NRA have identified the need to make changes to the consent and the treatment plant at Rye Meads sewage treatment works in order to meet the needs of the EC Fish Directive in the River Lee and to provide better protection for the aquatic environment. The proposed changes have been included in the TWUL Asset Management Plan (AMP2) recently approved by the Office of Water Services (OFWAT). ***Discussions between the NRA and TWUL are in progress to agree priorities for improvements at sewage treatment works on a Region-wide basis. Issues 4.4 and 4.5.***





KEY

	Watercourse	●	Sewage Treatment Works Location	●	HMIP Consents		
	Catchment Boundary	1. Rye Meads 2. Deephams		A B C	PowerGen Delta Metals, Enfield North London Waste Authority		
	Urban area					Scale (approx) 0 5 km	

Introduction: How land is used greatly influences the water environment. Urban development includes activities such as the construction of houses, shops, industrial units, roads, railways and airports. This type of development can have a detrimental impact on: the quality and quantity of surface water run-off; the diversity and range of river landscapes and habitats; and, the quality and availability of water resources. Local authorities and government departments develop policy and make decisions on the appropriateness of urban development. Rural land use in the area tends to be recreational or agricultural. The influence of the European Common Agricultural Policy on agricultural land use is significant. Surface water run-off in these areas tends to follow a natural course but can still be influenced chemically. Good land management is vital for maintaining and improving the water environment.

URBAN DEVELOPMENT

Current Situation: The catchment is characterized by extensive urban development both within the Greater London area and northwards along the Lee valley corridor.

This pattern of development reflects the growth of London over the past 100 or more years. Older development during the 19th and early 20th centuries is concentrated closer to central London and around centres like Enfield, Tottenham, Waltham Abbey and Hoddesdon, which were outlying towns at that time.

With improvements to the transport system, roads, railways and the London Underground in particular, the suburban expansion of London accelerated during the inter-war years and many of the previously outlying towns and villages merged into one large conurbation.

This suburban sprawl was the major factor leading to the creation of Metropolitan Green Belt policy. As the map opposite shows, the vast majority of land which is not already urban, is designated Green Belt. Recent development has therefore been largely constrained within, or adjacent to, existing urban areas.

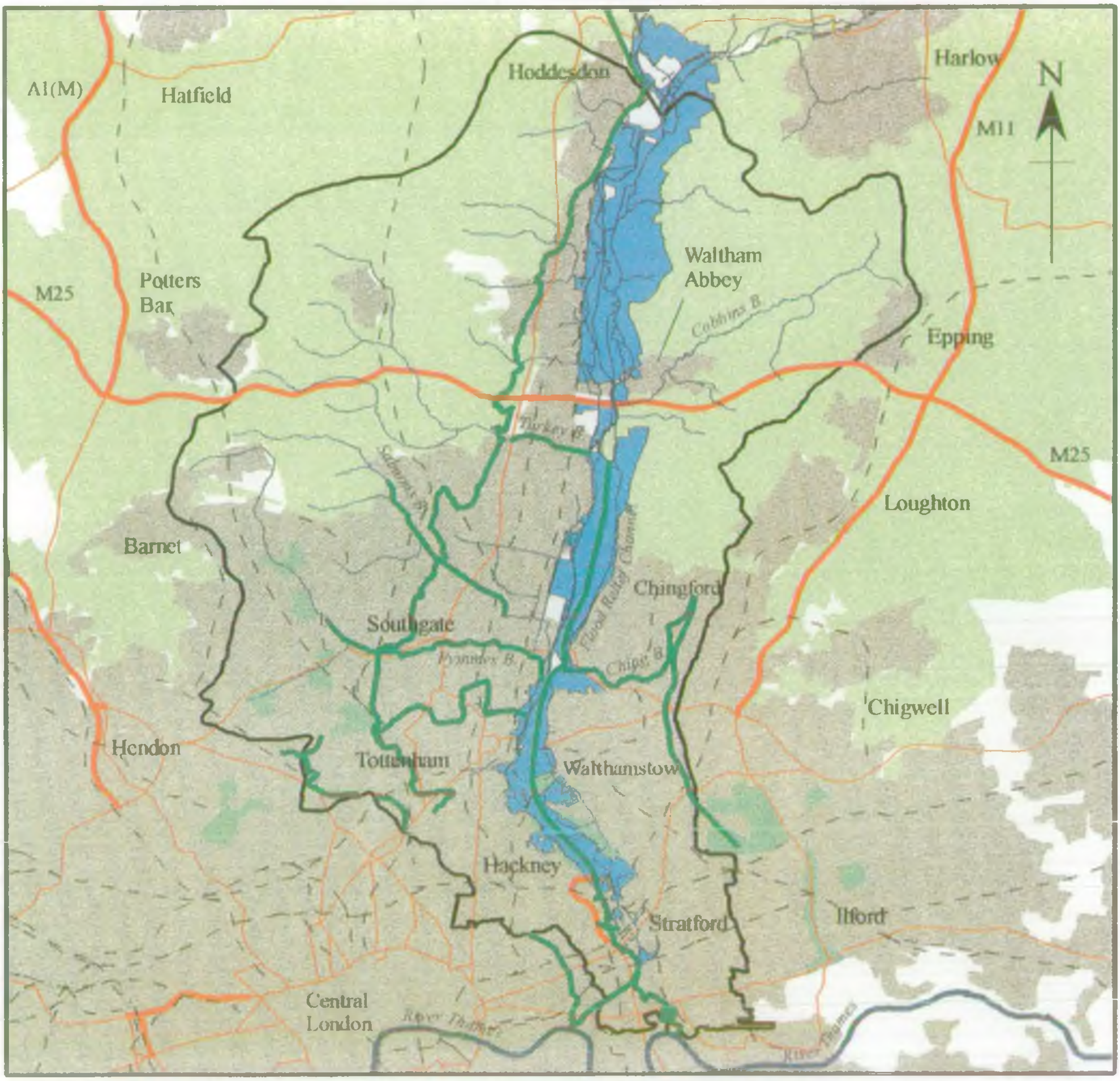
Some of the older Victorian and Edwardian industrial, commercial and residential areas in the Lower Lee valley, such as Stratford and Docklands, have become run down and often derelict. Additionally some areas of high density post-war housing estates are in a poor state of repair. Many of these areas are likely to be redeveloped at some stage in the future. There has already been large scale redevelopment of Docklands, including Canary Wharf, led by the London Docklands Development Corporation.

Future situation: With the exception of some releases of Green Belt land, such as the 22 hectares for just under 1000 new houses west of Cheshunt, future development is likely to be infilling and redevelopment of existing urban areas.

This process is currently being prompted by a number of regeneration initiatives. The largest of these is the European "Objective 2" status of parts of the Lee valley south of the M25. This will make £50 m available over three years for projects that include the provision of both tourism facilities and hi-tech premises, and also retraining schemes for the unemployed. A similar sum may be allocated for further redevelopment and infrastructure improvement beyond this period.

MAP 15

URBAN DEVELOPMENT CURRENT SITUATION



KEY

	Watercourse		Motorway		Green Chains		
	Catchment Boundary		Primary 'A' Road		Lee Valley Regional Park		
	Urban area		Railway		Major Public Open Space	Scale (approx) 0 – 5 km	
			Metropolitan Green Belt			FILE REF : LLCC38.PR8 REV.1.0 04/03/95 (URBAN DEVELOPMENT : CURRENT)	

URBAN DEVELOPMENT (Continued)

A bid has also been made for European LIFE funds. This applies to the southern most part of the catchment and is based on the concept of sustainable tourist development in East London. This bid is still being considered at this stage.

There are two City Challenge schemes currently in operation. These are at Stratford and Dalston. The southern part of the catchment is within the Thames Gateway (previously known as the East Thames corridor), a central government strategy to boost the profile and economy of east London, south Essex and north Kent.

The London Borough of Waltham Forest has recently secured funding through the Single Regeneration Budget (SRB) for the Leyton area. This is a fund made available to improve the local environment and the quality of social and economic life by encouraging local partners to plan a strategic approach to needs and priorities of the area.

Transport development is the key to many of the regeneration projects. These include the following rail projects:

Jubilee Line Extension to Stratford
East London Line extension to Dalston
Channel Tunnel Rail Link - including a possible International station at Stratford.
Hackney to Chelsea Line
Crossrail (linking Paddington to Liverpool Street stations)
and the following road projects:

Hackney - M11 link road
M25 widening
A10 widening north of the M25
possible east London river crossing
Lower Lee Crossing and Limehouse Tunnel (already built).

There are also three Ministry of Defence sites in the Waltham Abbey area which are subject to redevelopment pressures. These sites form large parcels of land and could be redeveloped in the medium term. They could be expected to be mixed developments of housing, industrial/business use, tourism/heritage facilities and some areas of non development for nature conservation purposes. ***It is critical that all these areas of opportunity contrbute to the overall improvement in the social, economic and environmental improvement of the catchment. Issue 4.13.***

RURAL DEVELOPMENT

Current situation: By contrast, the north of the catchment is generally rural. The land use in this area is split between grassland for livestock and cropping, particularly cereals. There is also a significant amount of woodland in the upper parts of the catchment including Epping Forest and Wormley Wood.

MAP 16

URBAN DEVELOPMENT FUTURE SITUATION

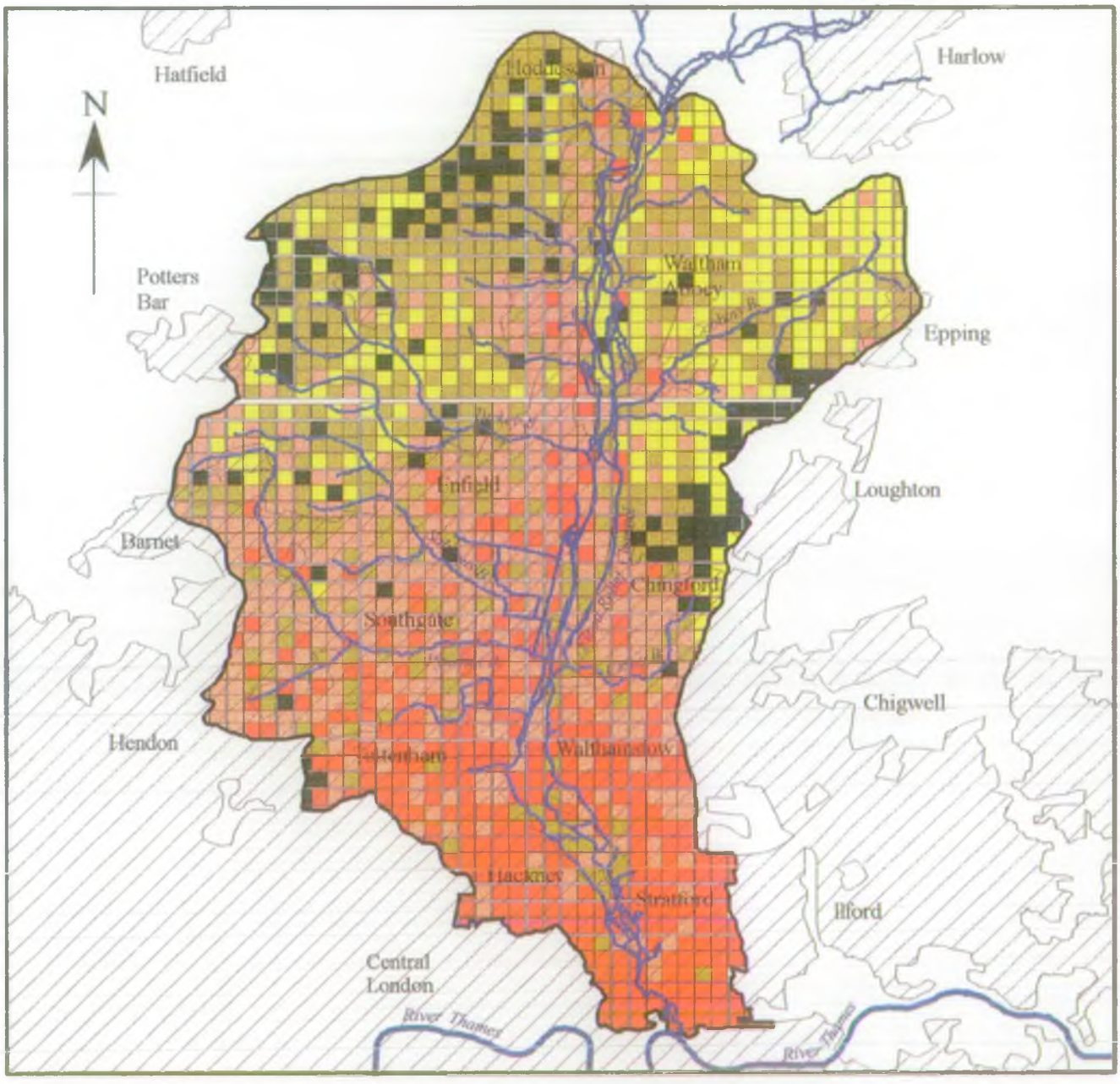
KEY

	Watercourse		Thames Gateway		Potential Development Sites	✱	Life '94 Bid
	Catchment Boundary		Lee Valley Objective 2 Area	1 Hoddesdon Industrial Area 2 West Cheshunt 3 RARDE Site 4 Land at A10 / M25 5 Royal Ordnance Site 6 Rammey Marsh 7 Enfield Island Site 8 Highlands Hospital 9 Temple Mills		
	Urban area		City Challenge				
	Major Public Open Space		Possible Road Proposals			Scale (approx) 0 5 km	
	Metropolitan Green Belt		Possible Rail Proposals				

RURAL DEVELOPMENT (Continued)

Historically, horticultural crops were intensively grown along the Lee valley, but their significance has dwindled and now only occupies around 5% of the cropped area. Recent changes to the Common Agricultural Policy (CAP) have led to the introduction of 'set-aside' for all but the smallest of farms. 'Set-aside' means that 15% of land used for growing cereals, oilseeds and protein crops, must be taken out of production. This has freed up significant amounts of land for other uses including the possibility of ecological areas.

Future Situation: The Non Rotational 'Set-Aside' Scheme has just been introduced. This allows the area to be 'set-aside' to increase to 18% and the Habitat Creation Scheme allows the period of 'set-aside' to be extended to 20 years. This should allow more valuable ecological habitats to be created and could be used to create buffer zones around the remaining intensively farmed areas possibly helping to reduce the amounts of pesticide and fertiliser residues reaching rivers.



KEY

Watercourse	Dominant Land Cover					
Catchment Boundary	Deciduous Woodland Arable Land Grassland Suburban Areas Urban Areas					
Urban area						
					Scale (approx) 0 5 km	
	Based on ITE Land Cover Data					

2.14 MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

Introduction: Mineral extraction has the potential to alter the quality and quantity of flow in rivers or aquifers. Having extracted the mineral deposits, sites are frequently used for solid waste disposal. A valid planning permission is required for disposal of waste; this contains conditions which control how the site is restored and monitored preventing closed sites from causing future environmental damage. Sites restored as open water bodies have the potential to be used for recreation and conservation areas.

Current Situation: Extensive deposits of sand and gravel on the floodplain of the River Lee have been extracted in the upper parts of the catchment, with former workings stretching almost continuously from Amwell Quarry on the northern catchment boundary down to Waltham Cross. Most of these have been restored as water features either for nature conservation or recreation, although former workings at Dobbs Weir are proposed to be restored to a golf course.

Existing extraction sites include several near Hoddesdon, a site at Waltham Cross, which will be restored to amenity grassland and a lake, and a site at Rye Meads where worked out areas have been restored to lakes and agricultural land. At Rye House there is also a rail served aggregates depot, an ancillary asphalt plant and permission exists for a 'Ready-Mix' concrete plant. There is a new permission at Cheshunt Park Farm which has yet to be worked. In the floodplain nearer London mineral extraction has been more limited with other development on the land effectively sterilising a number of reserves. The Lee Valley Park Plan 1986 does, however, make provision for further sand and gravel extraction within the park, subject to restoration conditions.

Solid waste disposal is undertaken at a number of sites including Hoddesdon, Cheshunt and Nazeing. The solid waste incineration plant at Edmonton has by far the largest capacity of the 30 existing household waste incinerators in the UK, with a design capacity of 400,000 tonnes/year. Considerable quantities of waste are also exported from London up through the catchment to sites located both in and beyond Hertfordshire. In line with this, there are a number of waste transfer sites within the catchment, such as those at Edmonton and Broxbourne. There are no sites within the catchment dealing with hazardous waste.

Future Situation: Given the relatively high water table along the floor of the Lee valley, further worked out pits here are most likely to be restored as wetlands and lakes for water based recreation or nature conservation. Sites on plateau areas are more likely to be restored for agriculture or woodland.

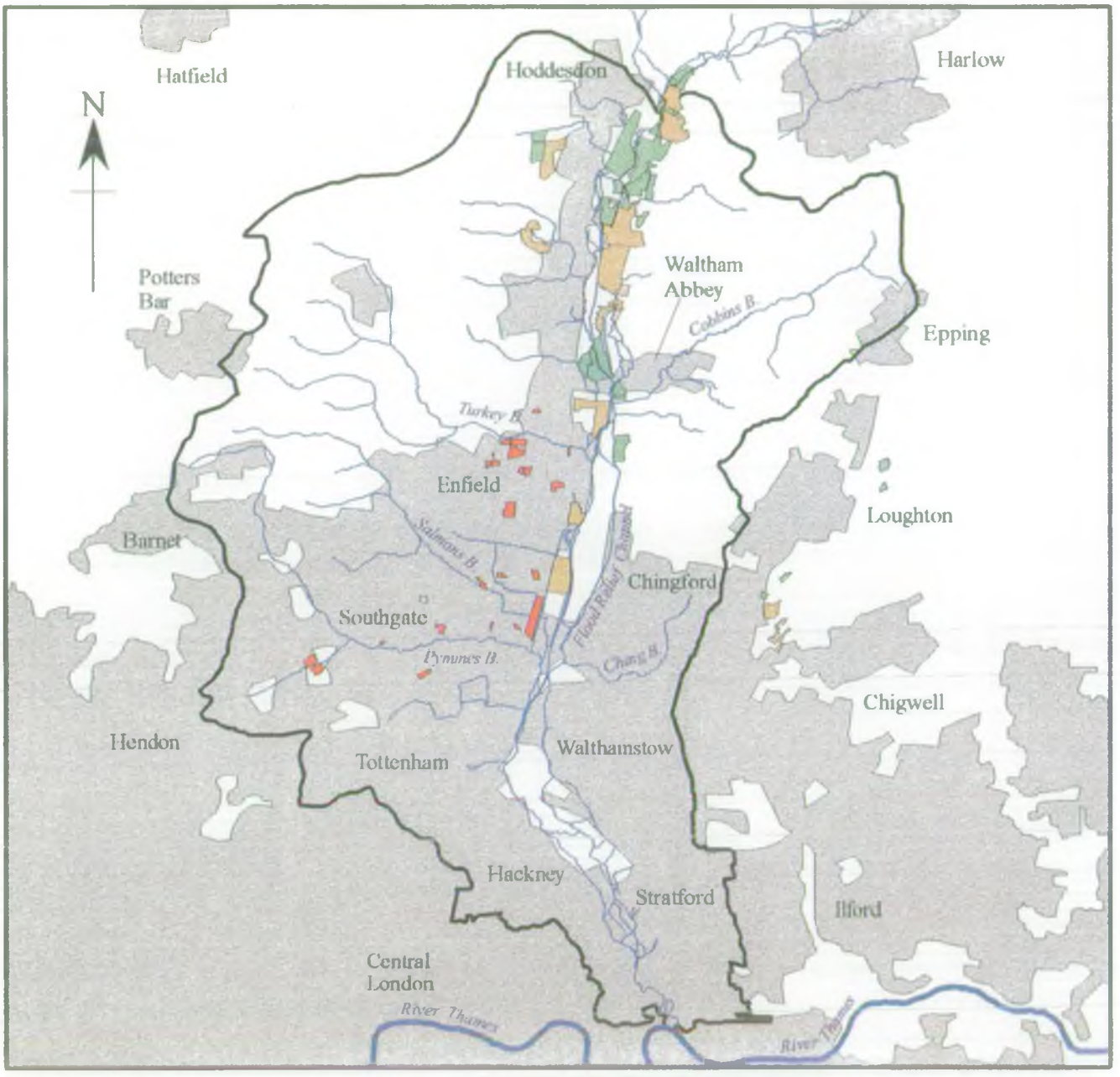
There is a high demand for sand and gravel in London and new extraction sites are being sought. One possible site currently being considered is Rammey Marsh where gravel bearing land, which is currently within the curtilage of Rammey Marsh Sewage Works, is likely to become surplus to requirements.

There is also an increasing need for rail depots and wharfs in this part of the south east to handle London's increasing long-distance bulk imports of aggregates by sea and rail.

A recent report by South East Regional Planning Conference, December 1993 (SERPLAN) entitled 'Waste Planning: Numerical Guidance', included a scenario for increased waste recycling and incineration. This strategy, which represents a 'high, but feasible, level of incineration', includes the doubling of capacity at the Edmonton incinerator to 800,000 tonnes a year.

MAP 18

MINERAL EXTRACTION AND SOLID WASTE DISPOSAL



KEY

	Watercourse	Mineral Extraction and Waste Disposal					
	Catchment Boundary		Mineral Extraction Only		Mineral Extraction and Waste Disposal		
	Urban area		Waste Disposal Only		Civic Amenity / Waste Transfer	Scale (approx) 0 5 km	
			Note : Information only available for Herts, Essex and L.B.Enfield				

2.15 FLOOD DEFENCE

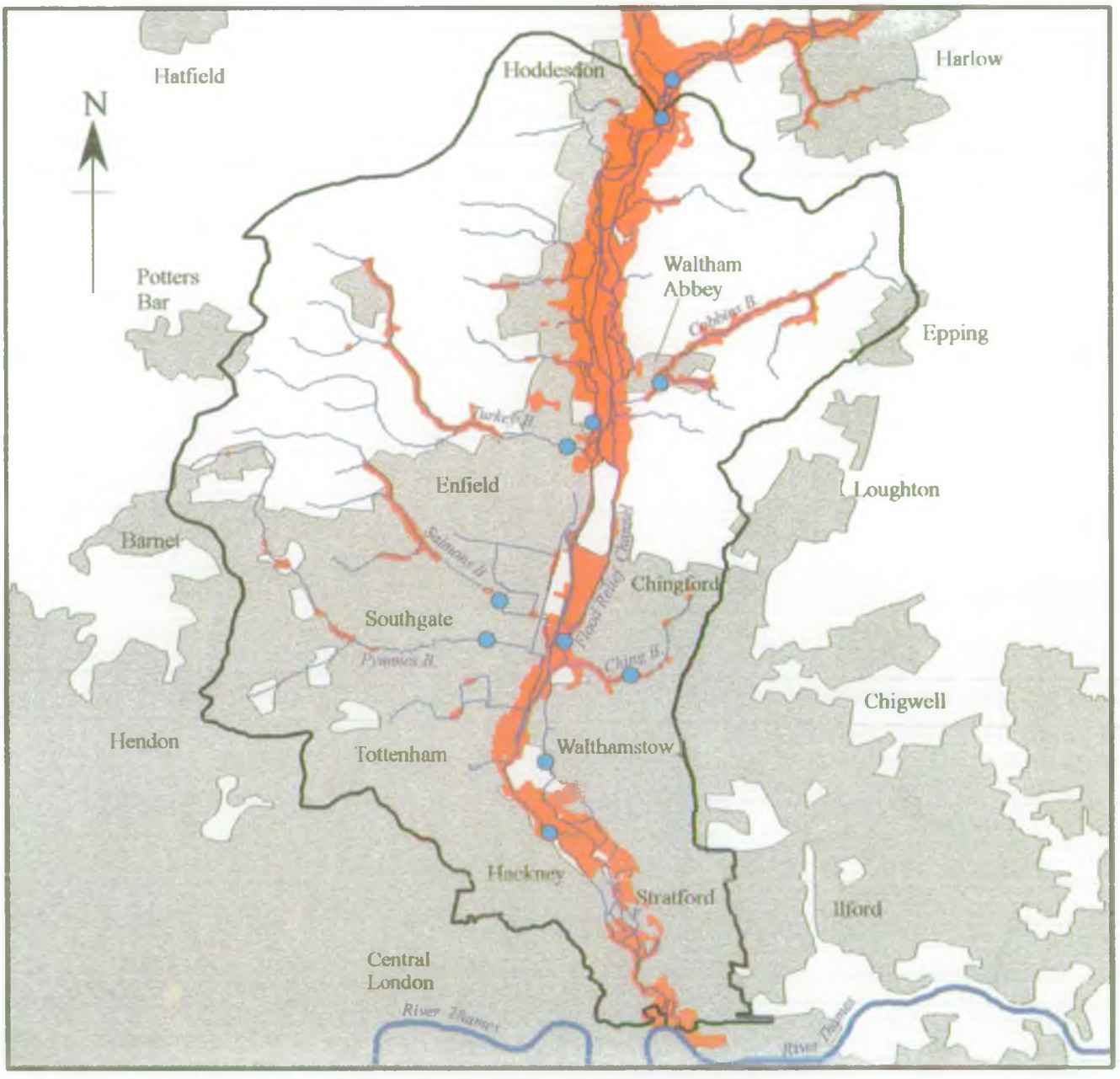
Introduction: Flood events, large or small, are a natural occurrence, and the threat of the rainfall conditions which cause them will always be present. Lowland watercourses of all sizes have natural areas of floodplain over which flood flows will spread once they exceed the capacity of their normal channel. This causes problems to human developments where they have been constructed within such areas of flood plain.

Current Situation: The Lower Lee catchment has had a history of major flood events on both the Lee valley and the tributaries flowing into it. The large upstream catchments of the Upper and Middle Lee feed the lower River Lee system, which is joined by flows from the lower River Lee's own tributaries. The combined flows are carried by the Lower Lee to the River Thames. Once the river has overtopped it's banks, the floodplain adjacent to the river will allow water to flood a large area. The map opposite clearly shows the extent of this. This problem can be exacerbated in the lower reaches if flooding coincides with high tides in the River Thames which can slow down the escape of River Lee floodwater into the estuary.

Flooding is usually a result of prolonged or very intense rainfall, rapid snowmelt, or a combination of both. Different types of watercourse will respond differently to the same rainfall conditions due to differences such as their individual catchment areas, channel capacities and overall uses to which land has been put. For example, an urbanised catchment with an associated high proportion of hard paved surface will have rivers whose levels respond relatively quickly to rainfall. The more open countryside of a rural catchment will often allow a higher degree of absorption into the ground of the same quantity of rain, and associated river levels will therefore respond more slowly. Whilst the locations that currently flood most frequently are on the tributaries, potential flooding on the larger rivers is by definition of a far greater scale.

The most recent major flood in this area was in March 1947; this accounts for most of the flooded area on the map opposite. This event was caused by a sharp rise in temperatures causing a rapid snowmelt combined with rainfall. The resultant flood affected the whole of the River Lee catchment. Within the Lower Lee, approximately 3,500 hectares (8,500 acres) were under water. This represents nearly 10% of the entire catchment area. The effects of this flood included the inundation of thousands of properties, causing a huge amount of damage, the true cost of which has never been fully calculated. Roads and communications were also disrupted, drinking water supplies were contaminated by floodwater, and pumps were put out of action at the Lea Bridge Waterworks. Over 1,000 tanker wagons were used to distribute around 14 million gallons of drinking water around north east London during the following days. Additionally, people in a much wider area had to boil their water because of the risk of contamination spreading further in the system. The 1947 flood was not an isolated incident. Severe floods also previously occurred in 1919 and several times in the 1800s.

Since this time a lot of work has been carried out by the NRA's predecessors, the Thames Water Authority and the Lee Conservancy Catchment Board, to reduce the risk of flooding. Major works were carried out, mainly during the 1970's, and involved building a Flood Relief Channel in section from Hackney to upstream of Hertford. This channel has a high capacity to convey flood flows to the River Thames. It has performed this function well, including following the very severe rainfall events of October 1987 and October 1993.



KEY

	Watercourse		Area Known to Have Flooded				
	Catchment Boundary		River level warning station				
	Urban area					Scale (approx) 0 5 km	

However, with changes in land use since its construction, there is a need to re-evaluate the standards of protection the channel offers to the surrounding land. (Issue 4.11). Many flood alleviation schemes have also been constructed on the tributaries. Whilst of lesser scale than the River Lee Flood Relief Channel, they are of equal importance to the communities for whom they reduce levels of more local flood risk. Thus the area known to have flooded in the past, as shown on the map on the previous page, is now less likely to flood.

It has to be appreciated that whatever size or standard a particular flood alleviation scheme is designed to flood conditions could arise that exceed the standard of protection provided. A balance, however, has to be struck between the level of risk accounted for and the financial cost of the required works.

Localised flooding may also happen when blockages occur in watercourses, including under bridges or in culverts. This risk is especially high where garden waste and other rubbish has been deposited on river banks, and can be a major problem in this highly urbanised catchment.

Flooding can also occur where surface water drains are unable to discharge into swollen watercourses, or further back in the surface water drainage system where the rain fallen simply exceeds their capacity. The condition of rivers is obviously not relevant in this last instance.

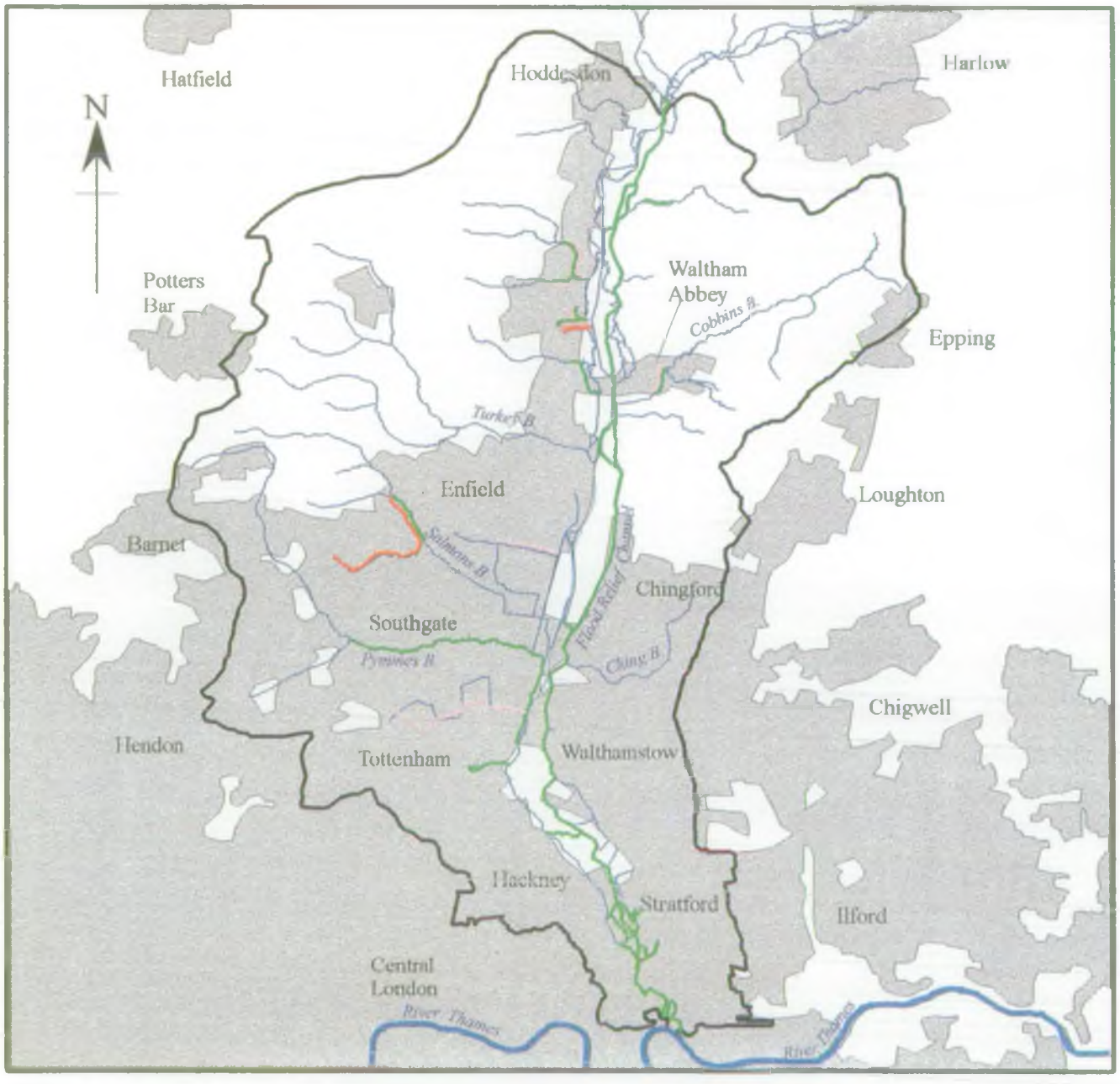
Maintenance

The NRA does not own watercourses (except in a few specific locations where flood defence structures have been constructed and their ownership retained).

Presumption in law is that, where a watercourse forms a boundary between adjacent landowners (riparian owners), such ownership is to the centre line of the watercourse. Fence lines at the top of watercourse banks, even if shown on property deeds, are not by themselves proof of actual boundary location.

Ultimate responsibility for maintenance rests with the riparian owner. The NRA's powers to carry out maintenance are permissive only, not mandatory, and can be used on those watercourses determined by the Ministry of Agriculture Fisheries and Food (MAFF) as "main river". The NRA uses these powers to carry out works to reduce flood risk, and exercises them according to available resources and priorities. Such works include vegetation control and dredging. Maintenance of banks is the responsibility of the riparian owner. ***In times of heavy rainfall operational priorities are to check river control structures and clear identified obstructions and debris where possible. Issue 4.15.*** Such activities when integrated with the Region's Flood Warning system as described below seek to minimise, as far as is possible, the impact of any flooding which does occur.

As described previously, the NRA and it's predecessors have constructed many flood alleviation schemes, including the River Lee Flood Relief Channel, and also several flood storage reservoirs, in this Lower Lee catchment. ***The proportion of maintenance expenditure thereby incurred on the many associated control structures such as weirs and sluices in this catchment is very high by comparison with other catchments. (Issue 4.11).***



KEY

	Watercourse		Channel Works				
	Catchment Boundary		Culverting				
	Urban area		Flood Storage			Scale (approx) 0 5 km	

Improvements

In addition to general watercourse maintenance work, the NRA has the right to exercise powers to provide effective protection for people and property from flooding by constructing and maintaining specific flood defences. Such defences are designed to deal with floods of a certain magnitude.

The likelihood of a flood of a given magnitude occurring is known as a return period. This is a statistical way of expressing the chance of a particular event happening during a time period, for example - once in 10 years, or once in 20 years, etc. Different land uses may require protection against different levels of flood.

It is important to note that funding for such schemes can only be expended within certain government guidelines. These include the requirement that the cost of any scheme is equalled by the value of the benefits to be gained. Whilst many schemes can be designed to be technically feasible they will not all meet these cost benefit criteria and some are therefore unable to proceed.

Flood Warning

As mentioned above, in some locations it may not always be possible to justify the construction of a full flood alleviation scheme. Also, any flood defence will ultimately be overwhelmed in a flood of large enough magnitude. It is therefore necessary to provide warnings of imminent flooding to those at risk so that they can take action to minimise damage.

The NRA uses permissive powers to provide a flood forecasting and warning service on all reaches of watercourses designated as "main river". This Flood Forecasting and Warning System takes account of current ground saturation, rainfall conditions, existing water levels and future weather predictions to assess the likelihood of flooding. The NRA maintains a network of automatic rainfall and river level monitors which can trigger alarms as rainfall increasing and river levels rise. Flood warnings can then be issued to the Police, Local Authorities (who can then exercise their Civil Defence responsibilities), Flood Wardens and other affected organisations as well as local NRA emergency staff in areas at particular risk.

Following a flood, information collected by the NRA can be used to assess the current levels of flood risk and to aid any future investigations that may be required.

Future Situation: The NRA will continue to provide its flood defence duty and investigate the feasibility of carrying out further flood defence works. Our revised guidelines for designating "main river" will be implemented. **This means that the current designations of "main river" can be reviewed. (Issue 4.11).**

The NRA will be carrying out surveys of land liable to flood, as required under s.105 of the Water Resources Act 1991 and DoE Circular 30/92. These should establish definitive up to date areas liable to flood. (Issue 4.11).

The purpose of this section is to compare the current status or condition of the catchment (where it is now) with overall objectives/standards/targets (where they have been developed) in respect of water quality, water resources and physical features.

Bold text in italics on a shaded background indicates a matter that may justify further action. These matters are brought together in Section 4.

3.1 WATER QUALITY

Introduction

A principal aim of the NRA Water Quality Strategy (see Appendix I) is to achieve a continuing overall improvement in the quality of rivers through the control of pollution. To achieve this aim, the NRA seeks to: maintain waters that are already of high quality; to improve waters of poorer quality; and, to ensure all waters are of an appropriate quality for their agreed uses.

Water quality improvements cost money and in many cases it is the public who pay the bill for these improvements, either directly or indirectly. It is important to relate the cost of any proposed improvements to the benefits in deciding on whether or not individual schemes should go ahead and in assigning priorities.

Surface Waters

Water Quality Objectives and General Quality Assessment

The NRA uses two principal schemes for the reporting and management of river water quality: the general quality assessment (GQA) scheme; and, the statutory water quality objectives (WQOs) scheme. These schemes have replaced the water quality classification system used previously by the NRA (the National Water Council (NWC) classification).

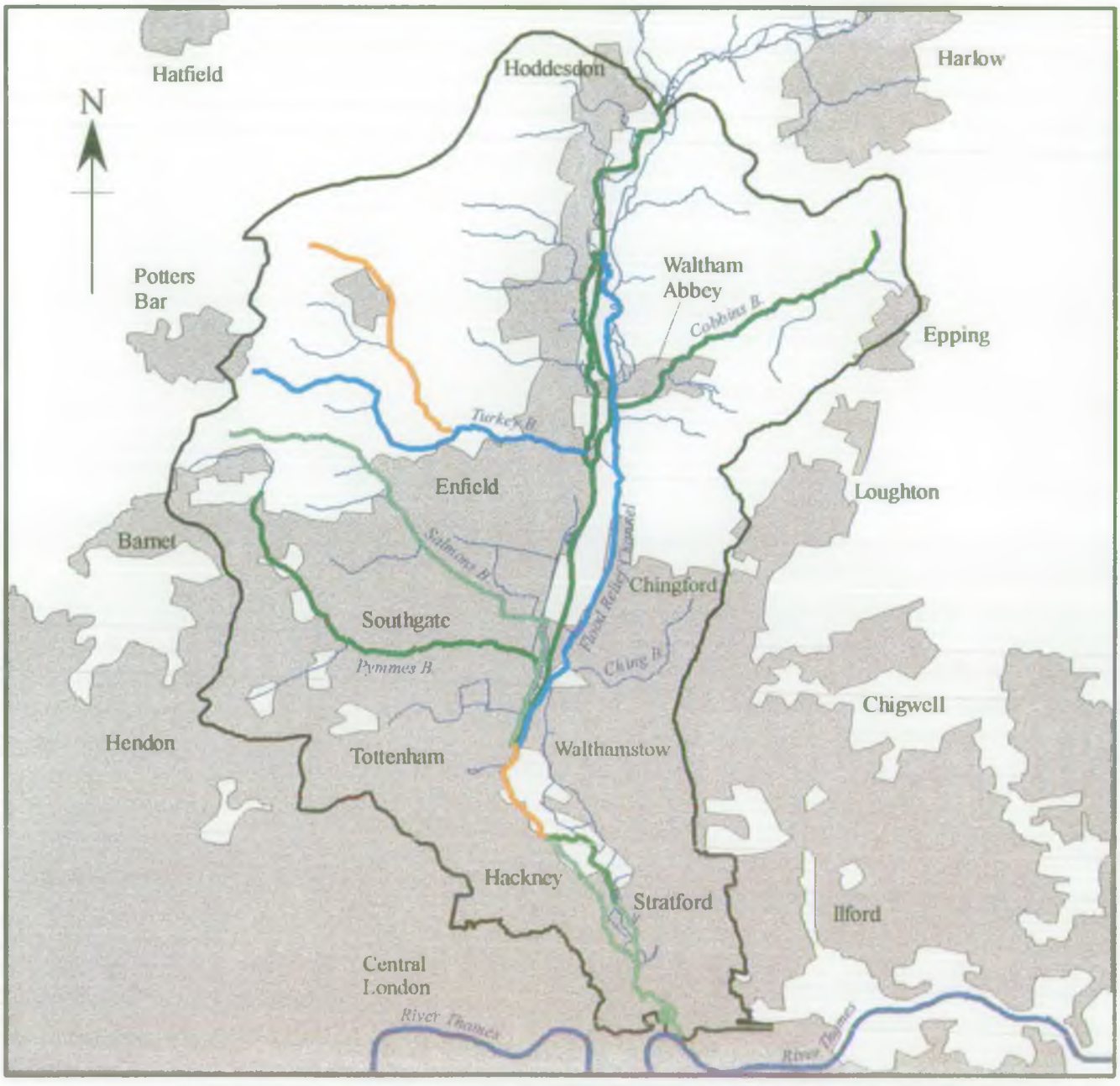
The GQA scheme is used to make periodic assessment of the quality of river water in order to monitor geographical and temporal trends. The scheme comprises four components - general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' upon the quality of river stretches. The general chemistry component of the GQA is in current use and comprises six tiered grades defined by standards for Dissolved Oxygen, Biochemical Oxygen Demand (BOD) and Total Ammonia. Details of these standards are given in Appendix III. The remaining three windows are still under development and will be applied when available.

The current GQA chemical quality of rivers in the Lower Lee catchment is given on the map opposite. This shows the rivers in this catchment to be predominantly of grade C and D (i.e. of fair quality), with two reaches of the River Lee downstream of Tottenham Locks to Lea Bridge Weir and the Cuffley Brook being of grade E (i.e. of poor quality).

The WQO scheme establishes clear quality targets to provide a commonly agreed planning framework for regulatory bodies and discharges alike. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses include: River Ecosystem; Special Ecosystem; Abstraction for Potable Supply; Agricultural/Industrial Abstraction; and Water Sports. The standards defining the five tiered River Ecosystem (RE) use classes, which address the chemical quality requirements of different types of aquatic ecosystems, were introduced by *The Surface Waters (River Ecosystem) (Classification) Regulations 1994*. Standards for further uses are still under development. A description of each of the RE classes is given in Table 5. Chemical standards have been derived for each of these classes and details of these standards are given in Appendix III.

MAP 21

WATER QUALITY: GENERAL QUALITY ASSESSMENT (GQA)



KEY

	Watercourse	GQA (1991 - 1993)					
	Catchment Boundary		Class B		Class D		
	Urban area		Class C		Class E	Scale (approx) 0 5 km	

Water Quality Objectives and General Quality Assessment (continued)

TABLE 5: DESCRIPTION OF THE RIVER ECOSYSTEM CLASSES

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

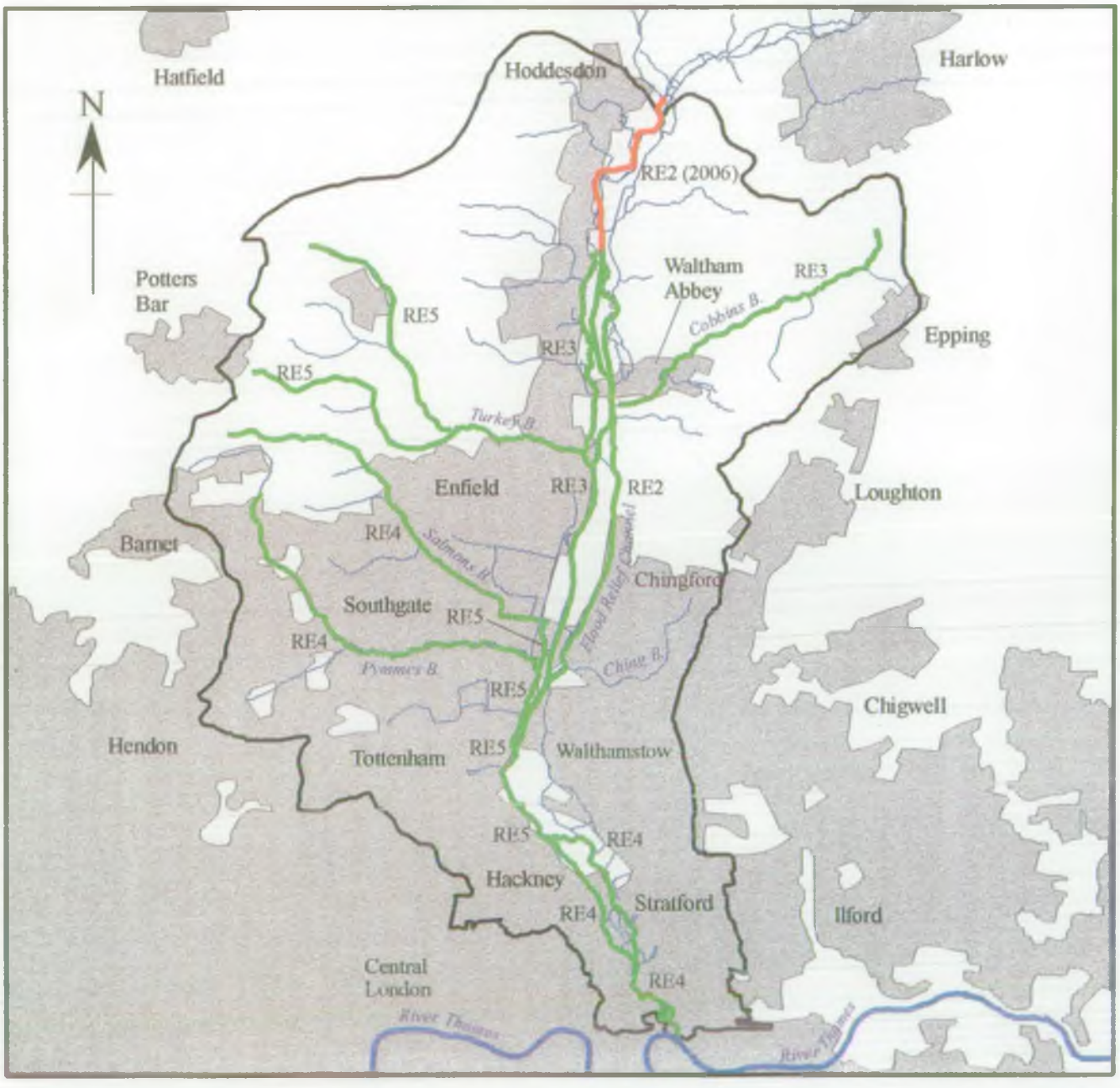
River Quality Objectives (RQOs) have been derived for the catchment by translating the old RQOs expressed as NWC classes into new RQOs expressed as RE classes in accordance with NRA national guidelines. These new RQOs will eventually consist of "short-term" and some "long-term" targets. The short-term targets indicate the quality that is achievable within a five - ten year horizon of planned investment and/or actions by dischargers and the NRA. These targets show both the target class (e.g. RE) and the date by which the target class will be achieved.

The long-term targets will indicate a quality that is achievable at some point beyond a 10 year horizon if future improvement actions can be funded. As a result, these long-term targets will show the target class but no target date. In order to set long term water quality objectives, it is important to determine the need for further water quality improvements within the catchment. A public view on the required river uses within the catchment on a reach by reach basis would be of value in this respect (e.g. Reach X of River Y which currently supports a cyprinid fishery should support a salmonoid fishery). ***One particular such target is that the River Lee should be of cyprinid fishery quality. A long term RQO of RE4 is therefore proposed. Issue 4.4***

A list of proposed short-term RQOs for watercourses in the Lower Lee catchment is given in Table 6. A short-term RQO of RE5 is proposed for the River Lee from Tottenham Lock to Springhill and from Springhill to Lea Bridge Weir. ***Observed fish kills in the River Lee below Tottenham linked with short term deteriorations in water quality are the subject of investigative work currently in progress. Issue 4.4.***

MAP 22

WATER QUALITY: COMPLIANCE WITH SHORT-TERM RQOs



KEY

	Watercourse	Compliance with Short-Term Provisional Water Quality Objectives 1991 - 1993					
	Catchment Boundary		Compliance				
	Urban area		Marginal Failure			Scale (approx) 0 5 km	
		RE4	Short Term RQO				

Water Quality Objectives and General Quality Assessment (continued)

Compliance with the proposed short term RQOs have been assessed using water quality data for the 3 year period 1991 to 1993. The results of this assessment are presented on the map opposite. All but the two reaches of the River Lee from the River Stort (Feildes Weir) to Tottenham Lock currently comply with their proposed short term river quality objectives. ***Compliance with the RE2 proposed for these two reaches is dependent on improvements at Rye Meads STW. These are included in TWUL's AMP2 (Asset Management Plan) and they should be completed by the year 2005. Issue 4.5.***

TABLE 6: WATER QUALITY OBJECTIVES

WATERCOURSE	REACH	RQO
Cobbins Brook	Source - Lee	RE3 (1994)
Cuffley Brook	Source - Turkey Brook	RE5 (1994)
Lee	Stort - Kings weir	RE2 (2006)
Lee	Kings Weir - TottenhamLock	RE2 (2006)
Lee	TottenhamLock - Springhill	RE5 (1994)
Lee	Springhill - Lea Bridge Weir	RE5 (1994)
Lee	Lea Bridge Weir - CarpentersRoad	RE4 (1994)
Lee	CarpentersRoad - Thames	RE4 (1994)
Lee (Navigation 'A')	Lea Bridge Weir - Bow Locks	RE4 (1994)
Lee (Navigation 'B')	Kings Weir - TottenhamLock	RE3 (1994)
Pymmes Brook	Green Brook - Salmons Brook	RE4 (1994)
Pymmes Brook (L. Channel)	Salmons Brook - Lee	RE5 (1994)
Pymmes Brook (R. Channel)	Salmons Brook - Lee	RE5 (1994)
Salmon Brook	Stag Hill - DeephamsSTW	RE4 (1994)
Salmon Brook	DeephamsSTW - Pymmes Brook	RE5 (1994)
Small River Lee	Source - Lee Navigation	RE3 (1994)
Turkey Brook	Source - Small River Lee	RE5 (1994)

3.1 WATER QUALITY

EC Directives

The EC Directive on the Quality of Fresh Waters Needing Protection or Improvement to Support Fish Life (78/659/EEC)

Three of the water quality reaches in this catchment have been designated under this directive as being capable of supporting cyprinid (i.e. coarse) fish populations. The remaining 14 reaches are not currently designated. All the designated reaches passed the water quality standards given in the directive for the 3 year period 1991 - 1993.

EC Urban Waste Water Treatment Directive (91/271/EEC): Sensitive Areas (Eutrophic)

The urban waste water treatment directive sets priorities for the treatment of sewage according to the size of the discharge and the sensitivity of the receiving waters. Receiving waters which may be subject to eutrophication problems are to be designated as sensitive areas (eutrophic) by the Government under the directive and phosphorus removal at sewage treatment works discharging into these receiving waters is to be considered. The River Lee has not been designated as a sensitive area (eutrophic). However, information on the eutrophic status of the River Lee is being collected for a review of designated areas to be carried out by the Government in 1997. Orthophosphate, phosphate and chlorophyll concentrations are monitored at sampling points on the River Lee and the Salmons Brook and a three year biological survey of macrophytes in the Lower Lee catchment is being undertaken.

The EC Directive on Pollution caused by certain Dangerous Substances discharged into the Aquatic Environment of the Community (76/464/EEC)

This directive is concerned with reducing pollution caused by substances known to be particularly hazardous to aquatic life. The substances which come under the control of the directive have been selected mainly on the basis of their toxicity, persistence and potential to accumulate in biological organisms. The substances include specific organic compounds such as pesticides and solvents, and specific metals.

Rye Meads sewage treatment works receives trade effluents containing pentachlorophenol (PCP), mercury and cadmium, and these substances are routinely monitored in the discharge from the works and also below the discharge at Dobbs Weir on the River Lee. The environmental quality standard for the receiving water was not exceeded in any of the samples taken during the three year period 1991 - 1993.

EC Directives (Continued)

The discharge consent from Deepham's sewage treatment works contains a limit on the concentration of cadmium in the discharge and the concentration of this metal is also determined in the Salmons Brook downstream of the discharge. The consent condition and the environmental quality standard for the receiving water was not exceeded in any of the samples taken during the three year period 1991 - 1993.

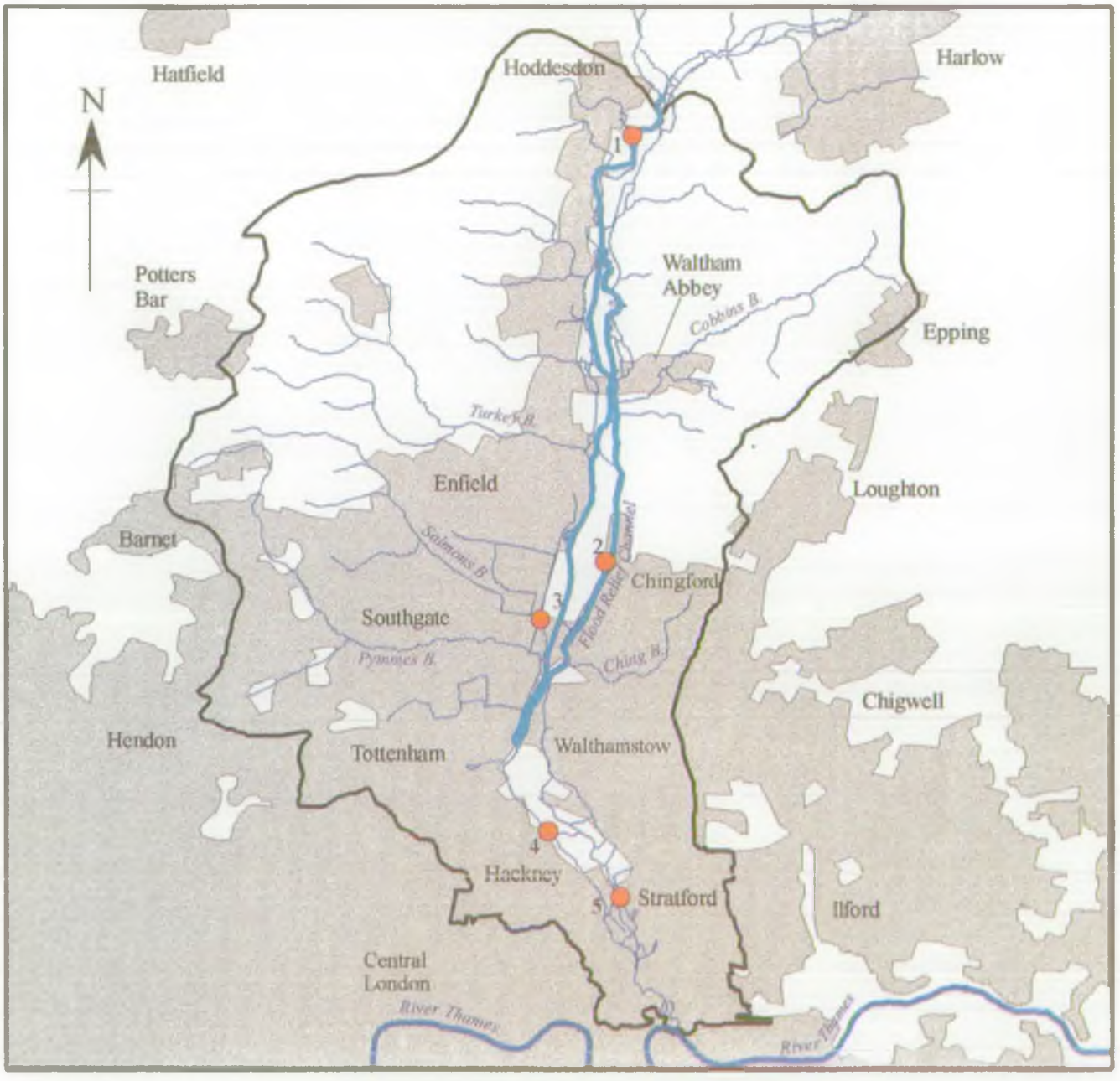
In addition to monitoring specific discharges, environmental monitoring is carried out in the River Lee for a number of other dangerous substances. Those substances most frequently detected are the solvents chloroform, trichloroethylene and tetrachloroethylene, the pesticide hexachlorocyclohexane (HCH) and cadmium. The environmental quality standards for most of these substances were not exceeded for the 3 year period 1991-1993. The only exceptions have been elevated concentrations of chloroform at Carpenters Road in 1991 and failures against the standard for HCH at Lea Bridge Weir and Carpenters Road. These failures are being investigated.

Biological River Quality Monitoring

The health of rivers is reflected in the variety and abundance of animal and plant life they support. The NRA routinely monitors the macroinvertebrate life in rivers, streams and canals. Aquatic macroinvertebrates are small, relatively immobile animals that are continually exposed to changes in water quality. Samples are routinely collected at sites which represent the water quality reaches sampled chemically and additional sites to provide further spatial coverage within the area. Biological monitoring provides a useful measurement of water quality since results take into account the effect of intermittent pollution which may remain undetected by standard chemical methods. Biologists also examine the effects of significant pollution incidents and assist in the detection of sources of pollution.

The biological quality of a site is shown by the number of different macroinvertebrate taxa present and by their individual susceptibility to pollution. This is measured by using the Biological Monitoring Working Party (BMWP) score system. BMWP scores above 100 generally indicate good diversity, whilst scores below 20 occur at the most polluted sites. The most natural rivers and streams in this area frequently achieve BMWP scores in excess of 150. It can be difficult to distinguish water quality limitations from the effects of artificial physical conditions and poor habitat provision which occur widely in urban areas. To overcome this, the Average Score Per Taxa (ASPT) is a particularly useful index because it measures the balance between pollution-tolerant and pollution-sensitive taxa. ASPTs below 3.00 are found at the most polluted sites, whilst values nearer 5.0 occur if water quality is not a limiting factor.

WATER QUALITY: EC DIRECTIVES



KEY

	Watercourse	Water Quality - EC Directives					
	Catchment Boundary		EC Fisheries Directive Cyprinid Water		EC Dangerous Substance Monitoring Point		
	Urban area			1. Dobbs Weir 2. Lee Valley Road 3. Salmons Brook 4. Lea Bridge Weir 5. Carpenters Road		Scale (approx) 0 5 km	

Biological River Quality Monitoring (Continued)

Current Biological Status

The average BMWP results obtained at sites during 1991-94 are represented on the map opposite. Appendix III provides a table summarising the current and historical BMWP and ASPT scores obtained at sites.

The biological quality of watercourses in this catchment varies greatly. The wide range of aquatic habitats found in the catchment produces corresponding differences in biological potential. However, water quality influences such as urban run-off and large sewage treatment works discharges are usually the cause of poor biological river quality (shown by BMWP scores below 50) in this area.

Sections of good or very good biological quality can be found throughout most of the River Lee below Feildes Weir downstream to the river's confluence with the Pymmes Brook. Biological quality is also generally good in many of the associated channels found in this section of the Lee valley such as the Small River Lee, New Cut, Cornmill Stream and Old River Lee.

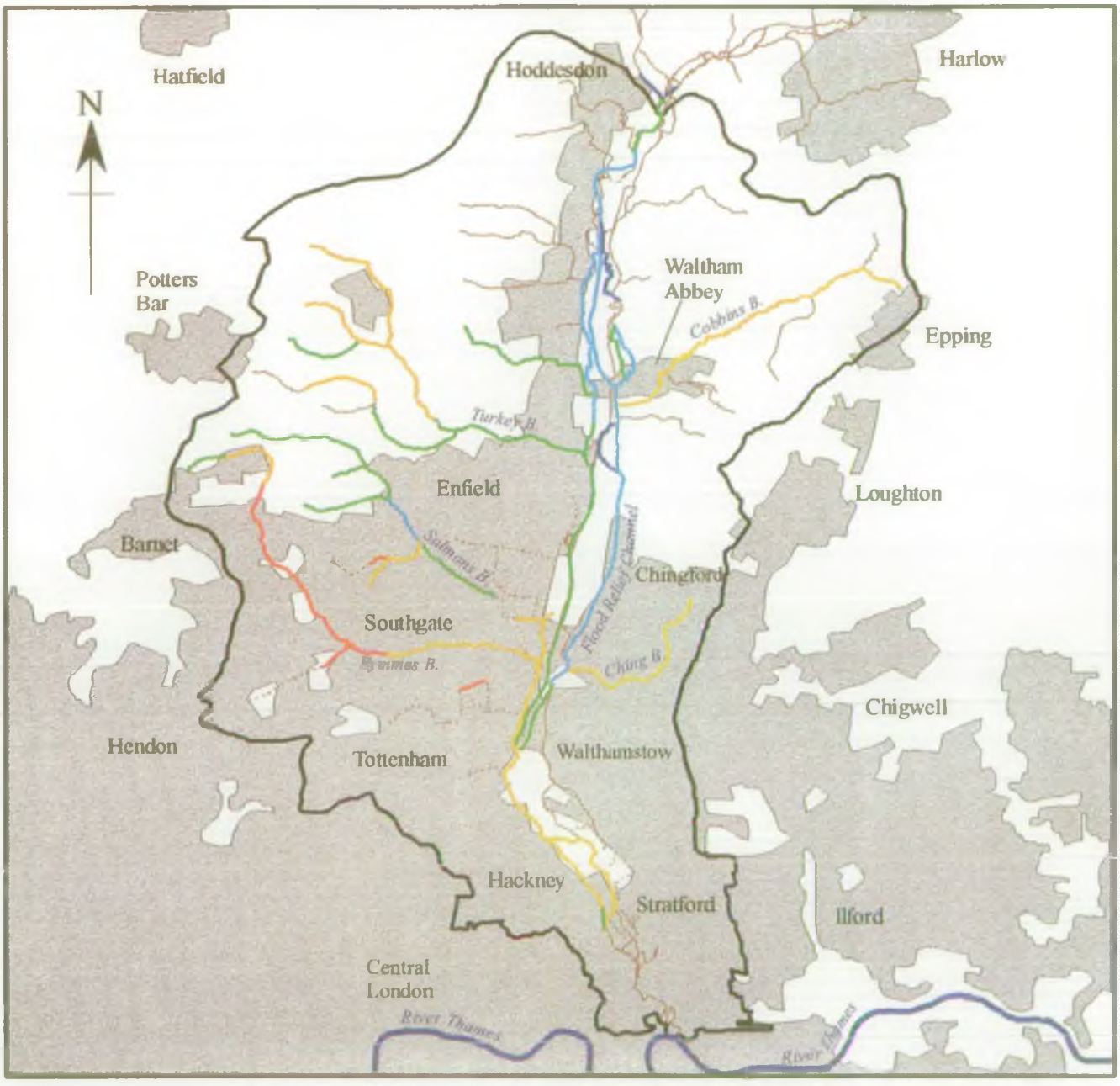
BMWP scores are reduced in parts of the Lee Navigation and the Lee Flood Relief Channel primarily as a result of limited habitat, rather than water quality. The most diverse macroinvertebrate communities are found where there is relatively clean, faster flowing water within a more natural channel, as with sections of the River Lee below Kings Weir and Enfield Weir. Pollution-sensitive mayflies and caddisflies are characteristic of these and other relatively clean sites.

Below the confluence of the Pymmes Brook with the River Lee there is a marked deterioration in biological quality attributable to water quality limitations. Quality is poor in both the Lee Navigation and River Lee below this point, although some recovery is apparent in the lowest section of navigation located above the tidal limit at Old Ford Locks. Below this point, no significant biological data is available for Bow Creek. ***There is a need to obtain baseline information in order to monitor water quality changes in this important transitional zone between the freshwater River Lee and Tidal River Thames. Issue 4.13.***

The impact of urbanisation upon water and biological quality is most acute in the tributary streams and brooks. The Pymmes Brook and Moselle Brook drain extensive urban areas and so receive large volumes of urban run-off. ***Diffuse pollution sources such as domestic sewer misconnections or minor pollution incidents are widespread. Issues 4.4 and 4.16.*** As a result, the fauna of these heavily urbanised streams is particularly poor and restricted to pollution-tolerant macroinvertebrates such as snails, leeches, and worms. Streams draining more rural or green belt surroundings such as the Turkey Brook, Theobalds Brook and upper parts of the Salmons Brook generally have a fair or locally good biological quality indicative of relatively clean headwaters. However, local agricultural or urban influences can have marked impacts within these small tributary catchments. ***No recent biological information exists for several tributaries such as the Spital Brook, Turnford Brook and Nazeing Brook. Issue 4.16.***

MAP 24

WATER QUALITY: BIOLOGICAL STATUS



KEY

~	Catchment Boundary	Mean BMWP Score (1991 - 94)					
▭	Urban area	~	A Very Good (>150)	~	D Poor (21-50)		
~	Watercourse	~	B Good (101 - 150)	~	E Very Poor (0 - 20)	Scale (approx) 0 5 km	
~	Culvert	~	C Fair (51 - 100)				

Pollution Incidents

TABLE 7: POLLUTION INCIDENTS IN THE LOWER LEE

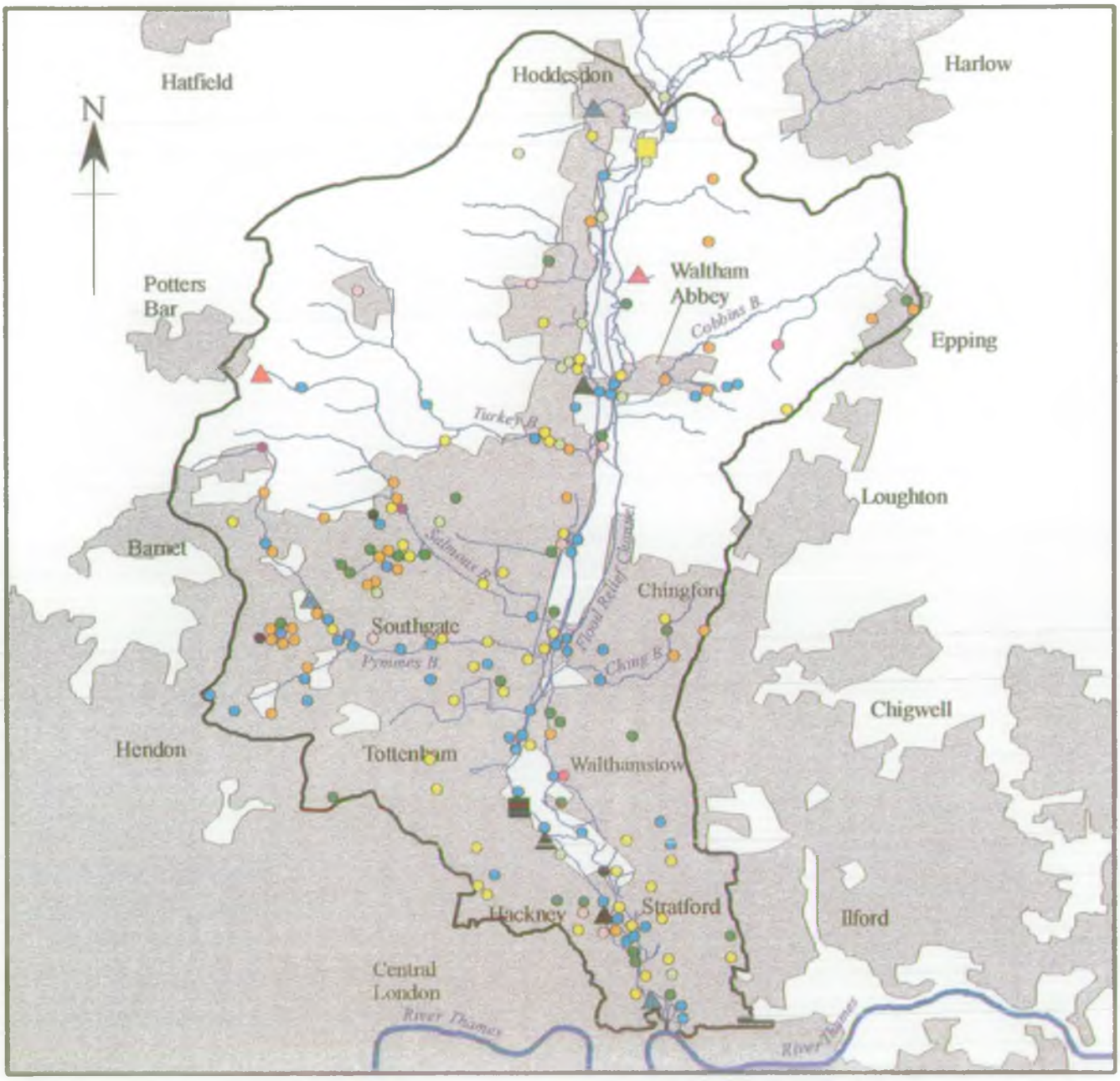
	91/92	92/93	93/94
By Incident Severity			
Major	2	1	2
Significant	9	11	7
Minor	188	163	205
By Incident Type			
Oil	64	68	66
Chemical	23	18	29
Sewage	45	32	37
Natural	14	15	12
Agricultural	5	4	3
General	31	27	48
Urban Run-off	3	7	5
Not Known	14	4	14
By Evidence Found			
Pollution: Yes	114	97	105
Pollution: No	85	78	109
Total Reported	199	175	214

The range of pollution incidents in the Lower Lee is typical for a generally urbanised catchment. Oil, sewage and chemical incidents respectively predominate, but it should be understood that the majority of these incidents are of a very minor nature, even where pollution is confirmed. As would be expected with the nature of the catchment, agricultural type incidents are low in number. The total number of incidents reported for the past three periods ending August 1994, were 199, 175 and 214 for each year respectively. Examination of the numbers of specific types of incidents does not show any particular trend.

The NRA invests a considerable effort in pollution prevention activities, pro-actively trying to prevent problems occurring. This occurs both by advice given to developers when building a new development and by education direct to industry, schools and the general public.

MAP 25

WATER QUALITY: POLLUTION INCIDENTS (1993/4)



KEY

	Watercourse	INCIDENT CLASS		INCIDENT TYPE			
	Catchment Boundary	□	Major (Category 1)	●	Oil	●	Agricultural
	Urban area	△	Significant (Category 2)	●	Chemical	●	General
Scale (approx) 0 — 5 km		○	Minor (Category 3)	●	Sewage	●	Urban Runoff
				●	Natural	●	Not Known

Bacteriological Status

Bacteria naturally occur in rivers. Faecal coliform bacteria are used as indicators of faecal pollution in all types of waters. The presence of such bacteria indicates the potential presence of pathogens. The faecal contamination may arise from point sources such as sewage treatment works or diffuse sources such as agricultural land, urban run-off or misconnections of sewage into surface water drains. Faecal bacteria can survive in water for varying lengths of time but do not multiply.

The NRA sampled the River Lee Navigation quarterly in 1991. The geometric mean of these 'snapshot' samples are shown on the map opposite. The figures are given in Appendix III. Overall the levels in the Lee Navigation were low (below 1,000 cells/100 ml). This is regarded as typical background levels. Two sites showed elevated levels of faecal coliforms, the first was at Dobbs Weir (2,500 cells/100 ml). This level (1,000-10,000 cells/100 ml) is typical for water containing treated sewage effluent from Rye Meads Sewage Treatment Works.

Of greater concern are the reaches downstream of Pymmes Brook to Lea Bridge Weir where faecal coliform levels were in excess of 10,000 cells/100 ml, equivalent to a watercourse carrying poorly treated sewage effluent and/or raw sewage. This area coincides with inputs from the Pymmes Brook, Salmons Brook, Moselle Brook and Deephams Sewage Treatment Works. These levels warranted further investigation to build up a picture of the levels in the tributary rivers.

In 1994 the NRA undertook sampling on the Pymmes Brook and tributaries, and the Moselle, Stonebridge and Dagenham Brooks. The geometric means of the levels of faecal coliforms in the water ranged between 14,000 and 270,000 cells/100 ml. The results of this work are also shown on the map opposite and in Appendix III, but generally represent high levels of faecal coliforms present.

On occasions, all these tributary rivers showed extremely high levels of faecal coliforms, in excess of 1,000,000 cells/100 ml, indicating areas of gross faecal contamination. The Local Authority Environmental Health Officers are responsible for advising the public on the health implications of this data.

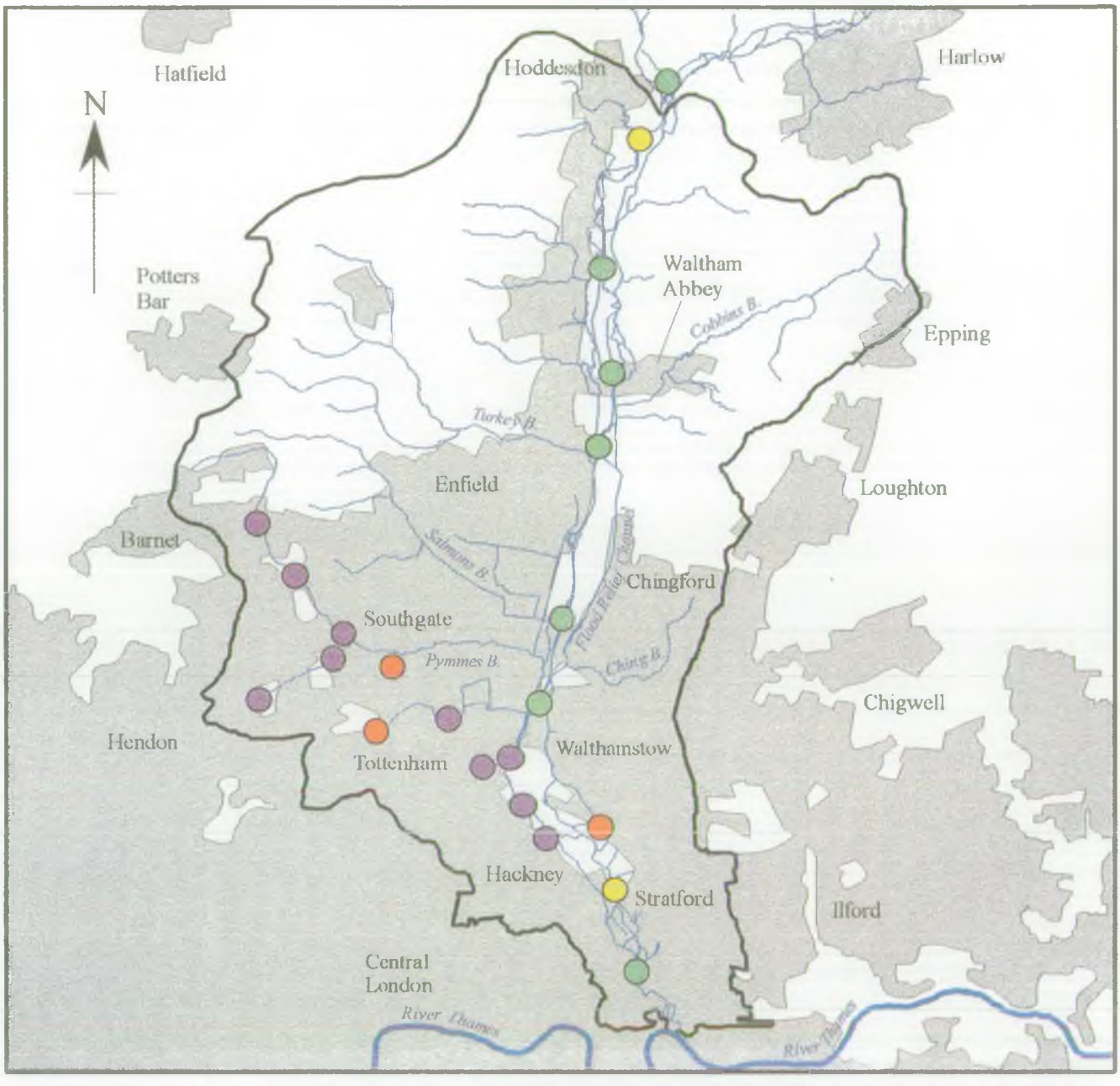
Monitoring undertaken by the NRA has identified areas where there are elevated levels of faecal coliforms in watercourses which contribute to the bacteria loading of the River Lee Navigation. The most likely causes of this faecal contamination are misconnections of foul water and sewage into surface water drains, leaking sewers and overflows from combined sewers. Once the worst problem areas have been identified, more concerted efforts can be made to remedy these diffuse pollution sources. Issues 4.4 and 4.16.

Groundwater

The underlying geology of the catchment (see Section 2.4) consists of river gravels overlying London Clay which in turn overlies the Chalk aquifer. Water can be found in two of these layers. The first, in the river gravels, 'perched groundwater', is a minor water resource which is isolated from the main body of groundwater by the London Clay. However, it is in continuity with surface water in some places and therefore if this water becomes contaminated, it could potentially leach into the surface water system and pollute rivers and streams.

MAP 26

WATER QUALITY: BACTERIOLOGICAL STATUS



KEY

	Watercourse	Faecal coliforms/100ml (Geometric mean) (1991 and 1994 surveys)					
	Catchment Boundary		Low (<1000)		High (10,000 - 100,000)		
	Urban area		Moderate (1000 - 10,000)		Very High (>100,000)	Scale (approx) 0 5 km	
						FILE REF : LLCCSA.PRE REV 2.0 28/2/95 (WATER QUALITY BACTERIA LEVELS)	

Groundwater (continued)

The second groundwater resource is in the Chalk aquifer which is where the main body of groundwater is to be found. On the whole it is protected from pollution because of the layer of impermeable London Clay that lies above it. However, there have been cases of pollution occurring to this resource. This could be through deep excavation works or through contaminants getting into boreholes. Pollution of the Chalk aquifer, which is a source of drinking water, must be avoided as it is expensive and potentially impossible to clean up.

It is thought that water travels along fissures from the Cuffley swallow holes, affecting groundwater quality in other parts of the catchment. There is no evidence of a direct link. A proven source of concern for groundwater abstracted in this catchment involves swallow-holes at Water End (near Welham Green). Although these swallow-holes fall outside the Lower Lee catchment, tracer tests have shown that there is a direct and rapid link, via fissures, between Water End and the northern part of the Lower Lee catchment. Public supply (groundwater) abstractions in the Lower Lee have been affected by contaminated groundwater, which the NRA intends to address through pollution prevention initiatives in the adjoining catchment.

Mineral extraction and associated land filling has occurred along the Lee valley. Waste disposal sites that have taken putrescible waste may generate leachate which could pose a risk to groundwater, especially older ones which may not have such advanced containment facilities.

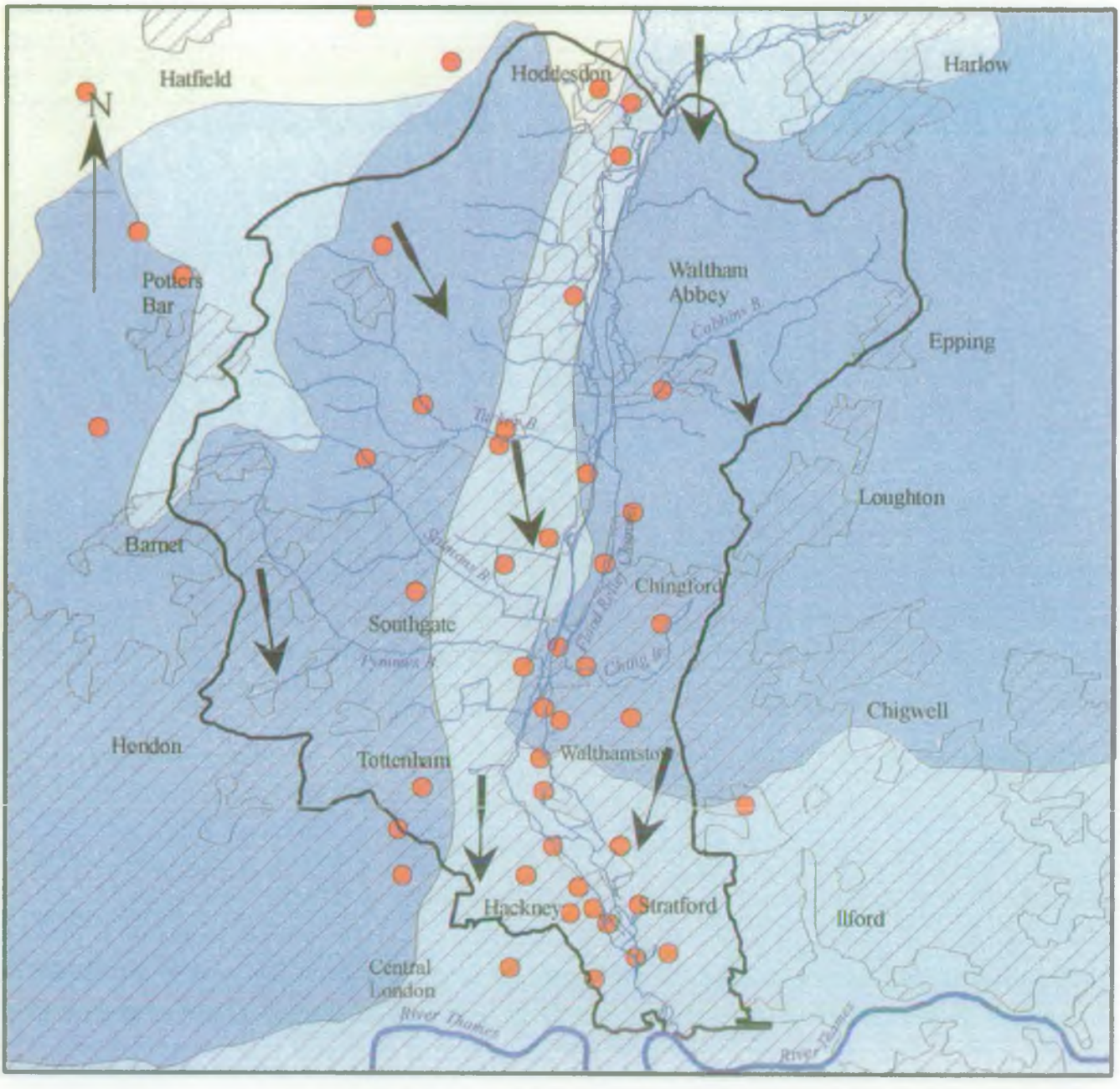
In the London area of this catchment there are large areas of contaminated land which are not currently documented. ***Redevelopment of sites which the NRA consider may be contaminated, requires site investigations to determine the nature and extent of any pollutants. Issue 4.6***

Our document "Policy and Practice for the Protection of Groundwater" (PPPG) sets out the NRA's approach on this subject. This includes the definition of protection zones around key boreholes, the classification of aquifers depending on their vulnerability (see map opposite) and a list of specific contaminative activities requiring high standards of control. Certain controls are available to the NRA and local authorities who can play a major role in influencing the locations of development which may pose a risk to groundwater. A comprehensive NRA monitoring network is currently being established (see map opposite) to enhance groundwater quality evaluation. This will be complemented with site specific initiatives.

Groundwater vulnerability from pollution depends upon the presence and nature of the overlying soils, the geology and the depth of the water table. In accordance with the NRA's PPPG, 1:100 000 scale maps are being produced which show groundwater vulnerability (not taking water table depth into account). These maps and their accompanying user manuals are scheduled to be completed by mid-1996.

An extract from a 1:1 million scale map has been reproduced for this catchment (see opposite). Because of the scale, this map can only be taken to show general categories of vulnerability. Soils classification was not superimposed for the minor aquifers on the map opposite but will be for the 1:100,000 scale maps.

WATER QUALITY: GROUNDWATER PROTECTION



KEY

	Watercourse	GROUNDWATER VULNERABILITY CLASSIFICATION			Groundwater Borehole / Observation Site		
	Catchment Boundary		Major Aquifer / Intermediate				
	Urban area		Minor Aquifer		Direction of Groundwater Flow		
			Non - Aquifer			Scale (approx) 0 5 km	

3.2 WATER RESOURCES

Introduction

In managing water resources, the NRA seeks to achieve a sustainable balance between the needs of the environment and the needs of abstractors for public and private water supply. In carrying out our water resources activities we have general duties to further the conservation and enhancement of the natural environment and have particular regard for the statutory obligations of the water undertakers.

Abstraction Licensing Policy

The NRA's regulatory role in the management of abstraction is governed by the Water Resources Act 1991 which sets out a system of Abstraction Licensing (see Section 2.11) which allows the NRA to control the abstraction of water. The Act also sets out those matters which the NRA must take into account when considering an application for a licence (e.g. whether the requirements of the applicant are reasonable; the impact on other water users; the impact on river flows), and describes the procedures which must be followed when applying for a licence. Licences enable the NRA to control abstractions by setting limits on the amount which may be taken, the purposes for which water may be used and any necessary conditions to protect the environment.

In response to its duties under the Water Resources Act, the Thames Region of the NRA has developed a set of formal policies for handling applications for licences and changes to existing licenses (see Appendix III). These policies do not, in general, allow the abstraction of water from rivers (or nearby groundwater) for a consumptive use in the summer months, and encourage the development of winter storage for uses such as spray irrigation.

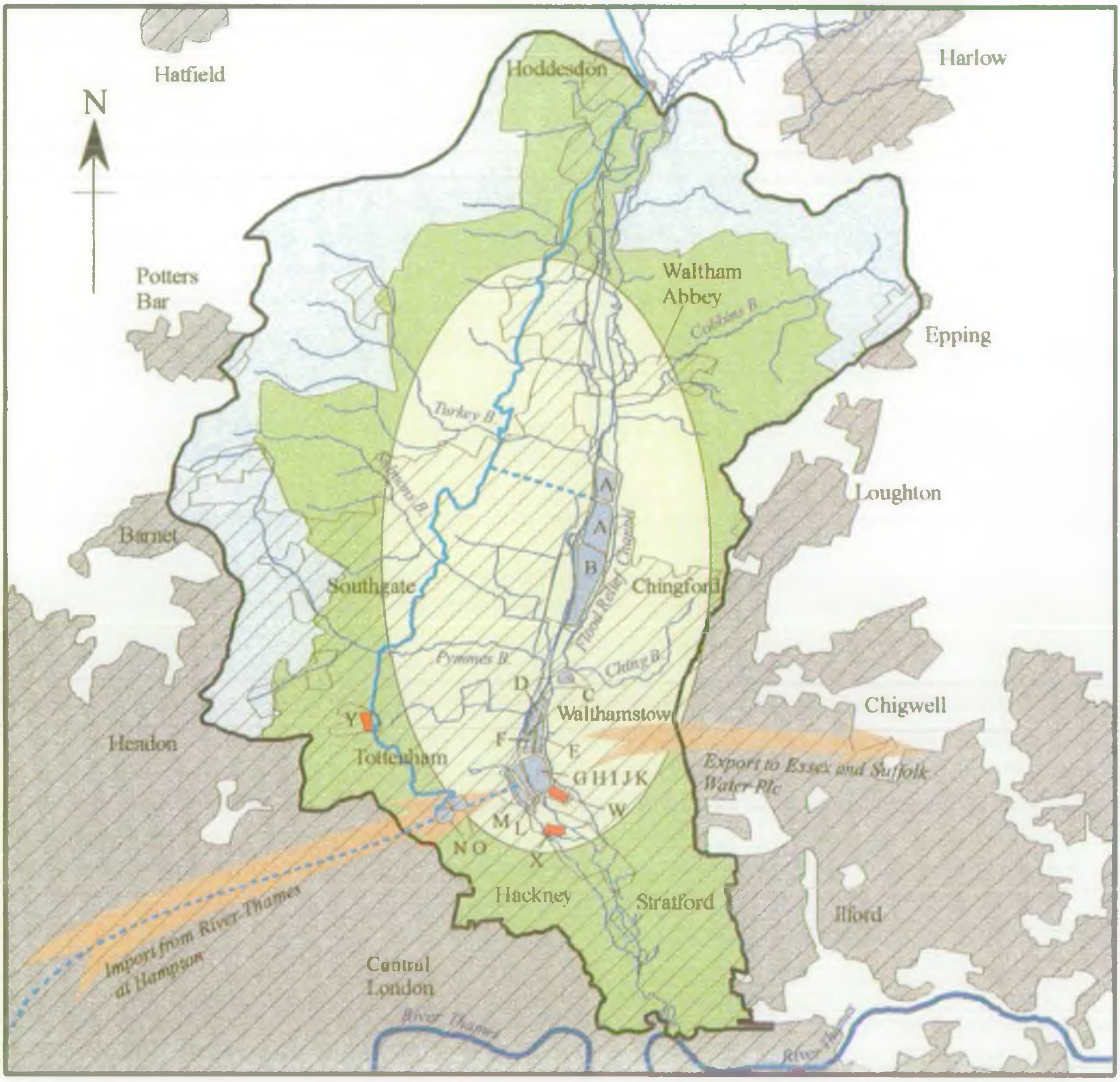
The Water Resources Act also establishes the power to specify Minimum Acceptable Flows in rivers. The NRA, in response to this, is carrying out research into Ecologically Acceptable Flows, which will help our understanding of what a living river needs to survive. Many new licenses, particularly for consumptive uses, will include a prescribed flow condition limiting abstraction below defined river flows in order to protect the water environment.

Catchment Perspective

Public Water Supplies

The principal water (and sewerage) undertaking and abstractor in the catchment is Thames Water Utilities Ltd (TWUL). Three Valleys Water Services Plc (TVWS) also supply some parts of the north of the catchment area.

Nearly a sixth of London's water supply is derived from water resources in the River Lee catchment based around the complex of reservoirs and Coppermills water treatment works in the Lower Lee catchment. Water pumped from Chalk groundwater wells to the north of the area and from the River Lee at New Gauge, Ware, is conveyed, via the New River, to Coppermills supporting river water abstracted into reservoir storage. These resources are operated conjunctively with River Thames derived water which is pumped across to Coppermills via the Thames-Lee tunnel. This is an important feature of water resources management for the north of London, particularly during times of drought.



KEY

Symbol	Description
	Watercourse
	Urban area
	New River
	Water Transfer Pipes / Tunnels
	Water Transfer
	N. London Artificial Recharge Scheme

RESERVOIR	
A. King George's Reservoir	G. H. I. J. K. } Walthamstow Reservoirs Nos 1 - 5
B. William Girling Reservoir	
C. Banbury Reservoir	
D. Lockwood Reservoir	
E. Low Maynard Reservoir	L. Warwick Res. East
	M. Warwick Res. West
F. High Maynard Reservoir	N. } O. } Stoke Newington Reservoirs

WATERWORKS
W. Coppermills Waterworks
X. Lea Bridge Waterworks
Y. Hornsey Water Works

WATER COMPANY	
	Thames Water Utilities Ltd
	Three Valleys Water Services Plc

Catchment Perspective (continued)

The recent development of the London Water Ring Main by Thames Water Utilities Ltd will provide more flexible distribution of water resources across the majority of London. The Ring Main links in to Stoke Newington and from there into Coppermills providing essential water supply security in all but extreme drought conditions (such as those witnessed recently and during 1976) to the Lower Lee area and North London generally.

The Lower Lee is also used to support public water supply needs to the east of the catchment. Thames Water Utilities Ltd operate a bulk water transfer to Essex and Suffolk Water Plc requiring, at times, up to 91 Ml/d to be exported out of the catchment.

Rising Groundwater Levels

In the early 1800s prior to any groundwater development, artesian conditions existed over much of the Lower Lee valley (i.e. if a borehole had been drilled through the confining tertiary strata into the Chalk, groundwater would have overflowed at the ground surface). With the commencement of groundwater abstraction, groundwater levels were drawn down significantly. Groundwater levels have been recovering (rising) since the 1970s as a result of the decline in industry and industrial water abstraction and because of a change in public water supply sources to the major surface water reservoirs.

Along much of the Lower Lee valley, north of Stratford and Hackney, abstraction is continuing with the operation of Thames Water's 'North London Scheme'. Further south however, monitoring by the NRA has been indicating a rise in Chalk groundwater levels of approximately 1-1.5 m/year over the past few years. In this area there is a significant thickness of London clay overlying the Chalk and, therefore, such a rise will not impact on shallow foundations and basements within the area, but may in future affect the soil strength beneath exceptionally deep foundations. There are virtually no tunnels constructed within this area and those that are, are fairly shallow constructions. NRA Thames Region continue to monitor Chalk groundwater levels from an extensive observation borehole network and produce annual maps of Chalk groundwater level and the rate at which it is rising. Although groundwater levels in London are slowly rising, there is still a major depression of groundwater levels compared to the conditions before abstraction in the nineteenth and early twentieth centuries. This condition is being developed by TWUL as additional storage instead of building major new surface reservoirs.

Water Resources Development

Future water resources need to be considered in the context of London as a whole given the conjunctive management of resources outlined above. Growth in demand for water may be influenced by a number of factors: for example, by increasing water use in the home, population growth and local development pressures and economic trends which may affect commercial water usage. "Future Water Resources in the Thames Region", published in June 1994, sets out a strategy for the future planning and sustainable management of water resources to meet the reasonable needs of public water supplies, industry and agriculture in the region. Managing growth in demand for water is a key element of the strategy. Managing leakage and encouraging more efficient use of water at work and at home can significantly affect growth in demand for water delaying the need for major new strategic water resource schemes and perhaps avoiding their development altogether for the foreseeable future.

Catchment Perspective (Continued)

Groundwater resources in the centre of the catchment, in the Enfield-Haringey area, are currently being enhanced by an extension of a scheme which artificially replenishes groundwater storage - or artificial recharge. Whilst groundwater levels in Central London are slowly rising, increasing abstraction in the nineteenth and early twentieth centuries have led to a progressive decline in groundwater levels in the outer areas of the confined Chalk aquifer of the London Basin. This is being developed by Thames Water Utilities Ltd as additional storage instead of building major new reservoirs. The amount of water stored in the aquifer can be managed by recharging with treated mains water, a surplus of which is available in the existing distribution system at times of seasonally low demand. This provides significant additional resources to meet drought deficiencies in the surface water resources supplying London. Between major abstraction periods, the aquifer is recharged by a combination of natural recovery (from rainfall) and by artificial recharge.

Should growth in demand for water continue, in the longer term this may contribute to the need to develop larger strategic water resource schemes. "Future Water Resources in the Thames Region" identifies a number of schemes which may be developed in this respect; two of which include:

- a scheme to transfer water from the River Severn to the River Thames at times of low flow;
- the proposed reservoir in south west Oxfordshire.

Further investigations are being carried out into potential strategic water resource schemes but their promotion should not be seen as a foregone conclusion because of significant environmental impacts and planning constraints.

Landscape

Some sections of the River Lee Flood Relief Channel and some adjacent rivers were the subject of Landscape Assessments in 1991 and 1993. The rest of the river corridors in the catchment are due to be surveyed and assessed during 1994/95. The Surveys identify landscapes on a scale of CLASS 1-4 (1 being very positive in character with many valued features which are essential to conserve; 4 being negative in character with few positive features, offering scope for enhancement). Assessments are also made to determine whether the appropriate management is:

Conservation Emphasis on conservation of existing character and an appropriate management of particular features which contribute to this character.

Restoration Emphasis on restoring landscape character where this is being eroded.

Enhancement Emphasis on the enhancement of landscapes which have completely lost their former character and are downgraded, derelict or otherwise damaged. There may be opportunities to create new types of landscape as a result of enhancement.

The northern section of the Flood Relief channel, Feildes Weir - Waltham Abbey, is characterised by the wide, flat valley of the River Lee which has been extensively modified by man, particularly old gravel workings. The landscape has been given a combination of CLASS 3 and 4 and the management strategy assessed as **Enhancement**. The Flood Relief channel through Enfield and Edmonton has also been allocated classes 3 and 4 because of its heavily urbanised character and artificial nature, concrete channel and reservoir embankments dominating. Again the management strategy is **Enhancement**.

In contrast, the River Lee Navigation has been allocated CLASS 2 because it has some attractive and tree lined sections incorporating positive features typical of canal infrastructure and furniture. Its management strategy is **Restoration**.

Overall, the landscape assessments completed so far have indicated that one of the major sources of visual intrusion within the immediate channel environment is the NRA's own infrastructure like weirs, sluices and fencing. Issue 4.10.

Geomorphology

Rivers naturally change their course and flow over time, but with human interference, i.e. channel straightening and weirs, the flow rate is altered which leads to different erosion and sediment patterns.

Notable erosion and sedimentation problems have been appraised in the Cobbins and Salmons Brooks in recent years. Increased urban run-off along with straightened channels has caused erosion of the gravel beds and sands along these tributaries.

Land Use Planning

Government policy on Town and Country land use planning highlights the importance of good communications between the NRA and local planning authorities. This is because development application decisions made by local planning authorities may lead to detrimental impacts on the quality of the natural water environment.

Land Use Planning (Continued)

Increased demands for water supply and effluent disposal, construction of property in the flood plains of rivers, and the indirect impacts on flora and fauna dependent on specific conditions are just some of the considerations that have to be weighed up during the process of making decisions on development.

The NRA's role in this process is as a statutory consultee. We take this role very seriously and seek to influence policy making at national (e.g. Planning Policy Guidelines such as PPG12 on the content of development plans and PPG23 on pollution and planning controls), regional (e.g. Regional Planning Guidance for the South East of England which raises the need for local planning authorities to take full account of the water environment when preparing development plans) and local (e.g. Structure and Local Plan preparation) levels so that decisions made by local planning authorities take into account all the relevant issues.

The Planning Liaison and Development Control teams of the NRA examine planning applications and enquiries from developers to determine the impacts on the water environment. During 1994 approximately 300 planning applications were commented on within the catchment. Many of these needed research into several possible impacts.

The NRA can provide advice on the impacts of developments which planning authorities must have regard to, but they are not obliged to follow. Our advice takes the form of either reasons for refusing planning applications, where we consider the adverse impacts to be unacceptable, or reasons to control certain aspects of the development by using conditions, or purely advice on the proposals which would be of benefit say, only to the developer/occupier or would provide an improved standard of pollution prevention. ***Within the Lower Lee the NRA is particularly keen to ensure that:***

(1) existing open rivers are kept that way by seeking to avoid culverting

(2) to re-open culverted sections of river where opportunities arise

(3) where redevelopment occurs on potentially contaminated sites, surveys and remedial works must be done to ensure that any risk of pollution is kept to a minimum

(4) development which could increase flood risk is avoided. (Issues 4.6, 4.11, 4.12, 4.13, 4.16)

We have been working with all the relevant local planning authorities (see Section 2.2) to integrate water environment issues into their statutory land use development plans. Our "Guidance notes for local planning authorities on the methods of protecting the water environment through development plans" (NRA, January 1994) covers the following issues:

- waste water management
- surface water protection and groundwater protection
- availability of water resources
- protection of the floodplain and surface water run-off
- tidal and fluvial flood defences
- river corridors, coastal margins and navigation
- mineral workings and waste disposal.

Land Use Planning (Continued)

The overall extent to which these policy interests have been taken up by local planning authorities is as follows:

Barnet	85%	Hertsmere	53%
Broxbourne	64%	Newham	70%
East Herts.	36%	Redbridge	30%
Enfield	59%	Tower Hamlets	83%
Epping Forest	75%	Waltham Forest	85%
Hackney	36%	Welwyn Hatfield	46%
Haringey	90%		

These figures, however, can be slightly misleading as they do not take into account the timing of plan production. For instance, the East Herts. Local Plan reflects the concerns of the NRA as expressed in 1991 rather than the full range of issues we now promote. ***Clearly the NRA will be working with the relevant authorities to improve their coverage of water issues as opportunities arise. (Issues 4.3 and 4.13).*** However, a reasonable level of policies has been achieved.

It is hoped that local authorities will work with ourselves so that the information and actions arising in Catchment Management Plans will be integrated into their own local plans. The Action Plan for the Lower Lee will contain a 'Land Use Statement' which will draw to the fore key land use planning issues needed to be covered in development plans.

Flood Defence

It is better to prevent flooding than to solve problems later. However, the relevant authority controlling development in the floodplain is not the NRA but the local planning authority. A flood policy, known as our "Non-Tidal Floodplain Policy", has been adopted by the NRA and involves close liaison with local planning authorities to ensure its implementation. This policy encourages local authorities to not normally allow development in areas which flood more frequently than once in a hundred years, in order to protect the catchment's flood storage areas and routes. Development which is allowed in these areas must meet the following criteria:

(1) flood flows must not be impeded

(2) the storage capacities associated with floodplains must not be reduced

(3) the number of people or properties a risk from flooding must not be increased

(4) land required for maintenance of, or access to, watercourses must not be obstructed

(5) environmental impact must be kept to acceptable levels.

Hydrological and hydraulic studies are necessary to help identify the areas covered by this policy. (Issue 4.11).

Flood Defence (continued)

Development in floodplains may also be unacceptable in respect of conservation, landscape, recreation and water resources issues.

This approach is further outlined in the DoE Circular 30/92 which encourages local planning authorities and NRA to liaise closely on flooding and surface water run-off matters. The aim is to ensure that flood defence risks of development are an integral part of the decision-making process undertaken by local planning authorities on relevant planning applications. In this respect the NRA has a responsibility to prepare surveys under Section 105 of the Water Resources Act 1991 to define the nature and extent of flood risks. The preparation of such surveys is the subject of the recent 'Memorandum of Understanding' between representatives of local planning authorities and the NRA.

The NRA is currently investigating the implementation of targets for the timely provision of flood warnings. The aim is that the police should be informed four hours in advance of an event in rural areas and two hours in urban areas. Formal monitoring of these targets will be introduced progressively.

The NRA has developed a standards of service approach to assist in the prioritisation of flood defence works. This combines an assessment of current land use with the recorded frequency of actual and predicted flood incidents. Five land use types are used to identify the required level of service, ranging from A (heavily urbanised) to E (non-intensive agriculture). The implementation of these standards is currently being investigated

Capital improvement schemes proposals, for which grant aid is sought from the Ministry of Agriculture, Fisheries and Food, need to be:

(1) technically feasible, i.e. they must achieve the desired improvement in the standards of service

(2) financially justifiable, i.e. the costs of implementation must be outweighed by the benefits of undertaking the proposals (the process of assessing this is as set out in a Project Appraisal Guidance Note produced by the MAFF)

(3) environmentally acceptable, i.e. the proposals have followed the requirements of Statutory Instrument 1217 - The Land Drainage Improvement Works (Assessment of Environmental Effects) Regulations 1988 or, alternatively,Statutory Instrument 1199 - The Town and Country Planning (Assessment of Environmental Effects) Regulations 1988.

A number of capital schemes are currently being considered by the NRA in accordance with the above criteria." (Issue 4.16).

The purpose of this section is to present the issues that have arisen through investigation of the catchment and informal liaison. We suggest ways of dealing with these issues and look for your comment on the best way forward. A draft vision, which has eight themes, is presented.

4.1 INTRODUCTION TO THE ISSUES

The remainder of this section is about the future of the Lower Lee catchment. It includes:

- a **vision statement** which includes **eight key management themes** (Section 4.2)
- descriptions of the **key issues** facing the catchment (Sections 4.3 - 4.16). Each issue is presented in a similar format. Following the presentation of background information we describe the available options, the pros and cons of those options and then identify key partners likely to be invloved in undertaking the options
- an assessment of the merits of a millennium fund submission being made based on environmental and recreational improvements in the Lee valley (Section 4.17)
- a summary of the relationship between the eight key management themes expressed in the vision and the individual issues (Section 4.18).

The purpose of the vision statement is to establish what we want to achieve in the catchment and how we want to achieve it. At this stage we have only described how we want to achieve the catchment vision. The specific long-term goals to describe what type of water environment we want will only be developed once the results of public consultation have been evaluated.

The diagram on page 92 shows how the vision relates to the issues and potential actions. To be successful the vision statement must have the support of local people, interest groups, industry and statutory groups. The extent to which the vision is delivered will depend on how much we can do to tackle the key issues.

Further detail about the issues is contained in Sections 4.3 to 4.16. Where specific NRA data or documents are referred to these can be obtained from NRA offices although there may be a charge for some data and reports (see Appendix III).

We realise that further knowledge and ideas exist and **this is why we want to hear the views of any person, group or organisation interested in the future of this area.**

Firstly, we want to hear if we have got things wrong:

- are there other issues, not yet covered ?
- are there other options we have not considered ?
- are there more pros and cons ?
- are our maps and information accurate ?

Secondly, and just as importantly, we want to hear if we have got things right:

- do you agree with our catchment vision ?
- do you support the way forward with issues ?
- is our information useful ?
- is the NRA right to co-ordinate actions for the water environment ?The vision, the interpretation of issues, the proposed actions and potential partnerships are all open to change in response to your views. A report on the consultation process will be included in the Action Plan which is programmed for completion in October 1995.

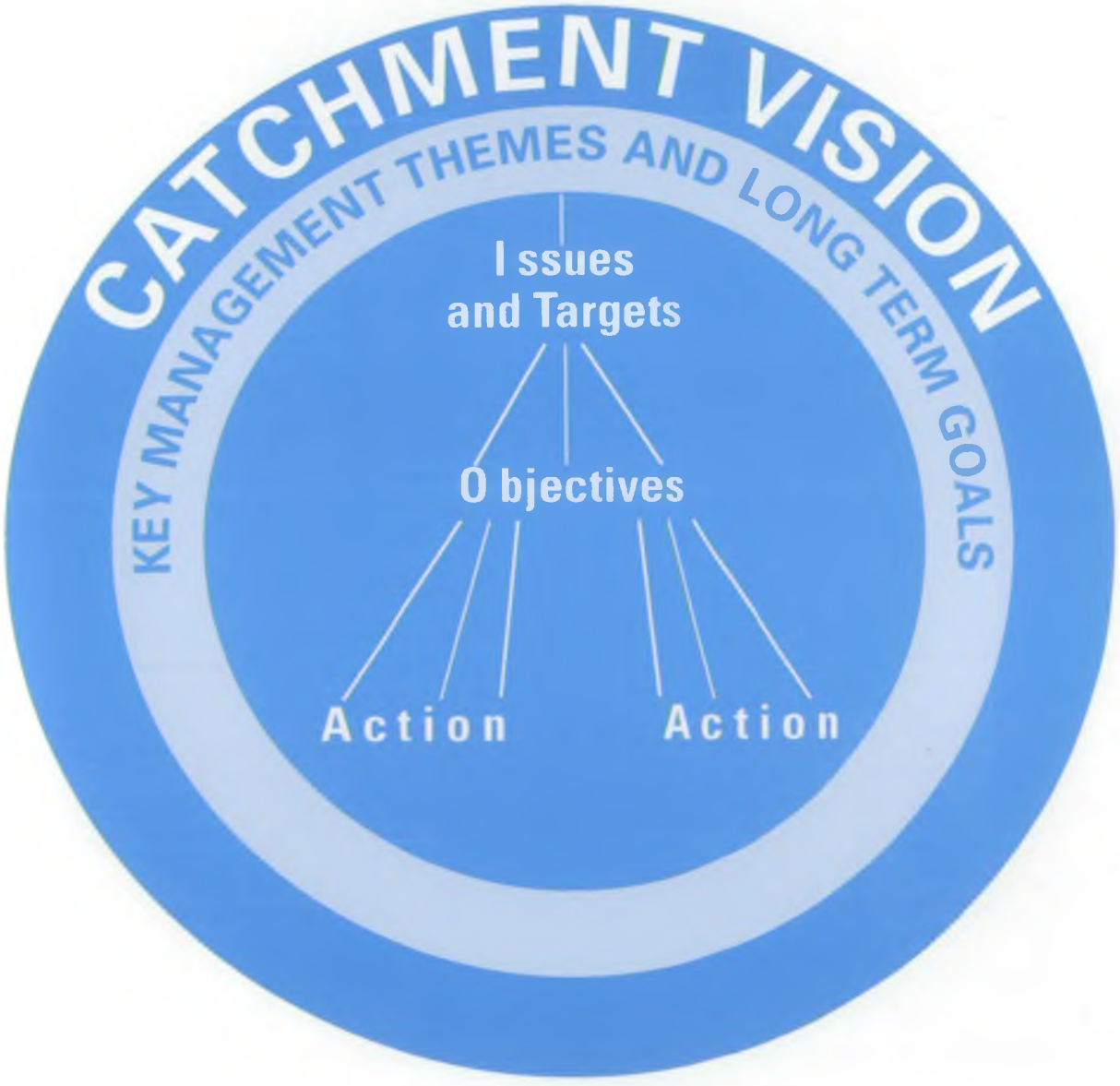
We will try and accommodate all the comments we receive. However, we must all realise the constraints on action that exist. These come about because of the varying powers and objectives of organisations, land ownership and availability, our level of scientific knowledge, timescales and inevitably, the available level of resources. It is extremely unlikely that funds will be available to implement all of the ideas for improvement suggested in this section and the others that will come forward as a result of consultation.

However, the consultation process does offer the opportunity to us to prioritise action to ensure the best use of resources. Even if no action is possible in the short term, any ideas raised can be considered for longer term investigation or implementation when circumstances and priorities may be different.

It must also be realised that although this document has been prepared by the NRA it is not solely within the NRA's powers to carry out all the potential actions listed. There are many options where the NRA could only have a supporting role and and some that are clearly outside the NRA's remit.

This is a plan for the water environment of the Lower Lee catchment. It should not be restricted by the capacity of individual organisations and groups to achieve action as we recognise there are many opportunities for closer partnerships to combat the diverse and complex issues of this area.

RELATIONSHIP BETWEEN CATCHMENT VISION AND ACTION



4.2 DRAFT CATCHMENT VISION

The Lower Lee Catchment is dominated by the urban area of north London. With a population of over 1 million people this is one of the most densely populated catchments not only within the UK but also in Europe. People use water for their most basic needs such as drinking, cooking, washing and sanitation. We also depend on water for recreational purposes, and the added interest it contributes to the landscape. It also plays a vital role in nature conservation, providing habitats for plants, insects and animals. Additionally we need to protect people and property from flooding. With such a large population, these needs bring about heavy demands on the water environment.

In meeting these many and varied demands, our predecessors have left us with a difficult legacy in the Lee valley. This legacy includes concrete lined river channels, the wide loss of natural habitats and unacceptable water quality problems. This poor environment is coupled with the social and economic aspects of urban decline in parts of inner London.

However, the Lee valley has proved to be very resilient. The River Lee is at the heart of the green corridor from the River Thames, through east and north London to the Green Belt in Hertfordshire and Essex. This corridor is now the focus for a range of environmental, economic and social regeneration initiatives by european, national, regional, local and community interests. Future generations may therefore inherit an improved environment even though our current demands on the water environment are just as wide ranging and significant as those of the past.

The purpose of this vision statement is to provide the context for action to sustain and improve the health of the catchment's natural water environment and ensure that appropriate uses of the water environment are managed in a sustainable manner. As no single individual or body is in a position to ensure this vision is fulfilled, it is essential that a partnership is built up consisting of the local people and community groups, local councils, and other relevant bodies including the NRA. Together, we can work towards the following themes:

Communications and Co-ordination

- we must ensure that diverse actions are sustainable by co-ordinating activities designed to deal with environmental, economic and social issues
- we must make sure that groups, agencies and individuals active in the catchment communicate effectively

Raising Our Sights

- we need to recognize that breaking the cycle of social, environmental and economic decline is a key element in gaining sustainable environmental improvements
- we need to achieve understanding of what can realistically be achieved in the catchment
- we need to raise awareness of the value of the water environment to local people

Catchment Quality

- we need to protect and enhance the backbone of the catchment, the Lee valley corridor, recognizing that its quality is dependent upon all the watercourses and groundwater contributing to it
- we need to ensure the health and safety of people, property and the natural environment
- we need to balance the interests of the many diverse users of the water environment.

4.3 COMMUNICATION BETWEEN GROUPS

Background

The Lower Lee is an immensely complex catchment in terms of both its physical features (i.e. river channels, tidal influences, flood protection works, water supply and overall infrastructure) and management (see Section 2.2 which describes the numerous agencies involved).

There are several statutory groups whose actions and policies play a major role in shaping the water environment. These are the NRA, Lee Valley Regional Park Authority (LVRPA), Thames Water Utilities Limited (TWUL), British Waterways (BW), English Nature (EN) and the local authorities within the catchment. As well as these are the other bodies and interest groups like Lower Lee Project (LLP), Royal Society for the Protection of Birds (RSPB) and Friends of the Earth (FoE).

It is important that the statutory groups work well together. The sharing of data and views is an essential first step in achieving good action and the best use of resources. This is particularly true in this catchment because of the complex inter-actions and needs of users of the water environment. However, it is also important that the statutory bodies can demonstrate support for their initiatives amongst the local population and interest groups. Community participation in policy making and the implementation of actions has been successfully promoted in a number of limited areas, but there are opportunities for much greater involvement.

We also believe there will be benefit in interested parties developing a shared strategy for the Lee valley in particular. This would ensure that when individual opportunities for change arise action can be assessed against agreed policy objectives. Thus, rather than undertaking a range of unrelated actions which may conflict, individual action can be seen to be contributing incrementally to a shared objective of improving the Lee valley as a whole.

The process of producing this CMP, and in particular the next stage, the development of the Action Plan, will assist in co-ordinating actions and improving communications. However, it is essential that this process is continued in order to (i) ensure proper implementation of the actions and (ii) to enable on-going development of the plan in responce to new and changing circumstances.

For these reasons, we believe that action should be taken to enhance communications. Please let us know what you think about the following options, or if you have any other suggestions.

Options

(1) An annual or 6 monthly Public Catchment Meeting.

This could be led by the main agencies involved, but open for any other group or individual to attend in order to give an opportunity for issues and problems to be raised.

Options (Continued)

(2) Option (1) could be split to create several sub catchment meetings (e.g. Lee valley downstream of Tottenham) to give a greater local focus.

(3) Establish a small working party from interested agencies and groups to drive forward integrated action plans and establish a shared strategy for the Lee valley.

(4) Publish a quarterly/6 monthly news sheet with distribution to all interested groups with an open invitation for contributions and comments.

(5) Utilise existing communication channels more effectively and take opportunities for multi-agency co-operation where possible.

Pros and Cons

All options will need commitment from people and organisations.

Option (1) could be too cumbersome an event with too many people to make progress.

Option (2) could result in duplication of effort for catchment wide interest groups, e.g. BW, TWUL, LVRPA.

Option (3) may exclude some of the smaller groups who have a role to play.

Option (4) publications need to be carefully prepared and promoted to be successful.

Option (5) may lack a new impetus and miss opportunities for wider contacts but does have the benefit of minimising time spent talking rather than doing.

Who Could Be Involved

NRA, BW, TWUL, LVRPA, local authorities plus any other bodies active in the water environment could all play a role.

4.4 WATER QUALITY DOWNSTREAM OF TOTTENHAM

Background

Water quality in the River Lee, Lee Navigation and semi tidal channels south of Tottenham Locks is of a poor to fair standard (see Section 3.1). This is sufficient to support fair to good quality fish populations (see Section 2.7). However, there have been a number of occasions over recent years when large fish mortalities (up to several thousand) have occurred in this section of the river. These events tend to occur after medium sized summer storms (5-10 mm of rain) following dry periods of a week or more. The chemical action of pollutants in the water leads to the rapid depletion of oxygen, thus killing off fish and other pollution sensitive fauna in the river. The causes of this chain of events are still not yet fully understood.

The current water quality situation is actually a substantial improvement over the status of the river 20 or 30 years ago when water quality was consistently too poor to support a healthy fish population. Under such circumstances, drops in water quality would have been less obvious.

The water flowing into this area comes from two major sources. Firstly, urban tributaries such as the Pymmes Brook, Salmons Brook, Moselle Brook, Stonebridge Brook and Ching Brook, which all receive rainwater from urban areas. Secondly, Deephams sewage treatment works (STW) effluent which can comprise over 75% of the flow in the River Lee in this area.

During the summer of 1994, the NRA commissioned a study into the water quality problems in this area. The study involved setting up water quality monitoring equipment in the Pymmes Brook and Salmons Brook tributaries and in Deephams STW effluent channel. The information gained from these sites plus existing NRA data from routine quality samples, volumes of flow, known discharges to rivers and rainfall patterns, allowed a computer water quality model to be developed and calibrated. With the model set up, it was then possible to simulate a wide range of conditions which could give rise to the sharp drop in water quality.

More water quality monitoring stations are, however, needed as there was insufficient data from the individual tributaries to narrow down the many specific points of potential pollution. However, the study was able to suggest the most likely causes, which include:

- Urban Run-off

  After a sustained dry period, a large amount of litter, leaves, animal faeces, oil and grit from roads accumulates in the gullies of road drains. Light rainfall will leave this matter undisturbed whilst heavy rainfall will flush pollutants through the surface water drains and into rivers. However, due to the large volume of water the pollution will be greatly diluted. Problems arise when a medium sized storm may just flush the polluting matter out without much dilution. As the catchment area, Haringey, Enfield and Barnet is predominantly urban and the time taken for rain falling to get into the river is short, this problem can be very severe.

- Stonebridge Brook/Moselle Brook Catchment

  As these two rivers are almost completely culverted it is difficult to see or detect any pollution. However, the investigations indicated that additional pollution comes from this area, and there have been instances of observed pollutants in Stonebridge Brook as it joins the River Lee.

Background (continued)

- Sediment in the River Lee

  Sediment (around 1 - 1.5 m deep in places) on the bed of the River Lee, could be mobilised by high, fast flows entering from tributaries. It is possible that the chemical constituents of the sediment could produce the type of pollution that is experienced. The slow flowing River Lee allows the deposition of silt and suspended solid particles in the water. These could come from urban run-off, the tributaries and from Deephams STW.

- Combined Sewer Overflows

  Some parts of the catchment have sewers which carry both surface water and foul water to STW. However, during storm conditions the sewer capacity can be exceeded by the increase in surface water flows and this can lead to the discharge of diluted foul water into rivers at storm overflow points. This is not currently felt to have a large impact on the pollution problems of this area because it only occurs when there are large volumes of rain water which dilute such pollution.

The causes of the fish mortality pollution events may be a combination of the above factors, but clearly further investigation is needed to identify the most critical causes. Once this has been discovered, options for remediating the problem can be considered. It must be realised that any solution could be extremely expensive and complex.

There are two further water quality issues in the catchment, which affect the background water quality. These are firstly wrong connections, that is foul sewers that have been incorrectly connected direct to the surface water sewers. These connect direct to streams and rivers and therefore do not receive any treatment. These misconnections can occur at any property and may be from washing machines, dishwashers or even toilets. This can result in raw sewage and toilet debris getting into rivers. In larger rivers the problem is diluted by the larger flows of water but in smaller tributary streams the consequences can become very unpleasant. The diffuse nature of the problem means that tracing the problem property is time consuming and hence expensive. Furthermore the extent to which this contributes to the overall poor water quality in the River Lee is not known.

Secondly, the quality of effluent from Deephams STW determines the background water quality downstream of Tottenham. This works currently treats sewage to a higher standard than that required in order to meet its discharge consent. As a result, TWUL could decrease the standard of treatment at the works without breaching the discharge consent. the poorer quality effluent produced would result in a decrease in water quality in the Lee downstream of the works. Investment is needed at the works if a stricter discharge consent is to be imposed and this investment is not included in the current TWUL Asset Management Plan which covers the 10 year period 1995 to 2005 (AMP2).

Options

(1) Further research into this issue. The NRA is committed to the following actions:

(i) installing 6 more Water Quality Monitors during Spring 1995

(ii) undertaking more detailed analysis of sediment in the River Lee

(iii) updating the water quality model with new data

(iv) conducting detailed biological surveys of urban catchments

(v) investigating in greater detail some of the less well understood sources of pollution

(vi) determining the impact that Deephams STW has on background water quality and on pollution events and the nature of work needed to improve current effluent quality.

(2) Evaluating the costs and benefits necessary to improve the Water Quality Objective of the whole of the River Lee to at least class RE4, i.e. that which will support a sustainable cyprinid fishery.

(3) Intermediate action. The NRA is investigating the following medium term options to reduce the impact of pollution on flora and fauna:

(i) creation of fish refuges. These are areas where fish could escape from mass pollution. Typical locations would be at the mouth of tributary rivers, backwaters or eddies where the main flow of polluted water would by-pass the refuge leaving it relatively clean. Possible locations for fish refuges include:

- The basin at the confluence of the West Cut and River Lee Navigation, just below Tottenham Locks, Ferry Lane, Tottenham. Work would involve deepening the basin and developing emergent vegetation as a fish refuge.

- Confluence of the East Cut and River Lee Navigation, 400 metres south of Ferry Lane. Creation of a fish refuge by deepening the basin, removing concrete banks and developing natural bank side and aquatic vegetation.

- Lee Valley Ice Rink, north of Lea Bridge Road, Clapton. There is an opportunity for creating an off-line fish refuge.

- Hackney Marshes, confluence of Flood Relief Channel (culverted) with River Lea. Remove part of the culvert to create fish refuge.

- Leyton Common Sewer confluence with River Lee. Improvement of habitat and installation of flow deflectors to develop this area which already acts as a fish refuge.

Options (Continued)

(ii) install aeration equipment at fish refuges. This could blow oxygen into the water to further improve the conditions for fish

(iii) install flow deflectors (not on navigable channels) to induce re-aeration of the water

(iv) promote the use of barley straw to control algal growth. The chemicals released during decomposition of the straw in water restricts algal growth

(v) install groynes to break up flow and encourage riffle/pool development.

(4) restore degraded river margin habitats and effective buffering of watercourses from adjoining land users. More natural river margins also provide refuges for fish and macroinvertebrates from episodes of poor water quality.

(5) plan an approach for reducing the impacts of raw sewage on tributary streams.

Pros and Cons

Tackling the root causes of the pollution is going to be a long and costly project. Actions in the short to medium term would help to improve river conditions even after the root causes of pollution have been rectified as there would still be the chance that accidental contamination could occur. No single agency has the power or funds to deal with pollution on this scale. Effective action will need the co-operation of all bodies and may need additional resources above and beyond those currently available.

Considerable research needs to be completed to determine the most effective means of tackling the problem.

Who Could Be Involved

NRA, BW, TWUL, local authorities (drainage, highways, environmental health, building control and planning departments) and user groups would all have a role to play. User groups could help in the collection of data on how water quality impinges on the levels of use whilst the statutory authorities can evaluate the technical feasibility and economics of options.

4.5 WATER QUALITY BETWEEN FEILDES WEIR AND TOTTENHAM LOCK

Background

Water Quality in the River Lee from Feildes Weir to Kings Weir is currently "fair" and from Kings Weir to Tottenham Lock is "good". During the period 1988-1990 water quality in both reaches was "fair". The upper reach marginally failed its RQO in the period 1991-1993. Both reaches are designated a Cyprinid Fishery under the EC Fisheries Directive.

Rye Meads sewage treatment works (STW) discharges just downstream of Feildes Weir and hence the quality of this part of the Lee is influenced by the quality of the effluent from Rye Meads STW. The maximum consented flow of effluent which can be discharged from the works is approximately equivalent in volume to the flow of the River Lee. The effluent from Rye Meads STW has been of a higher quality than is required by its consent for a number of years. If the works was to perform at its consent standards, water quality downstream would deteriorate.

Options

(1) Investment at Rye Meads STW to allow a more stringent consent to be imposed in order to protect the current water quality.

(2) Do nothing.

Pros and Cons

Imposing a more stringent consent at Rye Meads STW will result in the need for TWUL to invest in improvements at the works, but this will ensure both compliance with the EC Fish Directive, and RQO of RE2 and here the maintenance of current quality.

Who Could Be Involved

Investment is required by TWUL with on-going monitoring by NRA to ensure compliance with standards.

4.6 CONTAMINATED LAND IN THE LOWER LEE

Background

The Lower Lee valley has a long history of industrial development. Industries were often located in areas along the riverside, which were previously undeveloped because of flooding concerns. Directly underlying these areas are the terrace gravels, deposited by the River Lee, which form a minor aquifer. For almost the entire catchment the major Chalk aquifer lies at depth protected by the Reading Beds and the London Clay.

For many industries little control was exercised in handling potentially polluting substances, at least until recent decades. In many areas, large tracts of ground have become contaminated. Groundwater too has been subject to polluting inputs over a long period of time and widespread contamination of the gravel aquifer has occured. Groundwater in the Chalk aquifer, however, is generally good and it is used extensively for public supply. There are a few, apparently isolated, cases where groundwater in the Chalk aquifer has been contaminated. This may have been caused by leakage of contaminants via poorly lined boreholes or in some instances, by deliberate discharge of substances.

The types of activity which may have led to contamination in the Lee valley include:

- uncontrolled tipping of waste into former gravel pits
- manufacture of town gas
- chemicals manufacture
- use of unlined sewage lagoons
- armaments manufacture
- various engineering works.

The extent and degree of contamination has not been defined fully, since knowledge is site specific, specific having been obtained mainly from sites which have undergone redevelopment or, in some cases, where environmental audits have been carried out. This has shown groundwater contamination in the gravels to be severe in some localities, particularly in the southern most reaches of the River Lee in London.

Some problems of contamination have been addressed with varying degrees of success, particularly where this has been necessary during redevelopment of sites. Examples include works carried out at former gas works sites; a former armaments manufacturing site and certain chemicals industry sites. Contamination, including that in groundwater, at former petrol stations has been addressed in some cases with a high degree of success. However, some groundwater contamination is likely to remain intractable.

When dealing with contaminated ground and groundwater the policies described in the NRA's "Policy and Practice for the Protection of Groundwater" in respect of contaminated land will be applied.

Background (Continued)

For the Lower Lee catchment this will require the protection of "sensitive receptors", including:

- water abstractions from wells and boreholes, particularly where it is used for public supply
- watercourses which may be subject to ingress of polluted groundwater
- where polluted groundwater in the perched gravel aquifer could enter the Chalk aquifer (e.g. where the Chalk lies directly below the gravels near Hoddesdon) through poorly cased boreholes or poorly installed piles.

In most cases watercourses will be the features most sensitive to pollution, by leaching from contaminated ground or leakage of polluted groundwater, although the impacts are not necessarily clear. Urban run-off provides much of the flow to watercourses, and this in itself may be contaminated. This combined with dilution in the watercourse, can mask any impact on water quality due to contaminated ground or groundwater.

Protection can be achieved by:

- removal of the source of continuing or potential pollution. In many cases the polluting activity has ceased so that the original pollution source has in fact been removed;
- removal of any secondary source of pollution, such as contaminated ground which may lead to further pollution of water;
- consideration of the merits of groundwater clean-up on the basis of protection of sensitive receptors. In some cases it is acknowledged that groundwater clean-up options and benefits may be very limited.

The most likely sensitive receptors in the catchment are watercourses. However no adverse impacts from the ingress of polluted groundwater to rivers have yet been detected. Many watercourses derive a significant proportion of flow from urban run-off which frequently carries a contaminant loading. This, combined with dilution in the watercourse, would tend to mask any impact on water quality due to the ingress of contaminated groundwater.

Options

Unilateral action by the NRA to clean up groundwater is not considered appropriate at present and would not provide the best value for money in addressing groundwater protection. Achieving future protection of groundwater quality, or indeed clean up of groundwater pollution, is likely to rely on opportunities which may arise. This may include:

(1) the NRA and the Planning Authority working together to ensure appropriate clean up measures as part of any planning permission for contaminated sites

Options (continued)

(2) encouraging pollution prevention initiatives by industry, including clean up of groundwater where appropriate

(3) pollution prevention visits by NRA staff for sites of potentially greatest concern

(4) the NRA following prosecution procedures where active pollution is found to occur

(5) ensuring new developments which have the potential to cause contamination, are located, designed and operated in a manner which minimises the risk of contamination occurring. This will be done using the Town & Country Planning system and the NRA's own powers, where these are available.

Pros and Cons

A combination of all the options is likely to be needed to ensure that no further deterioration in groundwater quality occurs within the catchment.

Who Could Be Involved

Local authorities, NRA, industry and developers.

4.7 WATER LEVELS

Background

The issue of water levels is of concern in a number of locations within the catchment. Firstly, some areas of valuable habitat are dependent upon maintaining certain water levels. These include sites designated as SSSIs (see Section 2.6), for which the NRA has agreed to produce Water Level Management Plans (WLMPs) in conjunction with English Nature (EN). The plans will assess water needs, resources and future management of water related SSSIs, to protect their ecological value.

Secondly, areas of known or potential archaeological value which have not been excavated will need to be kept waterlogged in order to preserve any remains that exist. This is particularly true of locations along the Lee valley where remains are thought most likely and are contained within peat deposits which readily dry out (see Section 2.8).

Thirdly, water levels and flow rates need to be maintained within rivers to maintain suitable habitats for fish populations and other flora and fauna. Low water levels will restrict the amount of food and habitat available, and slow or stagnant flow will lead to high weed growth which can have an adverse impact on fish habitats and make angling impossible.

Fourthly, boats using rivers and canals for navigation need enough water not to become grounded (sediment build up could also be a causing factor), and enough water to allow the operation of locks. Additionally, a through flow of water is helpful in preventing the rapid build up of surface weeds, especially at structures, which can choke engine intakes (see Section 2.9 and Issue 4.8).

These requirements for particular water levels are set against a situation where water is abstracted from the River Lee and the chalk aquifer to meet the demands of householders and industry within the catchment. Furthermore, no one wants too much water. Flooding, when it occurs, is costly, unpleasant, very inconvenient and potentially dangerous. Fortunately, because of the flood alleviation works that have been completed within this catchment, flooding only occurs in a few locations and is relatively infrequent. These flood alleviation schemes have, however, disrupted the natural cycle of water management. Flood water is now rapidly removed from the catchment into the River Thames and out to sea. This is instead of it being stored on flood plains (many of which have been developed) and in aquifers from where it would be slowly released back into the river system, thus helping to maintain base flows.

Options

A comprehensive review of the amount, distribution and uses of water as it passes through the catchment is essential to determine where, if at all, capacity exists to accommodate any of the additional demands that my be placed on the surface water. This could include examining the storage, diversion or use of flood waters during times of peak flows. It is possible that by extending this review in the upstream catchments of the Middle and Upper Lee, a more strategic approach could be taken.

Pros and Cons

Because the river system is so complex, developing a full understanding of how it works in detail will be a time consuming, expensive process with the need for measurements to calibrate any

Pros and Cons (continued)

computer model developed. Without this work, however, changes in flow distribution to meet the needs of conservation, navigation, recreation, archaeology and others, will continue to be carried out in a piecemeal fashion.

Who Could Be Involved

NRA, TWUL, BW and interest groups can all contribute to such a study.

Specific Action Areas

(i) <u>Walthamstow Marshes Site of Special Scientific Interest (SSSI)</u>

Background

This is an area of 90 acres of primary meadow and marshland which has never been ploughed and still bears the imprint of Ice Age braided river channels on its surface. As such, it is unique in the catchment and rare regionally. The Walthamstow Marsh Society (WMS) aims to safeguard the Marsh and promote it as an educational resource. The area also falls within the Lee Valley Regional Park Authority's (LVRPA) area of jurisdiction.

The NRA and English Nature (EN) are committed to adopting a Water Level Management Plan for this site during 1996/7. However, similar work has already been done by the WMS as far back as 1981 and the LVRPA have formally adopted the 'Walthamstow Marsh Nature Reserve Development and Management Plan'. This includes proposals to construct a perimeter ditch, which is already nearly complete, and to abstract water from the Coppermill Stream to maintain water levels.

Options

NRA, EN, LVRPA and WMS to agree the WLMP for the Marshes, taking into account the work already done on this subject. The possibilities of abstracting water from the River Lee or Coppermill Stream to maintain levels and/or taking excess water during times of high flows along with any other ideas that come forward as a result of this consultation document should also be examined.

Pros and Cons

This subject has already been researched and so completion of an agreed WLMP will be achievable.

Who Could Be Involved

Primarily NRA, English Nature, WMS, LVRPA, London Ecology Unit and London Wildlife Trust.

(ii) Waltham Abbey, Cornmill Stream, Old River Lee, RARDE Site

Background

This area to the north of Waltham Abbey encompasses two distinct SSSIs. One site is the RARDE site which is valued for its alder carr. This site also has a network of small natural and made channels running through it and its habitat is dependent upon the ground being kept damp. The other SSSI is the Cornmill Stream, Old River Lee and the flood meadow in between. This site is particularly noted for its dragonflies, but has also been used as a popular local fishing site.

The two main concerns are that the alder carr is drying out and that the flow in the Old River Lee and Cornmill Stream is very low, thus reducing its value as a fishery and promoting extensive surface weed growth which acts as a negative impact on the amenity value of the area. The latter problem has been known for several years and meetings have taken place to try and resolve the matter, but to no avail. Recent discussions regarding this site have involved the NRA, LVRPA, local angling clubs and the Hertfordshire and Middlesex Wildlife Trust. This has led to agreement over a number of short term measures such as a selective vegetation cut within the river channels, removal of duckweed, the adjustment of weir levels at Waltham Abbey and the identification of the key dragonfly areas.

These measures are ostensibly dealing with the symptoms rather than the cause. The NRA and EN are already committed to producing a WLMP for these two sites, and because of the high profile of the issues and the interdependence of the two sites, the preparation of a combined WLMP for the area as a whole has been given a higher priority and the timescale brought forward.

Options

To be integrated in the WLMP, the following are potential actions:

(1) examination of the demands on water in this location, not forgetting the need to protect Waltham Abbey from flooding

(2) monitoring of the amount of water which currently passes through the various channels

(3) examination of options for changing the flow regimes through the Horsemill Stream, Old River Lee, Cornmill Streamand watercourses through the RARDE site

(4) surveying of the Old River Lee and Cornmill Stream river beds to determine the need, if any, for selective dredging to improve flows

(5) any other ideas that come forward as a result of this consultation.

Pros and Cons

By examining the whole area, sustainable improvements can be sought which make the best use of the available water to meet the needs of ecology, landscape, amenity and angling. Inevitably, with taking a wider view there is a longer lead time in gathering information and exploring options for change. During this process, it is essential that all interest parties are involved in decision making.

Who Could Be Involved

NRA, English Nature, LVRPA, Herts and Middlesex Wildlife Trust, angling clubs and land owners.

iii) River Lee Navigation

Background

There have been no cases of difficulty with boat movements on the Lee Navigation as a result of a lack of water. However, a lack of sweetening flow (i.e. the Navigation is full but the water is static rather than flowing) means that during summer months large growths of floating weeds, such as duckweed, occur especially upstream of locks. This can cause floating debris and litter to accumulate which can choke engine intakes. Furthermore the debris looks unsightly and severely limits angling opportunities. The problem is exacerbated by the high levels of nutrients in the water. (See also Issue 4.14)

The future demands for navigation are likely to see an increase in recreational boating on the River Lee and the re-introduction of freight traffic. This means an increase in boat movements with the consequent increase in lock operations meaning that the longer term availability of water for navigation will need to be monitored.

Options

(1) investigate the available water resource in the Lower Lee for future scenarios of boat use

(2) investigate the availability of current water resources to provide greater flow down the Navigation channel

(3) creation of marginal berms of emergent aquatic plants where possible to improve habitat, increase uptake of nutrients and trap floating duckweed

(4) purchase equipment to skim the duckweed from the surface. It may need to be a collective purchase between interested parties.

Pros and Cons

A long term view needs to be taken if substantial increases in use of the Navigation are to be realised without detriment to the water environment. Using machinery to tackle weed growth problems will mean a continual cycle of maintenance. It may be possible to make use of collected vegetation as compost. An increase in lock operation will lead to an increase in the flow of water through the Navigation. This could have the benefit of reducing weed and algal growth. BW are currently pursuing the option of making weed skimming equipment available on the River Lee. BW will also being carrying out a survey of boat use and lock operation during 1995. This should assist with options 1 and 2 above.

Who Could Be Involved

BW, interest and user groups, and the NRA

(iv) <u>Archaeological Sites</u>

Background

River valleys and the Lee valley in particular, are recognised as valuable areas for archaeology because their proximity to fresh water was vital for everyday living for past generations and river floodplains were fertile areas. Furthermore, these same wetland areas are good at preserving remains. This latter point is now of concern as it is felt that some of the important areas are drying out, thus risking the rapid deterioration of any remains as yet undiscovered (see Section 2.8).

Options

(1) identify which sites of value are drying out

(2) examine how these sites could be kept wet, in particular do they coincide with the areas identified as requiring WLMPs in (i) and (ii) above

(3) any other ideas that come forward as a result of this consultation.

Pros and Cons

The nature of archaeology is such that its value is always 'potential' until excavations are carried out. This makes it difficult to assess costs versus benefits. Failure to act could result in the loss of valuable evidence about our history.

Who Could Be Involved

English Heritage, LVRPA, local authorities, NRA and local interest groups.

4.8 RECREATION AND AMENITY FACILITIES

Background

Within the catchment there are a wide variety of amenity and recreational facilities ranging from formal water based activities to walks such as the Lee Valley Trail.

The Lee Valley Regional Park Authority co-ordinates recreational activities within most of the Lee valley for the benefit of the catchment population and beyond. LVRPA aims to further increase access to and within the park which will mean greater use of existing facilities. The Eastern Council for Sport and Recreation (ECSR) believes that many of the currently available facilities for formal water based recreation have reached full capacity in terms of both levels of use and quality of facilities available.

The River Lee has been used for a long time for navigation purposes and a common law public right of navigation exists on it. British Waterways, who are responsible for the Navigation, are also responsible for co-ordinating and managing recreational events and activities on the Navigation including walking, cycling, canoeing, angling and wildlife and heritage issues. Policies for increasing the number of moorings are also promoted.

With over 2 million boaters, anglers, walkers and cyclists using the canals and rivers every year, the Lee Valley Regional Park is serving the needs of a much larger population than is living in the catchment. As a result of this an increase in the number and type of recreational facilities currently available needs to be considered.

There is a need for further water based facilities. Using old mineral extraction sites could be an option. Informal recreation often depends for its success, on the quality of access into and across the park.

Options

With the Lee valley, a strategic view of current facilities and capacities and future demands and options for new sites should be taken with the views of relevent organisations and local people taken on board. These activities could be implemented as individual issues or in a phased manner whereby the most overused facilities are dealt with first.

Pros and Cons

The LVRPA have essentially done this in their pak plan of 1986. However, this document is now in need of updating.

Who Could Be Involved

LVRPA, BW, NRA, local authorities, gravel companies, nature conservation and built environment interests, landowners and amenity groups.

Specific Action Areas

(i) *Footpaths and Towpaths*

Background

Increased access points within the park could open up more footpaths and towpaths for informal recreational pursuits. Current examples include: the work being proposed by the Lower Lea Project, East London Rivers Initiative (ELRI) and others in the southern part of the catchment such as footpaths on the Waterworks River; cantilevered paths on the west side of Bow Back Rivers; completion of the Greenway on the Northern Outfall Sewer Embankment; and, the last stretch of improvements to the Navigation Towpath between Dobbs Weir and Rye House, the rest having already been completed by LVRPA and BW.

Options

(1) encouraging British Waterways, local authorities and LVRPA to improve existing pathways including links from railway stations to the Park

(2) creating a number of walks or trails that include areas traditionally under utilised for recreational purposes

(3) developing under used areas for the purpose of increased recreational activities.

Pros and Cons

The improvement of pathways and towpaths may not be fully realised if other aspects of an area's environment, such as water quality, are not improved in tandem. Improvements to local areas may be more beneficial to the catchment population than large scale trails which might encourage the development of corridors rather than specific areas. The L.B. of Newham with funding support from the DoE and other partners including private industry, have undertaken a programme of works to dredge and clean rivers and improve towpaths in the Bow Back Rivers area. This has led to improved navigation and wildlife habitat. LVRPA and BW are already examining opportunities for better links between the Park and public transport.

Developing under used areas may cause disturbance to breeding birds or specialised habitats, therefore increased use of time and space zoning could help alleviate some of the problems encountered in existing sites.

Who Could Be Involved

LVRPA, BW, local authorities, land owners and voluntary groups.

(ii) ***Water Based Recreation***

Background

With increased use of the Park comes the opportunity to provide more facilities for water based recreation. This covers sports from canoeing to water skiing. However, these need to be carefully planned and researched, as has happened with the Bow Back River Strategy, a joint study by British Waterways and the Lower Lea Project.

Options

(1) utilise former gravel pits at Glen Faba for the full range of water sports

(2) develop a 2000 metre international rowing course at the Victoria and Albert Docks

(3) develop a 150 metre canoe slalom course downstream from Dobbs Weir on the River Lee

(4) develop a canoe slalom course at Glen Faba, linking the River Stort to the Lee Flood Relief Channel, incorporating a water recycling facility

(5) implement the Bow Back Rivers Strategy for long term regeneration and recreation use of the area

Pros and Cons

By encouraging water based recreation in an area there will be a need for increased access and services for users. This will have the added benefit of the development of under-utilised facilities. The development of such facilities will need to be carefully monitored to ensure that any impacts upon the environment are negligible.

Again, time and space zoning would have to be implemented in order to prevent overcrowding of facilities.

Who Could Be Involved

LVRPA, BW, London Docklands Development Corporation, ECSR, NRA, private developers, gravel companies and user groups.

(iii) ***Moorings***

Background

At present moorings exist at Springfield Marina, Hackney, Hazelmere Marina, Waltham Abbey and Lee Valley Marina, Broxbourne. The number of privately owned craft registered on the Lee and Stort Navigations has increased by 40% over recent years (1986-1994), such that there are now over 700 boats registered. BW estimate that each boat only makes an average of 4 movements per year.

Background (continued)

British Waterways, who are responsible for navigation, are promoting the area for recreational purposes such as walking, cycling and wildlife and heritage issues. This also includes policies for increasing the number of moorings that are available. BW consider the environmental and navigational impacts of any new moorings and will only promote schemes which conserve and enhance the built and natural conservation value of a site.

The LVRPA aims to improve access to the park thus encouraging increased use of existing amenities. In order to meet these increasing demands, it would appear necessary to consider the need for more mooring sites.

Options

(1) British Waterways, local authorities, LVRPA and the NRA, in agreement, could designate specific sites considered suitable and unsuitable for moorings

(2) develop specific policies for residential and recreational mooring sites.

Pros and Cons

Any new mooring sites would require easily accessible facilities and services which, if not investigated carefully may prove to be damaging to the environment. With increased moorings available, the movement of recreational craft will be likely to increase, leading to greater lock use which may have the benefit of restricting weed growth. Consideration will need to be given to the capacity of the system, in terms of water availability, if development of moorings is significant.

By encouraging the siting of moorings in more derelict areas, it may be possible to enhance these areas both in terms of facilities and landscape features. The value of this may also be seen in terms of making these areas more secure and safer for general use.

A follow-on effect of suitable mooring sites would be the increased availability of facilities for visitors to the catchment. Residential moorings would also provide more housing facilities and hence greater utilisation of local services but will reduce the amount of water area available for other activities.

Who Could Be Involved

BW, LVRPA, local authorities, NRA and interest groups.

4.9 INVASIVE PLANT SPECIES

Background

In the past, a number of non-native plant species were introduced into the catchment including Giant Hogweed (*Heracleum mantegazzianum*), Japanese Knotweed (*Polygonum cuspidatum*) and Himalayan Balsam (*Impatiens glandulifera*). These species are very invasive causing native species to be crowded out and the destruction of natural habitats. Since they are not native species, very few insects, birds or animals are suited to utilising them as habitat or food. These species can colonise many different habitats, but especially river banks. Due to their invasive nature other species are no longer present which in autumn means that when these invasive species die out, the river banks are prone to erosion as bank stability is reduced.

The Giant Hogweed can be considered to be a risk to human health. If the sap from this species contacts the skin it causes hypersensitivity to sunlight resulting in the skin burning and blistering.

Within the catchment there have been a number of successful projects implemented for the removal of Japanese Knotweed. This has been achieved by continual weeding and replacement with native species. An NRA research and development project has resulted in the production of a booklet 'Guidance for the Control of Invasive Plants near Watercourses'. This identifies suitable methods for dealing with invasive species.

Options

Eradication of invasive species in the Lower Lee catchment will probably be impossible due to the many upstream sources of seeds. However; to ensure that any projects to remove invasive plant species from important areas are successful, a number of options could be followed:

(1) the most sensitive areas of invasion to be targeted as part of wider improvements to the physical environment

(2) adjacent land owners to work together to implement projects whereby successive sections of the river are cleared

(3) existing projects to be extended and built upon.

Pros and Cons

Any clearance of invasive plant species needs to be carried out in conjunction with upstream clearances, as problems may arise when plant debris migrates downstream and spreads. Co-ordination between local authorities, wildlife trusts, riparian owners and interested groups will reduce the likelihood of this occurring. As most of these species were introduced in the nineteenth century as ornamental plants, they have become quite common throughout the British Isles. The complete eradication of these plants may prove to be not only expensive, but impossible. The Wildlife and Countryside Act 1981 makes it an offence to plant, or cause, Japanese Knotweed and Giant Hogweed to grow in the wild. Himalayan Balsam is not currently included in this legislation.

Who Could Be Involved

Local amenity and conservation groups, local authorities and landowners.

4.10 LANDSCAPE OF THE LOWER LEE

Background

The landscape of several of the river corridors within the catchment is poor because of poor quality buildings and structures and/or vandalism. In heavily urbanised reaches, most buildings have turned their backs on the river, leaving bleak walls or fences as features of the river corridor e.g. industrial areas around the North Circular Road. In some areas, particularly at the southern end of the catchment, some of these buildings are derelict thereby increasing the area's negative image.

Other features such as railway bridges, pipe crossing for gas, water, sewage or electricity and boundary walls can also detract from the river's visual appearance. There are examples of rusty, poorly painted structures all over the catchment. Some of the NRA's own structures also detract from the visual amenity of the river. These include high security fencing and the painting of weirs and sluice gates in colours that are not readily absorbed into the landscape. The Flood Relief Channel is particularly sterile with few trees and shrubs lining the banks. Improvements to such features can often be relatively cost-effective requiring painting or perhaps landscaping in the form of tree and shrub planting.

The Lower Lea Project has begun to look at this problem in the south of the catchment. Premises have been identified as needing improvement and it has been suggested that grants may be available towards the costs of works. The LVRPA is particularly active in bringing about landscape improvements in the Lee valley with a wide variety of schemes already completed and more planned. Face lifting works can offer local communities an opportunity to create a distinct identity for certain areas by using, say, certain colour schemes or designs in particular locations. These could be designed by local people, schools etc.

Options

(1) identify the negative aspects of visual intrusion within river corridors, especially the Lee valley by carrying out a Landscape survey of the catchment

(2) NRA to carry out improvements to its own structures, particularly where maintenance or renewal work is already programmed

(3) support existing works that are being carried out by LVRPA, BW, Lower Lea Project, including the Bow Back Rivers Strategy and encourage individual owners/operators to make aesthetic improvements, involving local communities where possible.

Pros and Cons

This type of visual improvement can be relatively cost-effective to tackle and can improve the visual amenity of a river and surrounding area. A lack of cooperation from a single site or utility owner can, however, devalue the work of others. This is one area where the NRA has little power to implement improvement but is prepared to carry out initial survey work.

Who Could Be Involved

LVRPA, BW, NRA, local authorities, landowners, conservation and community groups, schools.

General Management

Background

Whilst reductions in flood risk have been achieved in many parts of the catchment where schemes with positive cost benefit have been designed and constructed, flooding on several watercourses especially some of the tributaries, has caused damage and disruption.

Also, all existing flood alleviation schemes, as described in Section 2.15 have a finite capacity for the carriage of flood flows, which would be exceeded in an event greater than that for which they could be justifiably constructed.

Options

(1) implement policies to prevent development from causing an increased flood risk.

(2) implement policies to encourage new developments to build in flood water storage measures.

(3) continue with routine maintenance work to watercourses for reduction of flood risk.

(4) carry out Section 105 surveys to determine extent of current flood risk areas, where not already known.

(5) confirm the standards of protection offered by existing flood alleviation schemes, especially in the light of changes in development and other land use. Carried out in conjunction with Section 105 surveys.

(6) ensure the structural integrity of existing assets (e.g. sluices, weirs, flood storage reservoirs, flood defence walls) created as part of the flood alleviation schemes. Increased planned preventative maintenance to reduce likelihood of breakdown maintenance being required.

(7) carry out feasibility studies for potential future flood alleviation schemes. To be re-prioritised as required with other sites highlighted from Section 105 survey initiative and from results of the Catchment Management Plan consultation process.

(8) investigate the provision of flood warning stations on tributaries, particularly the upper reaches of Cobbins Brook, Salmons Brook, Nazeing Brook, Pymmes Brook, Turkey Brook, Ching Brook and Tidal River Lee.

Pros and Cons

Existing levels of watercourse maintenance are subject to availability of resources. Significant numbers of additional flood alleviation schemes have now been created. Lack of an increase in overall levels of pre-planned maintenance would compromise the integrity of the protection provided by these existing schemes in the future.

Pros and Cons (continued)

However, any increases in maintenance of structural assets may have to be balanced with the levels of routine maintenance to watercourses, for example in vegetation control.

The relative priorities of these activities may need to be re-assessed with one another if any identified additional funding for asset maintenance was not obtainable. Some potential alleviation schemes may not achieve a positive cost-benefit ratio and may therefore not be allowed to progress. Environmental acceptability also has to achieved.

Who Could Be Involved

NRA, local authorities, developers and MAFF.

Main River Revisions

Background

The Ministry of Agriculture Fisheries and Food (MAFF) determines those watercourses which are classified as "main river" and have an upstream "main river limit" up to which the NRA's permissive maintenance powers can be applied. (Other watercourses are classified as "Ordinary Watercourses". The relevant local authority has permissive powers similar to those of the NRA on these watercourses.)

Changes in development and other land use can affect the relative strategic function of a watercourse and there may be cases where the route of "main river" and the actual location of the "main river" limit require review.

Options

(1) Complete a review of these parameters for the already identified watercourses of College Brook and Dagenham Brook.

(2) NRA to consider justifiable suggestions for extension/reduction of limits on other watercourses.

Pros and Cons

Appropriate resourcing will need to be secured for any large scale change of main river limits that may be identified. The effects of such changes on the parties involved would need to be addressed. Associated resourcing for maintenance requirements would have to be secured.

Who Could Be Involved

NRA, local authorities and MAFF.

4.12 POOR PHYSICAL ENVIRONMENT

Background

The southern part of the Lower Lee catchment has long been an area of poor environmental quality. Furthermore, water courses have been one of the worst aspects of this area, being primarily used for waste water disposal and the conveyance of flood flows in engineered channels. The physical results of this are still evident today. The most common examples are uniform channels, often constructed with concrete banks and bed, or culverted sections of rivers. Such modifications to natural river channels not only reduce their value as ecological habitats, visual amenities and recreational resources, but can also be an added health and safety risk. Anyone falling into a river with steep concrete sides and limited vegetation will have greater difficulty in finding their way out when compared to a natural river with bankside trees, shallow riffles and gently inclined banks.

A few rivers have been totally culverted (e.g. Stonebridge Brook, Tommy Lee Sewers), others have had extensive culverting (e.g. Moselle Brook) whilst most of the smaller streams have had limited lengths culverted. The NRA resists new culverting and the loss of natural riverine features. In the Lower Lee corridor the loss of natural environmental capital in terms of open watercourse has been so great, there is a very strong argument in favour of restoring watercourses to a more natural form. This can be done in a number of ways:

- opening up culverted watercourses when sites are redeveloped
- creating natural features in artificial channels, e.g. mud banks, gravel beds
- replacing concrete banks with sloping natural banks
- replacing straight sections with more natural meanders.

Another feature which reflects nature is the use of on-site storage of surface water run-off. In urban areas rain water passes very quickly through surface water drains into rivers. In undeveloped areas water takes time to soak into the ground (rates will depend on soil types) and accumulates on the natural flood plain, allowing more evaporation and infiltration into the ground. Flood water therefore feeds into rivers at a slower rate. The urban situation could be brought into line with nature by the installation of rain water storage facilities, be they open ponds or underground tanks. These can hold a certain amount of rainwater during a storm. This water can then be slowly fed into the local stream and hence back into the river system. Such facilities are most easily built into new developments or redevelopments but there may be opportunities also to build them into existing drainage systems.

Options

(1) a list of stretches of river where naturalisation works, including opening up of culverts, could take place should be compiled. Your views on any particular reaches would be welcomed along with reasons why they should be done. Once such a list is compiled, consideration could then be given to prioritising and planning such works.

(2) no new culverting should be permitted and there should be no net loss of natural watercourse.

Options (Continued)

(3) opportunities for overcoming physical barriers to movement should be examined. This could apply where rivers are in concrete channels and have to be fenced off for health and safety reasons, for example, parts of the Flood Relief Channel and Pymmes Brook.

(4) new developments should be considered with regard to the appropriateness of on site surface water storage.

(5) criteria should be investigated to determine where, if at all, the creation of flood water storage facilities on existing development would have significant benefits

(6) opportunities could be sought for installing reed beds to serve the dual functions of improving water quality and providing natural habitat.

Pros and Cons

Many of the above ideas are expensive or may reduce the amount of land available for development on certain sites. Some of the ideas rely on local planning authorities to implement them through Town and Country Planning legislation both in terms of policies in development plans and the implementation of such policies on specific planning applications. Works on the Bow Back Rivers may be brought forward as part of the Stratford City Challenge.

By starting to implement policies, such as those in the options, now, we can start to undo some of the damage already caused. Furthermore by having a priority list of schemes worked out on a cost-benefit basis, we may have pro-actively set up the basis for any bids for future European or central government funds for environmental improvements.

Who Could Be Involved

Local authorities (Planning, Engineering, Envionmental Health), NRA and developers, Stratford City Challenge.

4.13 PLANNING FOR MAJOR DEVELOPMENT

Background

The Lower Lee catchment has enormous potential for large scale redevelopment of land. The catchment is also the focus of UK Government and European Union attention for urban regeneration. Seven key opportunity areas are described below to illustrate this point.

(i) **Stratford**

The Jubilee Line extension, possible Channel Tunnel Rail Link station and existing good communications mean that large amounts of land with redevelopment potential in this area could be brought forward with positive proposals over the next five to ten years. Stratford also falls within the Thames Gateway. The general area of opportunity could extend south to Three Mills and down to the River Thames and north to Temple Mills, Leyton.

Several groups and partnerships including the private sector have been set up to achieve redevelopment, investment and environmental improvements in this area. The environmental works are concentrated in the Bow Back Rivers area. The NRA is keen to see improvements in this area and to support initiatives.

(ii) **Royal Gunpowder Factory (RARDE) Site, Waltham Abbey**

This site has been used for the production of gunpowder for several centuries, including supplying the battles of Trafalgar, Waterloo and the American Civil War. The Ministry of Defence have recently moved their operations off this site leaving it vacant. This site has a number of very important features: firstly, the northern part of the site is a designated SSSI; secondly, there is a considerable amount of contaminated land: and, thirdly, the site is of high historic value with most of the site designated as a Scheduled Ancient Monument and many of the buildings being Listed.

Epping Forest District Council has drafted policies for guiding future development of this site in their District Local Plan (Deposit Draft 1994). These allow redevelopment given satisfactory decontamination works and protection of the heritage and conservation value of the site. Additionally, a Gunpowder Museum should be incorporated.

(iii) **Royal Ordnance Site, Waltham Abbey**

Lying south of Waltham Abbey, this site is one which the MoD has been committed to vacating for a number of years.

Again, the Epping Forest District Local Plan identifies policies for the future redevelopment of the site. Requirements for the site include a new road link to be constructed from the M25 junction 26, to Highbridge Street, Waltham Abbey, and that the southern part of the site is not used for built development.

Background (continued)

(iv) **Royal Small Arms Factory (Enfield Island), Enfield Lock**

This is another site which the MoD has vacated and is known to be heavily contaminated. The site has moved from Epping Forest District to the London Borough of Enfield as part of local government boundary changes implemented in 1994. The site has been the subject of development proposals for mixed use including light industrial and commercial premises as well as residential areas. A Planning Brief was drawn up for the site in 1989 by Epping Forest District Council. This ensures that the site is redeveloped as a whole.

(v) **Rammey Marsh Sludge Disposal Works, Enfield Lock**

TWUL currently still use this site for operational purposes, although it has indicated that the land may become surplus to requirements and available for development. The London Borough of Enfield see this as an area of opportunity which could accommodate a mixed development of residential, business and open space use. Before this could go ahead the feasibility of extracting gravels from the site would be investigated. If planning permission is granted for the extraction of gravel any development of this site will only happen in the long term.

(vi) **Temple Mills**

This is an area of railway sidings and marshalling yards in the Leyton area. Much of the land is surplus to the operational requirements of the railways and the L.B. of Waltham Forest are seeking to optimise employment provision through new development at this site.

(vii) **Thames Gateway**

Formerly known as the East Thames Corridor this is a Government initiative to raise the profile of East London and areas both north and south of the River Thames in Essex and Kent. This area includes the southern area of the catchment including the tidal sections of the River Lee (Bow Creek) for which there is very little data on its current ecological status. It is conceivable that major development pressure could occur in this area given the amount of derelict land and the transport infrastructure developments.

All of the above areas are within the Lee valley and four of them are grouped in close proximity to the M25 at Waltham Abbey. Together they represent opportunities for major change within the catchment. This change will be managed by local planning authorities using Town and Country Planning powers. All interested parties, will have an opportunity to comment on any development proposals as part of the formal consultation process for planning permissions.

Options

(1) individual people and organisations continue to respond to ideas put forward by developers and/or local authorities (i.e. planning briefs).

Options (continued)

(2) use this consultation process to collect together views on what could reasonably be gained for the water environment from these and other areas of opportunity (see Section 4.17).

(3) establish a strategic and integrated framework for land and water use in the Lee valley so that we can maximize the overall improvements to the water environment.

(4) carry out surveys of Bow Creek to determine its current ecological value.

(5) ensure consistency between regional, London-wide, County, District and Borough land use planning policy in relation to water issues in general and any overall development strategy as indicated in (3) above.

Pros and Cons

The first option leaves the possibility of under achieving benefits for the whole catchment though a lack of co-ordination. The second and third options are proactive approaches which will again be time consuming, but may have widespread support. In reality the case may arise that different views come forward on each site which cannot be reconciled into a unified approach. Baseline environmental data is an essential element in determining the potential impacts of new development.

Good success has been achieved in integrating water and land use issues in a variety of statutory and non-statutory plans in recent years in the catchment. However, the scale of potential development in the area requires continued effort to ensure the best outcome for the water environment.

Who Could Be Involved

Local authorities (Planning, Drainage), LVRPA, BW, NRA, landowners, developers, interest groups and any interested parties.

4.14 NUTRIENT ENRICHMENT OF RIVERS

Background

All rivers contain nutrients which support flora and fauna. However, large excesses may cause significant increases in algal and/or weed growth, both of which have detrimental effects in terms of the amenity, aesthetic and ecological value of rivers and lakes and can lead to health hazards in terms of toxins produced by, for example, blue-green algae.

The sources of these nutrients, principally nitrates and phosphates, can come from fertilisers used on agricultural land and effluent from sewage treatment works (STW). The Lower Lee receives water from the predominantly rural upstream catchments of the Upper and Middle Lee and two very large STWs discharge their effluent into the lower River Lee system.

The process of stimulating excessive plant growth is known as eutrophication and there has been evidence of this occurring within the catchment on some of the lakes and slower flowing rivers, particularly the Lee Navigation. Indeed in a recent study commissioned by the NRA some reaches were described as hypertrophic, i.e. even greater nutrient levels than in a river that is eutrophic.

Options

(1) continue to monitor the nutrient loading on the River Lee to build up data on the causes and sources of eutrophication in order that any future improvements can be quantified and demonstrated

(2) review the position of the River Lee, and any other affected watercourses, for inclusion under the EC Urban Waste Water Directive (91/271/EEC) Sensitive Areas (Eutrophic) when the Government reviews designated areas in 1997

(3) if the River Lee is designated, it would then be possible to plan for finances to be set aside to reduce the problem. Typical action could include phosphate stripping at STWs but action may also be needed to address more diffuse sources of nutrients such as those from agricultural inputs.

Pros and Cons

Progress would appear to be dependent upon recognition by the Government of the need to designate the River Lee as a Sensitive Area (Eutrophic) under the relevant EC directive. There may be a good case for designating the River Lee given its high profile, location within London and large demand for recreational open water and river facilities, if the scientific data collected justifies designation.

Who Could Be Involved

NRA, TWUL, UK Government and interest groups.

4.15 LITTER AND DEBRIS

Background

Some of the rivers in the catchment, particularly in the southern section are prone to the dumping of rubbish and accumulation of litter. This looks unsightly, but can also be a nuisance for boats and a potential pollution and flood defence hazard. Some of the litter occurs through carelessness or neglect whilst other sources may be more deliberate, for example shopping trolleys, household items and stolen cars.

As described in Section 2.15, the NRA does not own rivers generally, but has permissory powers for maintenance work granted to it in order to reduce flooding risk. Debris clearance is carried out on watercourses in the catchment according to such flood risk priorities. The NRA does not however have the power or the resources to deal with smaller items of litter.

The generally held view is that litter attracts more litter, in terms of influencing people's behaviour. Therefore in order to reduce litter in the long term, the rivers need to be kept as free as possible of litter.

Options

(1) regularly clear up litter from rivers. This could be done by a variety of voluntary and statutory groups

(2) regular clearance of large items of debris by organisations such as the NRA and British Waterways

(3) clearer reporting mechanisms to be established to ensure action is taken promptly.

(4) booms or litter traps could be installed at locations where debris is a continual problem, particularly from tidal influxes

(5) educate people to take an environmentally responsible attitude to the disposal of litter

(6) ensure enforcement action is taken against fly tippers.

Pros and Cons

Picking litter from rivers is an extremely labour intensive, and therefore costly, activity. It would be difficult to justify large expenses on any single body. They may be scope for improving response times when dealing with single large items of debris, especially as these can prove to be problems for navigation and flood defence reasons.

Who Could Be Involved

Local authorities, NRA, BW, LVRPA, Lower Lee Project and other local voluntary groups, the community as a whole.

Background

Although the River Lee and the Lee valley is the main focus of the catchment, there are many important tributaries which have their own particular character, features and issues, albeit on a more localised scale.

(i) Nazeing Brook

There have been incidents of localised flooding along Nazeing Brook, including recent events in 1987 and 1983. These have occurred despite flood alleviation works carried out by both the NRA and Epping Forest DC. In the 1993 flood, tens of thousands of pounds worth of damage was sustained to property in the Nazeing area. In the light of this, there is a need to review the standard of protection from flooding for Nazeing.

Options

(1) examine the causes of flooding problems and investigte the provision of a flood warning station on upstream sections

(2) seek possible remedies, including ideas put forward by local residents, and pursue schemes which offer benefits in excess of their cost.

Pros and Cons

Flooding presents major problems for those affected and it is clearly desirable to prevent it where possible. However, any works proposed need to be assessed on a cost benefit basis along with any environmental impacts they may have.

Who Could Be Involved

NRA, local authority and local residents.

(ii) Woolens Brook, Spital Brook, Turnford Brook, Rags Brook, Theobalds Brook

These brooks to the west of the Lee valley are all essentially rural streams although they flow through urban areas like Hoddesdon, Broxbourne and Cheshunt close to their confluences with the River Lee. They are thought to be of high conservation value and Theobalds Brook in particular is a good example of a clay headwater stream. However, there is currently little data, particularly biological data, to support this view. Some local flooding problems have been experienced on these watercourses.

Options

(1) carry out further biological monitoring to establish the value of these streams

(2) produce feasibility studies into potential measures to reduce the risk of flooding.

(ii) **Woolens Brook, Spital Brook, Turnford Brook, Rags Brook, Theobalds Brook (ctd)**

Pros and Cons

Flooding presents major problems for those affected and it is clearly desirable to minimise the risks where possible. However, any work proposed needs to be assessed on a cost benefit basis along with any environmental impacts they may have.

Who Could Be Involved

NRA, Herts and Middlesex Wildlife Trust and local interest groups.

(iii) **Cuffley Brook**

Cuffley Brook is essentially a rural stream with relatively natural habitat along much of its length. The only urban influences are from Cuffley and the M25. However, it has been assessed as being poor water quality and therefore its provisional Water Quality Objective (PWQO) is also low (RE5). This is the same as the worst sections of the River Lee which receive very large amounts of urban run-off. Biological sampling has also indicated this river as being of poor quality.

This is of particular concern as the Cuffley Brook flows into the Turkey Brook which is of fair to good water quality. Part of the problem may be that Cuffley Brook is ephemeral (i.e. naturally dries up) in its upper reaches.

Options

(1) investigate the causes of the poor water quality in Cuffley Brook

(2) examine options for revising the PWQO for the Brook upwards to reflect the expectations for this river.

Pros and Cons

Relatively natural rivers draining predominantly rural areas, such as the Cuffley Brook should not be of such poor water quality. If quality problems are due to natural phenomena, then this must be recognised but not used as an excuse for continuing poor water quality.

Who Could Be Involved

NRA, local people, landowners and local interest groups.

(iv) **Turkey Brook**

The water quality on Turkey Brook is poor and its PWQO reflects this (RE5). The brook flows through the Green Belt and as with Cuffley Brook it must be questioned as to why water quality is so poor. There is an anomaly in that biological monitoring classifies most of the river as of at least fair quality. There are also problems with litter in the urban sections of the Brook and repeated incidents of sewage pollution in the reaches close to Albany Park.

Options

(1) investigate the causes for poor water quality in the Turkey Brook

(2) examine options for revising the PWQO for the Brook upwards to reflect the expectations for this river

(3) identify options for reducing levels of litter in the Brook

(4) trace and if possible remedy causes of sewage pollution.

Pros and Cons

Although this is a Green Belt stream, it may receive run-off from Potters Bar and the M25 which may affect its quality. The problems of litter and sewage can be difficult ones to deal with but the most likely sources are in the urban area of Enfield Highway.

Who Could Be Involved

Local Authorities, NRA, TWUL, local people and local interest groups.

(v) **Cobbins Brook**

There have been both water quality and flooding problems on the Cobbins Brook. The biological surveys of the Brook indicate limited biological diversity, despite a relatively natural channel upstream of Waltham Abbey with many meanders. The water quality may be affected by the chemicals used in the greenhouse industry which has historically been located in this part of the catchment.

Within Waltham Abbey there have been flood alleviation works carried out to reduce flood risk. These have resulted in artificial channels with vertical concrete banks. Localised but severe flooding as in 1987 still persists.

(v) **Cobbins Brook (continued)**

Options

(1) investigate causes of pollution in the Cobbins Brook

(2) examine causes of flooding, including the impacts of new developments and examine a full range of options for reducing the risk. Recent reviews of investigations have demonstrated that the cost of further action exceeds the benefits. Seek to provide improved flood warning by installing monitors at the upstream reaches of the Brook

(3) seek opinion on the desirability and feasibility of improving the physical habitat of the river through Waltham Abbey, both in terms of public amenity and natural habitat.

Pros and Cons

The Cobbins Brook presents a range of difficulties, all of which are issues but which at present are not considered priorities. From a catchment wide perspective this would make the Cobbins Brook a low priority, unless particular public interest could be established. Previous efforts by the NRA to identify cost efficient flood defence options have not proved successful.

Who Could Be Involved

NRA, local authorities, land owners, interest groups, residents and local people.

(vi) **Salmons Brook**

Salmons Brook has its head waters in the Green Belt and flows through Enfield and Edmonton. It accepts Deephams STW effluent just before its confluence with Pymmes Brook. Water quality is generally fair throughout much of the Brook's length with reaches of good biological diversity in the upper reaches. It is designated as a Green Chain by the L.B. Enfield UDP, although several sections are culverted and have limited public access. The fisheries value of the river has never been systematically evaluated.

Some flooding has occurred in the past from Salmons Brook. An investigation has taken place which has found that any flood alleviation scheme cannot be justified economically. Other flooding has emanated from a tributary of the brook, Houndsden Gutter.

Options

(1) examine options for opening up culverts and restoring natural river features, particularly when redevelopment occurs, in line with the Green Chain designation

(2) maintain water quality and seek opportunistic measures for improvement where possible. Gather data on the fisheries value and potential of the brook

(3) further flood defence investigations into the problems of the Houndsden Gutter and the role of the Ivy Road, Southgate storage tank in reducing flood risk.

(vi) **Salmons Brook (continued)**

Pros and Cons

This river is in good health relative to some of the other urban tributaries. Whilst this means there may not be pressing problems to be addressed further improvements may be feasible to make it a fully functioning Green Chain with both amenity and wildlife value.

Sources of funding for opening up the culverted sections may prove difficult to find.

Who Could Be Involved

L.B. Enfield, NRA, developers, interest groups and riverside landowners.

(vii) **Pymmes Brook**

Pymmes Brook is a more urbanised river than the Salmons Brook and exhibits more acute problems. From its first contact with the urban area (East Barnet), it is degraded by poor water quality and engineered river channels. This is in spite of the river flowing through many areas of open land including Oak Hill Park, East Barnet, Arnos Park, Southgate, Pymmes Park, Edmonton and Tottenham Marshes, Tottenham, as well as the Muswell Hill golf course and St. Pancras and Islington cemetery which lie on the Bounds Green Brook.

Mis-connections (see Issue 4.4), are known to be a problem along much of the Pymmes Brook and its tributaries. Particular problem areas are thought to be East Barnet and Muswell Hill. This is supported by measured levels of bacteria. The London Borough of Barnet, Drainage Department, carried out some investigations into this problem and achieved limited success. Tracing sewer pipes is a labour intensive and expensive activity.

Pymmes Brook is also identified as a Green Chain in L.B. of Enfield's UDP. Clearly the river's amenity and ecological value is restricted by poor water quality and concrete banks. The physical structure of the river is a greater problem in the downstream reaches through Edmonton and Tottenham where it has been fenced off in places and presents a barrier to movement.

No systematic review of the fisheries potential of the brook has been undertaken.

Options

(1) establish where there is a clear need and public desire to improve the water quality of Pymmes Brook and its tributaries

(2) investigate more closely the causes of poor water quality, including targeting action on misconnections

(3) look for opportunities to improve the amenity value of the river particularly within areas of open land. This could include involving local volunteer groups and schools

(vii) **Pymmes Brook (continued)**

Options (continued)

(4) carry out research into the feasibility of localised reed bed treatment to improve water quality. Possibilities may include areas of open land on the Pymmes Brook and its tributaries

(5) the North Circular Road (Telford Road), New Southgate is due to be considered for widening. Improvements to Bounds Green Brook could be included in conjunction with this scheme

(6) examine options for opening up culverts and restoring natural features in the river channels, particularly when redevelopment occurs, in line with the Green Chain designation

(7) undertake fisheries survey of the brook to assess its current value and potential.

Pros and Cons

Given the poor current state of much of the Pymmes Brook it may be difficult to develop support and enthusiasm for actions which could be relatively expensive. However, the fact that the river is generally quite accessible and flows through public parks should help to raise its profile.

Who Could Be Involved

L.B. Enfield, L.B. Haringey, L.B. Barnet, local volunteer groups, local schools, TWUL, NRA, developers, riverside landowners, Dept of Transport, Highways Agency and interest groups.

(viii) **Moselle Brook**

The Moselle Brook and its tributaries are mostly culverted. From the sources around Highgate, East Finchley and Muswell Hill, through Hornsey, Wood Green and Tottenham there are only two significant sections of open watercourse at Lordship Recreation Ground and Tottenham cemetery. This fact has been recognised by the L.B. Haringey and their UDP highlights the route of the Brook as being a potential Green Chain.

The water quality in the Brook is amongst the worst in the catchment. This problem is reflected in very high bacteria levels, particularly from the upstream sections of the Moselle Brook in Highgate and Hornsey and very poor biological quality. Poor water quality is exacerbated by the lack of open reaches of water which would allow plant growth and natural breakdown of at least some of the pollutants.

Investigations are currently taking place into the structural stability of certain culverted sections of the Moselle Brook. Consideration by the involved parties into required future works will need to be given once the outcome of this study is known.

(viii) **Moselle Brook (continued)**

Options

(1) pursue opportunities to open culverted sections of river, particularly with redevelopment proposals, in line with the policy of establishing of a green chain along the route of the Brook

(2) investigate sources of pollution and the costs and benefits of remedies.

Pros and Cons

With such a decimated river, it may be hard to envisage a return to a semi-natural state of ecological and amenity value. However, the third option is an unsustainable approach because the Brook flows through accessible public open spaces. Given that this area is generally short of open space it makes the possibility of recreating what was once a natural stream even more important. It must be realised that it is likely to take a long time to achieve this, but it has taken 150 years of progressive urbanisation to achieve the current position.

Sources of funding for the opening up of culverts may prove difficult to find.

Who Could Be Involved

L.B. Haringey, NRA, local interest groups, TWUL and developers.

(ix) **Ching Brook**

The Ching Brook has been identified in L.B. Waltham Forest UDP as a Green Chain. It has some sections of culverted river and restricted access. Again, it drains a large urban catchment and biological quality is poor.

Options

(1) press for opening up of culverts and improvements to the river corridor for conservation and amenity in line with the Green Chain designation

Pros and Cons

As no new issues have been raised on this Brook, this action represents a continuation of the current approach, but more widespread support for this could change the emphasis placed on improving the river corridor.

Who Could Be Involved

L.B. Waltham Forest, developers, NRA, interest groups and riverside owners.

(x) **Dagenham Brook**

The Dagenham Brook drains parts of Walthamstow and Leyton which are predominantly urban areas to the east of the brook. Within this catchment, 50% has hard surfaces giving an indication of the population density.

The brook has reaches of earth channel, concrete lined channel and culverts. The earth channel reaches are typically silt bedded with grass and vegetation on the banks and occasionally debris due to the proximity of highly urbanised areas. The water quality of the brook has been found to be of bad quality according to biological surveys. Bacteriological data for the brook indicates that it has the highest levels of faecal contamination of any stretch of open 'main' river within the Lower Lee catchment. (see Section 3.1).

The brook is accessible and could be a potential green link through the urban area. Improvements to the landscape, riverside pathways and linkages with other path networks could greatly enhance the brook.

Options

(1) the London Borough of Waltham Forest has recognised the need for the improvement of this watercourse and has included it in a major area-based bid for central government SRB (Single Regeneration Budget) funds. Identify the best ways to invest SRB money in physical improvements to the Brook and its river corridor for recreation, amenity, access and nature conservation

(2) identify the sources of pollution, particularly bacteriological (e.g. sewage), and investigate opportunities for improving water quality

(3) remove the invasive plant species, e.g. Japanese Knotweed and any other plants causing overcrowding of the channel

Pros and Cons

The Brook is within the Objective 2 designated area (see Section 2.13) and part of it is within a successful bid area for SRB funds.

The overall landscape value of the area would be enhanced by improvements to the quality of the water and habitats for wildlife. The removal of invasive plant species would also contribute to these improvements. Having enhanced the overall safety of the area, it would then be possible to consider it for projects such as green chain networks and pathways, thus increasing accessibility to the area. Any projects carried out in the area should involve local groups and could be used as a 'model' project on rehabilitation of degraded urban watercourses. The brook is open and accessible which makes it easier for projects to be implemented.

Who Could Be Involved

L.B. Waltham Forest, landowners, developers, NRA, LVRPA, local people and interest groups.

The catchment has already been identified as needing action to bring about real physical, social and economic improvement. The list below demonstrates the scale and range of projects that have already received some degree of consideration and would help to address some of the issues presented in this plan. Most of the projects have been proposed by London Boroughs or the LVRPA and aim to improve the recreational facilities and physical environment of the Lower Lee catchment. Finance has been sought from a wide variety of government, European and other grants and trusts and it has yet to be seen which, if any, projects progress.

With the approach of the year 2000, a number of projects and events are being planned to celebrate the Millennium. These projects could attract funding from the Millennium Commission. There is a possibility that some of the projects identified below could as part of a co-ordinated package be eligible for such funding. If this approach were to be followed it should be linked closely to other improvement works in the valley but have its own particular objective and identity.

A recent report 'The London Millennium Study - towards a vision for the Millennium' highlighted the lack of projects in outer London and north-east London in particular. It also highlighted a lack of small scale projects, which most of those listed below are. In view of these two facts the NRA believes that there is an opportunity for a wide range of agencies and local interest groups to join together to consider a submission to the 'Millennium Commission'. **Your views on this idea are welcomed.**

TABLE 8 : COMPARISON OF POTENTIAL PROJECTS WITH ISSUES IN THE LOWER LEE CATCHMENT

Project Details	Issues
Rammey Marsh, Landscaping and Access improvements.	Landscape, Amenity & Recreation, Poor Physical Environment, Major Development Planning
Swan & Pike Pool, Enfield Lock, Car Park/Picnic/Access/improved environment	Landscape, Amenity & Recreation
Enfield Lock Bridge, Open up pedestrian and cycle access to area	Amenity & Recreation
Circular Walks to Messups Creek and Turkey Brook	Amenity & Recreation
Tottenham Marsh Improvements - Landscaping and Access	Landscape, Amenity & Recreation, Contaminated Groundwater, Tributaries
Tottenham Marsh Further Improvements. Toilet Facilities, event areas etc	Amenity & Recreation
Folley Lane to the river - linking footpath and cycleway joining the Park path	Amenity & Recreation
West Leyton: Dagenham Brook, Temple Mills. Linked footpath with landscaping scheme.	Landscape, Amenity & Recreation, Invasive Plant Species, Water Quality, Poor Physical Environment, Litter & Debris

Brimsdown Lee Navigation Corridor improvements including Messups Creek	Litter & Debris, Landscape, Amenity & Recreation, Poor Physical Environment
Lee Valley Reservoir Banks, Landscaping to base of reservoirs as a gateway to the Valley	Landscape
Lee Valley Trading Estate, North Circular Road. Wharf & towpath environmental enhancements	Landscape, Amenity & Recreation
Lea Bridge Road. Phase 2, Landscaping improvements at a gateway	Landscape
Lea Bridge Road. Phase 3 Landscape improvements to car park and south side of road	Landscape
Hackney Wick Community Forest	Landscape, Poor Physical Environment
Residential Moorings - Salmon Lane Stepney. Development of vacant site to provide permanent residential moorings and riverside facilities	Amenity & Recreation
Victoria Park Wharf feasibility study to investigate creation of new mooring basin at Victoria Park Wharf.	Amenity & Recreation
Victoria Park Wharf. Excavation new basin for residential mooring with improved facilities and access	Amenity & Recreation
Graffiti removal.	Landscape
Stonebridge Lock, Tottenham. Provide a new marina with recreational facilities	Amenity & Recreation
Floating Market at Tottenham Hale with Chinese Centre, restaurant and training school	Amenity & Recreation
Wetlands Heritage Centre, Lea Bridge Road - interpretation centre and nature reserve on old water filtration site	Poor Physical Environment, Amenity & Recreation
Three Mills setting. A package of environmental schemes to improve the setting of listed buildings and to enhance / develop disused sports ground for events, information, recreation and wildlife	Landscape, Amenity & Recreation, Poor Physical Environment
Heritage Trail. A 'Birthplace of Technology' trail covering the whole of the Valley.	Amenity & Recreation
Lea Bridge Road underpass - improve pedestrian access to open spaces and provide a safe north / south route	Amenity & Recreation
Bridge to link Hackney Marsh to Essex Filter Beds as part of pedestrian access to area	Amenity & Recreation

Improvement to boating club facilities to attract user groups to the river and to develop further water based and other training courses. Bankside improvements.	Amenity & Recreation, Poor Physical Environment
Bow Flyover. Pedestrian Link under Bow flyover to join existing pedestrian routes	Amenity & Recreation, Poor Physical Environment
Bow Housing Action Trust improvements. Environmental improvements to Hertford Union Canal side.	Landscape
Wellington Boat Club, Tower Hamlets. Scheme to establish boating / canoeing club on Regents Canal. Provision of changing rooms.	Amenity & Recreation
Regents Canal Towpath improvements linking Mile End Park and Victoria Park to Limehouse Basin and the Thames as part of a green corridor strategy and development of a regional footpath	Amenity & Recreation
Limehouse Cut Towpath. Improvements linking Limehouse basin to River Lea.	Amenity & Recreation
Lea Valley minor landscaping, planting of reed beds, excavations of Roman Ford, signage etc	Landscape, Amenity & Recreation, Invasive Plant Species
Pedestrian Bridge over canal near Queen Mary and William college, Mile End. Bridge to enable pedestrians on the west side to gain access to towpath and Mile End Park.	Amenity & Recreation
Improvements to Bridge / links to Hertford Union Canal from Four Season Park and Yellup Yard. Provide a pedestrian link from railway line to eastern end of Hertford Union Canal with Landscaping.	Amenity & Recreation
New Canal side link on west side of Regents Canal from Old Ford to Roman Road	Amenity & Recreation
Footpath / cycleway network. Improving links, providing signage and interpretation along the river corridor and into Stratford and West Ham. Feasibility study to examine pedestrian and cycle links from Bully Fen to residential areas.	Amenity & Recreation
Maintenance Team. A range of works to realise the leisure, and recreational amenity, and ecological potential of the river and its corridors including works to enhance navigation potential, water safety and ongoing river cleanup principally through the maintenance team.	Amenity & Recreation, Landscape, Litter & Debris, Poor Physical Environment, Invasive Plant Species

Nature Conservation Trail within the Lee Valley Park	Amenity & Recreation, Poor Physical Environment
Sculpture Trail within the Lee Valley Park's Enfield area.	Amenity & Recreation
Improved signage and Valley identity, within the Lee Valley Park.	Amenity & Recreation
Feasibility and then upgrade Park path to cycleway where immediately practical	Amenity & Recreation
Access to Park Path from Tower Hamlets along link adjacent to Hertford Union Canal with two crossing points into Newham.	Amenity & Recreation
Picketts Lock, Edmonton. Bank protection works. Regrading of waterside margins to reduce erosion and increase conservation interests.	Poor Physical Environment, Landscape
Lee Park Way. Re-profiling of banks to increase accessibility and enhance conservation interest.	Amenity & Recreation, Poor Physical Environment
Tottenham Marsh Scrape. Provide an area for birds and experimental method of dealing with pollution problems	Landscape, Water Quality, Poor Physical Environment
Re-introduce Black poplar on the bankside at North Marsh. Conservation of a threatened tree.	Landscape
Walthamstow Marsh recreation of ditch to enhance wildlife interest	Water Levels
Limehouse Cut Towpath. Improvements linking Limehouse basin to River Lee.	Contaminated Groundwater, Amenity & Recreation
Bow Locks. Improvement to the locks to facilitate commercial traffic on the river and to reduce tideborne pollution.	Litter & Debris, Water Quality
River Cleanup Campaign. Study of sources of pollution in the river area. Dredging to remove historic pollution in river bed.	Water Quality, Amenity & Recreation, Nutrient Enrichment
Study & Pilot to determine an economic and sustainable way of dealing with problems of road water run off polluting the river.	Water Quality, Litter & Debris, Tributaries, Poor Physical Environment, Amenity & Recreation
Bow Creek (Limmo pennisula) wetland Ecology Park	Poor Physical Environment, Landscape
Bow Back River Strategy	Amenity and Recreation, Landscape, Poor Physical Environment
Reed Bed Planting along Bow Creek.	Landscape, Water Quality

TABLE 9: HOW THE ISSUES MEET THE MANAGEMENT THEMES OF THE VISION

	ISSUE				
VISION THEME	Communication Between Groups	Water Quality Downstream of Tottenham	Water Quality Between Feildes Weir and Tottenham Lock	Contaminated Land in the Lower Lee	Water Levels
COMMUNICATIONSAND CO-ORDINATION					
• sustainability through co-ordination	•	•		•	•
• effective communications	•			•	
RAISING OUR SIGHTS					
• breaking the cycle of decline	•	•			
• raising expectations	•	•	•		
• raising awareness	•	•	•		
CATCHMENT QUALITY					
• protecting and enhancing the Lee Valley and associated water environment		•	•	•	•
• health and safety		•		•	•
• balancing interests		•	•		•

	ISSUE				
VISION THEME	Recreation and Amenity Facilities	Invasive Plant Species	Landscape of the Lower Lee	Management of Flood Risk	Poor Physical Environment
COMMUNICATIONSAND CO-ORDINATION					
• sustainability through co-ordination	•			•	•
• effective communications	•				•
RAISING OUR SIGHTS					
• breaking the cycle of decline			•		•
• raising expectations			•		•
• raising awareness	•	•			
CATCHMENT QUALITY					
• protecting and enhancing the Lee Valley and associated water environment	•	•	•	•	•
• health and safety		•		•	•
• balancing interests	•				

TABLE 9 (Continued): HOW THE ISSUES MEET THE MANAGEMENT THEMES OF THE VISION

	ISSUES			
VISION THEME	Planning for Major Development	Nutrient Enrichment of Rivers	Litter and Debris	Tributary Issues
COMMUNICATIONS AND CO-ORDINATION				
• sustainability through co-ordination	•		•	•
• effective communications	•			•
RAISING OUR SIGHTS				
• breaking the cycle of decline	•			•
• raising expectations	•	•	•	•
• raising awareness			•	•
CATCHMENT QUALITY				
• protecting and enhancing the Lee Valley and associated water environment	•	•		•
• health and safety	•		•	
• balancing interests	•	•		•

Appendix I:
Organisation Responsibilities and NRA Aims and Strategies

Appendix II:
Report on Informal Liaison

Appendix III:
Supporting Information

Appendix IV:
Glossary

Appendix V:
Bodies Being Consulted Over This Plan

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

INTRODUCTION

The supply of water for domestic consumption and industrial use is not the responsibility of the NRA but of **water and sewerage undertakers**. The prices charged by these private companies are regulated by the **Office of Water Services**. The quality of water supplied for consumption is monitored by the **Drinking Water Inspectorate** and **District** or **Borough Councils**.

The disposal of sewage effluent is the responsibility of **water and sewerage undertakers.** Their discharges are subject to control by the NRA. Potentially significant industrial discharges to the water environment are controlled by **Her Majesty's Inspectorate of Pollution.**

The NRA has the primary responsibility for flood defence and land drainage matters but on "ordinary watercourses" the responsible land drainage and flood defence agency is the **District** or **Borough Councils** who may also manage on behalf of **water and sewerage undertakers** surface water drains leading to rivers and watercourses and the pipe networks carrying sewage to sewage treatment works.

British Waterways are responsible for navigation on the Lee and Stort Navigations and on the relevant canals (i.e. Hertford Union, Limehouse Cut and Grand Union Canal). The **Port of London Authority** are responsible for navigation on the lowest reaches of the River Lee.

The responsibilities of the above organisations are described further below. The activities of the NRA are then described in detail.

Water and Sewerage Undertakers

These private companies are responsible for providing water supplies and the management of sewage treatment works. Thames Water Utilities and Three Valleys Water Company both provide services to the catchment area.

Her Majesty's Inspectorate of Pollution (HMIP)

HMIP is the regulatory authority for Integrated Pollution Control. This is a system introduced to control pollution from industrial processes which could cause significant pollution to air, land or water. Discharges from sewage treatment works and other discharges to water are regulated by the NRA.

Drinking Water Inspectorate (DWI)

The DWI is responsible for checking that companies supplying drinking water carry out proper monitoring and meet the regulations for the quality of water supplies set in part by the European Community Drinking Water Directive.

Office of Water Services (OFWAT)

A government agency responsible for making sure that the water and sewerage undertakers provide customers with a good quality and efficient service at a fair price.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

District or Borough Councils

These authorities monitor the quality of all water supplies, including private supplies, within their area. They can require improvements to be made to private water supplies.

Watercourses which have not been statutorily designated as "main river" on maps held by the NRA and Ministry of Agriculture, Fisheries and Food (MAFF) are known as "ordinary watercourses". The provision of flood defence and land drainage services on these watercourses is the responsibility of the relevant council.

British Waterways (BW)

Created by the Transport Act 1962 BW is the largest navigation authority in the country. The Lee and Stort Navigations are run by BW (Southern Region). Their mission statement is; 'Our business is to manage the inland waterways system efficiently for the increasing benefit of the United Kingdom. We provide a safe and high quality environment for users, staff and local communities. We take a commercial approach and aim for excellence in every aspect of our work. The heritage and environment of our waterways will be conserved, improved and made to work well for future generations'.

Port of London Authority (PLA)

As a public trust, the PLA is required to run the Port of London for the benefit of port users and the community as a whole. It is a non-profit making body and is wholly self-financing. It receives no Government subsidy and has no equity capital, but funds all its operations from its reserves, supplemented as necessary by commercial loans and leasing.

National Rivers Authority (NRA)

Our Mission Statement (printed on the inside of the front cover) is supported by the following aims:

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

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

Strategic Objectives

Corporate Strategy

The NRA's vision is of a healthy and diverse water environment, managed in an environmentally sustainable way, balancing the needs of all users.

Sustainable development is at the heart of international and UK policy on the environment. The most widely accepted definition of sustainable development was originally included in the 1987 Brundtland Report and is as follows: "....development that meets the needs of the present without compromising the ability of future generations to meets their own needs". This has been further developed through Agenda 21, the action plan for the next century, endorsed at the 1992 UN conference on environment and development held in Rio de Janeiro (the 'Earth Summit').

Sustainable development must embrace environmental, social and economic concerns for it to be a workable concept; our challenge is to apply it to the water environment. The NRA Corporate Strategy relates the principles of sustainability, precaution and economic efficiency to our Mission to protect and improve rivers and coastal waters.

To achieve our Mission we apply three principles:

- *making real improvements to the water environment through effective local operations*
- *integrating our services to balance the needs of water users with those of the environment*
- *providing value for money through economic efficiency and effective use of our resources.*

We are guided by three core values which we use as a template by which we can judge our actions:

- *achievement of results*
- *teamwork*
- *trust.*

Our functional strategic objectives for water resources, water quality, conservation, recreation, flood defence, navigation and land use planning are described later. These express how we achieve our Mission and Aims. They follow a logical cycle of planning, action and subsequent review.

Plan

- To plan for environmental sustainable improvement through an integrated approachto river catchment management.

Act

- To protect and regulate the water environment and its various uses by achieving agreed standards and objectives.
- To identify and ensure implementation of balanced, lasting and cost-effective solutions to environmental problems.
- To provide customers with advice, information and incentive to influence behaviour and mitigate or prevent environmental damage.
- To use collaboration, partnershipand consultation with others to further NRA objectives and make best use of available resource.

Review

- To assess and report on the state of the water environment and our success in ensuring its sustainable use.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

Water Resources

It is the NRA's responsibility to assess, manage, plan and conserve water resources. The Water Resources Act 1991 describes the duty of the NRA to be to ensure measures are taken towards conservation, redistribution, augmentation and proper use of water resources. The Act requires the NRA to make arrangements with water and sewerage undertakers and statutory water companies for securing proper management and operation of water resources and associated works. To effect these requirements the NRA controls abstractions by a licensing system and has the power, if necessary, to issue drought orders and designate water protection zones and nitrate sensitive areas.

Under the Water Resources Act 1991 all abstractions require a licence except for those of less than 20 cubic metres a day for domestic or agricultural use from surface water and those of less than 20 cubic metres per day for domestic use. There are also other exceptions for small abstractions from boreholes and springs. Charges for abstraction licences are based upon quantity, source, season and loss.

To secure proper management of water resources the NRA operates a hydrometric network of rainfall and river flow gauging stations. These not only provide data for water resource assessment but also for flood prediction, impact of effluent discharges, fisheries management, conservation and recreational uses.

Our Strategic Objectives are:

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

Water Quality

The aim of the NRA is to maintain and improve the quality of rivers, estuaries, coastal waters and groundwater through the control of water pollution. These aims are fulfilled via:

- water quality management
- effluent quality regulation
- pollution incident investigation and
- pollution prevention.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

Water quality management is based principally on monitoring of the environment to establish chemical, biological and microbiological quality. These data are used by the NRA to detect trends, plan improvements and execute its statutory duties regarding the setting of discharge parameters and compliance with EC directives.

The NRA controls inputs into the environment via the issue of consents. Discharges from industrial, agricultural, domestic and sewage related sources are regulated by specification of effluent quality limits and conditions which the discharger must achieve. Such discharges are routinely monitored and failure to satisfy consent conditions may lead to legal action being taken.

The NRA makes an immediate response to all reports of pollution. During a pollution incident investigation actions are taken to identify the source, stop the discharge, minimise adverse effects and ensure remedial work where appropriate is completed. Legal action is considered in cases of serious and/or repeated incidents.

Pollution prevention via development control and advice on best practice to industry, farmers, water supply and sewage companies is carried out in support of water quality management to prevent deterioration of the water environment.

Our Strategic Objectives are:

- To maintain waters that are already of high quality.
- To improve waters of poorer quality.
- To ensure all waters are of an appropriatequality for their agreed uses.
- To prosecutepolluters and recover the costs of restorationfrom them.
- To devise charging regimes that allocatethe costs of maintainingand improving water quality fairly and provide incentive to reduce pollution.

Conservation

Conservation activities of the NRA aim to:

- conserve and enhance the wildlife, landscapes and archaeological features associated with inland and coastal waters
- promote the conservation of aquatic flora and fauna.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

The statutory duties under the 1991 Water Resources Act further state that the NRA shall further the conservation and enhancement of natural beauty in respect of proposals relating to NRA functions, protect sites of conservation interest and take into account the effects that any proposals would have. This is achieved through regulating the work of others through the land use planning consultation process and the issuing of consents under the Land Drainage Act 1991 and Water Resources Act 1991 for works adjacent to rivers. The NRA also carries out a programme of conservation works using its own workforce, in addition to assessing the conservation implications of other functional activities.

Our Strategic Objectives are:

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

Recreation

The NRA has statutory duties to:

- ensure that water and land under the NRA's control is made available for recreational purposes
- promote the use of inland and coastal waters, and land associated with them, for the purpose of recreation.

Recreation and amenity includes provision for opportunities and facilities for sports associated with water and the surrounding land, passive activities around water including public access and rights of way and the general aesthetic quality of the water environment.

These duties are identified in the 1991 Water Resources Act in addition to a Code of Practice which gives guidance on the kinds of provision required and the need to consider collaborative management with other bodies.

In addition to these recreation and amenity considerations the NRA, where it is the authority, has responsibilities towards the maintenance and improvement of waterways for navigation.

Our Strategic Objectives are:

- Maintain, develop and improve recreational use of NRA sites.
- To take account of recreation in proposals relating to any NRA function.
- Promote the use of water and associated land for recreational purposes.

Fisheries

The general fisheries duties of the NRA are set out in the Water Resources Act 1991. Under this Act the NRA is responsible for the regulation of fisheries through the application of orders, byelaws and licensing systems.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA AIMS AND STRATEGIES

An essential feature of the Water Resources Act 1991 is the statutory duty placed on the NRA to "maintain, improve and develop fisheries". The term "fisheries" refers to an aquatic ecosystem in which fish are, or in natural circumstances would be, the highest form of life living wholly therein. This includes both sport and commercial fisheries but not fish farms which are regulated by MAFF.

To discharge its statutory duties the NRA undertakes a wide range of fish surveillance and monitoring activities. Fish populations are biological indicators of changes in river flow, quality and habitat. The regulation of fish introductions and fish capture are important activities.

The costs of the fisheries service are met by funds raised from rod licences.

Strategic Objectives:

- Protect and conserve salmon, trout, freshwater, eel and, where appropriate, coastal fisheries.
- Regulate fisheries through the enforcement of a consistent series of licences, orders, byelaws and consents.
- Monitor the fisheries status of rivers and inland estuaries and, where appropriate, coastal waters.
- Formulate policies to maintain, improve and develop fisheries and restore and rehabilitate damaged fisheries.
- Provide an efficient and effective fisheries service which is responsive to the needs of its customers and which is based on a sound charging system.

Flood Defence

The NRA has powers to:

- protect people and property against flooding from rivers and the sea
- provide a means for the drainage of land
- provide adequate arrangements for flood forecasting and warning.

Certain watercourses are designated as "main river". On main rivers the NRA have permissive powers to: construct new defences; maintain defences; and, control the actions of others so that the risk to existing and future uses (eg development) can be minimised. The NRA are the primary group involved in flood defence matters but on ordinary rivers District or Borough Councils are the first point of contact. For flooding from sewers the responsible group is either the District or Borough Council or Thames Water Utilities.

The standard of flood protection can be measured in terms of the frequency at which (eg 1 in 50 years), on average, it will prove ineffective. The standards considered appropriate vary according to the land use to be protected and the economics of providing the service.

These activities are undertaken under the 1991 Water Resources Act and are directed by the Regional Flood Defence Committee. In addition to works on statutory main river, the NRA also has powers to control weirs and culverts on ordinary watercourses that would otherwise affect the flow.

APPENDIX I ORGANISATION RESPONSIBILITIES AND NRA STRATEGIES

Our Strategic Objectives are:

- To develop and implement our flood defence strategy through a systematic approach for assessing capital and maintenance requirements and develop medium and long-term plans for those defences owned and maintained by the NRA.
- To encourage development of information technology and extension of facilities which will further improve the procedures for warning of, and responding to, emergencies.
- To support R&D which will assist in identifying future flood defence needs.
- To review best practices for all operational methods, and the identification and justification of work, thus increasing efficiency and enhancing value for money.
- To heighten general awareness of the need to control development in flood plains and contribute to the development of catchment management plans.
- To identify opportunities for the enhancement of environmental, recreational and amenity facilities when undertaking flood defence works.

Navigation

Our future strategy is to take a lead in working with other navigation authorities (eg British Waterways) to bring about a more consistent approach to the administration of navigation in inland waters than currently exists in England and Wales, and to facilitate and regulate the use of those inland navigations for which the NRA is navigation authority or has powers, and to manage the inter-relationship of navigation with other core functions of the NRA.

Our Strategic Objectives are:

- Contribute to the development of an overall navigation strategy for England and Wales.
- Regulate NRA navigations through the enforcement of a consistent series of licences, orders, byelaws and statutes.
- Maintain and improve NRA navigation fairway, facilities and standards.
- Recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

Land Use Planning

The NRA is a statutory consultee of the land use planning system and seeks to ensure that local authorities take into account the needs of the water environment when preparing development plans and determining planning applications. A close working relationship is required with both County, District and Borough Councils on mineral workings, waste disposal issues, infrastructure works, works within river corridors or floodplain, and any activities likely to pollute surface or groundwaters or increase the demand for water resources.

Guidance notes for local planning authorities on the methods of protecting the water environment through development plans have been produced (December 1993), and these are being promoted in conjunction with the initiative to prepare Catchment Management Plans.

Summary

Further details on the work of the NRA can be found in a series of NRA strategy documents covering: corporate strategy water quality; water resources; flood defence; fisheries; conservation; navigation; recreation; and, research and development. These documents are available from the NRA Corporate Planning section at our head office at Rivers House, Waterside Drive, Aztec West, Almondsbury, Bristol BS12 44D.

During July 1994, a number of organisations with an interest in the water environment of the catchment were contacted. These included: County, district and parish Councils; Government departments and statutory bodies; organisations and interest groups; industry; and landowners and angling interests. As a result of the initial contact, a number of meetings were held.

The purpose of this period of informal external liaison was to secure relevant information and appreciation of the issues related to the water environment concerning those associated with the area from as wide a range of local people, interest groups and statutory bodies as possible. This period of informal liaison was not intended to be a substitute for the planned period of formal consultation. It enabled the NRA, however, to review a wide range of activities relevant to the natural water environment before identifying the key issues we and others need to tackle.

The response rate overall was 33% with the level of response varying in consultee groupings, see Table 10 below for details.

TABLE 10: RESPONSES TO INFORMAL CONSULTATION

Consultee Group	Number Contacted	Number Responding	% Response
A. County and District Councils	17	10	59
B. Parish Councils	1	0	0
C. Government Depts and Statutory bodies	27	11	41
D. Organisations and Interest Groups	89	24	27
E. Industry	9	4	44
F. Boating and Angling Interests	11	2	18
G. Secondary Schools	101	17	17
Total (excluding schools)	154	51	33

Within the total response representations were received from most sections and interests throughout the catchment, although it is of some concern that a number of the local authorities have failed to respond. It is hoped that those consultees with any significant concerns would have responded as part of the 33%, suggesting that other consultees have no particular issues to raise with regards to this catchment at the moment, although they will be contacted in the future to comment at the formal Consultation Report stage of this plan.

As a result of these responses, it was possible to identify a number of recurring concerns:

- Water quality in terms of leisure activities, wildlife and pollution.
- Conservation including promotion of the conservation of flora and fauna, and biodiversity.
- Accessibility of the water environment to the public and for navigation purposes.
- Flow levels of the river including up-stream abstraction, navigational requirements, keeping archaeological sites water logged to preserve known artifacts, and flood relief.

Despite the incomplete response rate from the councils, it was possible to identify specific issues of concern. These were mainly connected with the quality of water and the need to improve habitat for wildlife and facilities for leisure activities. The Councils also expressed a concern that the watercourse and surrounding environment should be accessible for the public. This view was also expressed by a number of statutory bodies.

The statutory bodies identified the need for better communications between the various bodies and overall strategy for the Lee valley as key objectives. Preservation of archaeological sites was also highlighted as a key issue which needed to be included in the Catchment Management Plan as the sites could be disturbed if their surrounding environment was altered, i.e. were no longer water logged or the earth was moved to alter the watercourse in any way.

The organisations and interest groups that responded were concerned mainly with the conservation, litter and pollution aspects of the Catchment Management Plan. The identified issues relating to this area included concerns on the impact that flood prevention works would have on the wildlife and river levels. Also, how the quality of water would affect amenity use and wildlife and they impact of sewage pollution within the catchment. The promotion, enhancement and maintenance of the rivers' biodiversity was also expressed as an important issue. The accessibility of water environment in terms of safe towpaths, was cited as an important issue.

On the whole, it would appear that the main concerns are those relating to the conservation of the water environment. The preservation and enhancement of the biodiversity linked to the river and, as a prerequisite of that, the quality of the water. The majority of consultees expressed concern that the Catchment Management Plan should enhance the accessibility of the river environment, not only for navigation, but also along the river corridors.

TABLE 11: BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE (NGR)	Mean BMWP Score (Diversity measure)				Mean ASPT score (Waterquality measure)			
	74-79	80-84	85-89	90-94	74-79	80-84	85-84	90-94
Ching Brook								
Below Cavendish, Highams Pk (TQ380 915)	-	-	-	36	-	-	-	3.3
Cobbins Brook								
Cobbins Bridge, Epping Upland (TL447 380)	-	49	37	-	-	4.9	4.1	-
Fernhall Lane (TL418 266)	-	34	46	-	-	4.2	3.7	-
Above Reevesgate Brook (TL412 210)	-	-	-	26	-	-	-	3.3
Above Breach Barns Ditch (TL405 088)	-	-	44	-	-	-	3.7	-
Above PaternosterHill (TL394 110)	-	16	14	30	-	2.9	2.6	3.3
Cornmill Stream								
Cornmill Meadows (TL382 012)	-	-	-	105	-	-	-	4.0
Below Leverton Way (TL381 050)	-	-	76	-	-	-	4.2	-
Cuffley Brook								
Home Wood, Cuffley (TL298 430)	-	-	-	33	-	-	-	3.7
Whitewebbs Road, Crews Hill (TQ319 999)	-	24	24	37	-	-	4.0	3.5
Whitewebbs Golf Course (TQ328 990)	-	-	-	64	-	-	-	3.8
Dagenham Brook								
Marsh Lane (TQ371 870)	-	-	-	15	-	-	-	2.5
Friary Park Stream								
Friary Park, Friern Barnet (TQ272 927)	-	-	-	39	-	-	-	3.3
Green Brook								
Above Pymmes Brook, Hadley Wood (TQ273 975)	-	-	-	55	-	-	-	3.9
Grovelands Park Stream								
Below Grovelands Park Lake (TW309 945)	-	-	-	28	-	-	-	3.1
Hempshill Brook								
Northaw Road (TL300 019)	-	-	-	35	-	-		3.9
Hounsden Gutter								
Hounsden Road, Enfield (TQ312 952)	-	-	-	12	-	-	-	2.4
Deepdene Court (TQ318 953)	-	-	-	21	-	-	-	2.6
River Lee (Excluding navigable river)								
Below Kings Weir (TL373 043	101	115	128	176	4.8	4.9	5.0	5.3
(Sub A) Below Enfield Weir (TQ373 988)	53	98	95	152	3.8	4.7	4.5	5.0
At Hackney Marshes (TQ366 865)	43	41	27	47	3.3	3.7	3.3	3.4
Below Carpenters Road (TQ377 845)	-	-	-	33	-	-	-	3.0
Lee Flood Relief Channel								
LFRC (Nazeing) Above Nazeing Brook (TL380 059)			119	-	-	-	5.2	-
LFRC (Cattlegate)at Cattlegate (TQ377 982)	-	-	-	106	5.1	-	-	4.5
LFRC At Lee Valley Road (TQ375 949)	86	-	-	95	-	-	-	4.4
	-	-						

TABLE 11: BIOLOGICAL MONITORING RESULTS

WATERCOURSE/SITE (NGR)	Mean BMWP Score (Diversity measure				Mean ASPT score (Waterquality measure)			
	74-79	80-84	85-89	90-94	74-79	80-84	85-89	90-94
Lee Navigation & Navigable Lee								
At Rye House Inlet (TL390 090)	56	118	-	144	4.9	5.1	-	4.9
Above Dobbs Weir (TL385 682)	-	-	-	95	-	-	-	4.3
	-	-	-	101	-	-		4.8
Above Aqueduct Lock (TL373 046)	54	107	113	128	4.4	5.3	4.5	4.8
Above Waltham Town Lock (TL374 007)	-	53	-	76	-	3.7	-	4.0
Above Keides Weir (TQ365 957)	-	-	-	30	-	-	-	3.1
At Springhill (TQ348 876)	11	27	27	26	2.4	3.0	3.4	3.3
At Lee Bridge Weir (TQ 357 866)	-	-	-	66	-	-	-	4.1
Above Old Ford Lock (TQ373 840)								
Leeging Beech Gutter	-	-	-	74	-	-	-	4.1
Trent Country Park (TQ296 975)								
Merryhills Brook	-	-	33	52	-	-	4.1	4.0
Snakes Lane, Trent Park (TQ290 966)	-	-	46	51	-	-	5.8	3.6
Above Salmon Brook (TQ309 969)								
Monken Mead Brook	-	-	-	67	-	-	-	4.5
Above Burtrams Lane, Hadley (TQ261 983)	-	-	-	43	-	-	-	3.6
Kingswell Road, Hadley Wood (TQ273 985)								
Moselle Brook	-	-	-	15	-	-	-	2.5
Tottenham Cemetery (TQ331 912)								
Nazeing Brook	-	-	69	-	-	-	-4.6	-
Above Nurseries, Nazeing (TL 403 062)								
New Cut	-	-	-	98	-	-		4.1
r/o Stonebridge Lock (TQ352 907)								
New River	-	-	-	85	-	-	-	4.5
Bullsmoor Lane (TQ347 996)								
Northaw Brook	-	-	-	59	-	-	-	3.9
Cattlegate Road (TL298 015)								
Old River Lee	-	-	-	78	-	-	-	4.1
Powdermill Lane (TL379 008)								
Pymmes Brook	-	-	-	104	-	-	-	4.3
Below Jacks Lake (TQ271 969)	-	-	29	41	-	-	3.2	3.4
At Park Road (TQ269 964)	-	-	32	18	-	-	3.2	3.0
Oakhill Park (TQ276 949)	-	-	15	18	-	-	3.0	3.0
At Arnos Park (TQ295 927)	-	15	15	29	-	2.5	2.5	3.0
At Pymmes Park (TQ338 925)	-	-	12	24	-	-	2.4	2.9
At Tottenham Hale (TQ347 895)								
Salmons Brook	-	-	-	54	-	-	-	4.9
Below Spoilbank Wood (TQ266 989)	-	-	-	55	-	-	-	4.0
At Roundhedge Hill (TQ284 988)	-	-	29	50	-	-	3.2	4.0
Hadley Road, Enfield (TQ302 980)	-	-	-	89	-	-	-	4.2
Above A110, Enfield (TQ310 969)	-	-	-	103	-	-	-	4.3
Enfield Golf Course (TQ315 964)	-	-	-	72	-	-	-	4.0
Little Bury Street (TQ331 946)	-	-	-	32	-	-	-	3.4
Above Montagu Road (TQ353 932)	-	34	17	32	-	3.4	2.7	3.2
Above Deephams STW (TQ355 935)	-	34	13	30	-	3.4	2.6	3.2
Below Deephams STW (TQ356 930)								
Small River Lee	-	-	-	87	-	-	-	4.4
Cheshunt Marshes (TL370 009)	-	-	87	101	-	-	4.2	4.4
High Bridge Street (TL371 040)	-	-	54	76	-	-	3.6	3.9
Above Turkey Brook (TL370 987)	-	62	84	-	-	3.9	4.2	-
Below Turkey Brook (TQ368 982)								
Strawberry Vale Brook	-	-	-	15	-	-	-	2.5
Seafield Road (TQ307 921)								
Theobalds Brook	-	-		75	-	-	-	5.0
Theobalds Lane (TL355 013)								
Turkey Brook	-	-	21	37	-	-	3.0	3.7
Below M25, Crews Hill (TL304 004)	-	-	26	54	-	-	3.2	3.7
Hillyfields Park (TQ318 985)	-	-	44	95	-	-	3.7	4.5
Maidens Bridge, Forty Hall (TQ342 988)	-	-	-	67	-	-	-	3.9
Gilbert Street (TQ354 988)	-	-	-	81	-	-	-	3.9
Above Small River Lee (TQ366 984)								
Victoria Watercourse	-	-	-	15	-	-	-	2.5
At Recreation Ground (TQ268 964)								

TABLE 12: BACTERIOLOGICAL DATA

SITE (1991 Survey)	NGR	1st Quarter T.C.	1st Quarter F.C.	2nd Quarter T.C.	2nd Quarter F.C.	3rd Quarter T.C.	3rd Quarter F.C.	4th Quarter T.C.	4th Quarter F.C.	Geometric mean F.C.
Rye House	TL 3850 0980	1800	140	100	20	220	7	100	50	31
Dobbs Weir	TL 3850 0820	26000	1400	12000	1300	5000	600	320000	35000	2486
Kings Weir	TL 3730 0520	14000	700	6000	300	1000	130	1500	700	371
High Bridge St. W. Abbey	TL 3755 0055	1000	100	300	70	1200	180	700	140	115
Enfield Lock	TQ 3710 9805	500	20	100	4	700	90	2400	220	35
Keides Weir	TQ 3630 9530	5000	900	2000	100	200	50	4000	350	199
u/s Tottenham Locks	TQ 3474 8953	1000	100	300	5	3300	200	1700	210	67
d/s Pymmes Brook	TQ 3475 8925	30000	13000	80000	5000	450000	35000	40000	16000	13812
Springhill	TQ 3480 8760	40000	6000	180000	3000	420000	22000	12000	12000	11979
Lea Bridge Weir	TQ 3570 8660	30000	8000	140000	5000	320000	23000	120000	11000	13200
Carpenters Road	TQ 3770 8450	20000	2000	60000	3300	52000	4800	5000	14000	2580
Three Mills Lane	TQ 3820 8280	20000	1000	2000	300	5400	220	2200	1200	530
SITE (1994 Survey)										
Pymmes Brook										
Cat Hill	TQ 2728 9541	530000	39000	970000	31000	900000	400000	380000	90000	81223
Osidge Lane	TQ 2940 9421	275000	26000	108888	13700	240000	100700	119000	113000	44869
u/s Bounds Green Brook	TQ 2970 9265	135000	16000	44000	12600	84000	23000	32000	90000	14292
Strawberry Vale Brook										
Islington Cemetery	TQ 2759 9117	430000	63000	113000	38000	50000	14000	80000	80000	40465
Bounds Green Brook										
u/s Pymmes Brook	TQ 2982 9251	315000	62000	46000	14000	97000	190000	220000	96000	63079
Muswell Stream										
u/s Pymmes Brook	TQ 3108 9218	870000	230000	117000	41000	52000	28000	610000	630000	113567
Moselle Brook										
Cross Lane	TQ 3062 8963	1000000	440000	880000	210000	> 1500000	560000	> 1500000	> 1000000	476941
Lordship Rec. Ground	TQ 3242 9009	50000	5000	-	-	-	-	-	-	-
White Hart Lane	TQ 3361 9132	350000	30000	> 1000000	77000	360000	61000	180000	20000	40972
Stonebridge Brook										
u/s Lee Navigation	TQ 3411 8876	1000000	700000	230000	38000	330000	90000	3600	5900	61304
Dagenham Brook										
u/s Lee Navigation	TQ 3708 8696	330000	46000	> 1000000	900000	> 1500000	1050000	800000	94000	252830

Notes: 1) T.C. = Presumptive Total coliforms/100 ml 2) F.C. = Faecal coliforms/100 ml (Presumptive Escherichia coli/100 ml)

TABLE 13: RIVER ECOSYSTEM CLASSIFICATION: WATER QUALITY CRITERIA

Class	Dissolved Oxygen % saturation 10 percentile	BOD (ATU) mg/1 90 percentile	Total Ammonia mg N/1 90 percentile	Un-ionised Ammonia mg N/1 95 percentile	pH lower limit as 5 percentile; upper limit as 95 percentile	Hardness mg/1 Ca CO³	Dissolved Copper pg/1 95 percentile	Total Zinc pg/1 95 percentile
RE1	80	2.5	0.25	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500
RE2	70	4.0	0.6	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	30 200 300 500
RE3	60	6.0	1.3	0.021	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE4	50	8.0	2.5	-	6.0 - 9.0	≤ 10 > 10 and ≤ 50 > 50 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000
RE5	20	15.0	9.0	-	-	-	-	-

TABLE 14: GENERAL QUALITY ASSESSMENT: CHEMICAL GRADING FOR RIVERS AND CANALS

Water Quality	Grade	Dissolved Oxygen (% saturation) 10 percentile	Biochemical Oxygen Demand (ATU[1]) (mg/1) 90 percentile	Ammonia mgH/1) 90 percentile
Good	A	80	2.5	0.25
	B	70	4	0.6
Fair	C	60	6	1.3
	D	50	8	2.5
Poor	E	20	15	9.0
Bad	F[2]	-	-	-

[1] as suppressedby adding allyl thio-urea
[2] ie quality which does not meet the requirementsof grade E in respect of one or more determinands

POLLUTION INCIDENT Categories

MAJOR

A major incident involving one or more of the following:

a) potential or actual persistent effect on water quality or aquatic life;
b) closure of potable water, industrial or agricultural abstraction necessary;
c) extensive fish kill;
d) excessive breaches of consent conditions;
e) extensive remedial measures necessary;
f) major effect on amenity value.

SIGNIFICANT

a) notification to abstractors necessary;
b) significant fish kill;
c) measurable effect on invertebrate life;
d) water unfit for stock;
e) bed of watercourse contaminated;
f) amenity value to the public, owners or users reduced by odour or appearance;
g) breach of consent conditions

MINOR

Minor suspected or probable pollution which, on investigation, proves unlikely to be capable of substantiation or to have no notable effect.

NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS

Introduction

The abstraction of water is controlled by the Water Resources Act 1991 . This summary presents the key policy statements contained in the General Statement on Licensing Abstraction in the Thames Region. These policies are currently being applied to all new applications for licences or variations. They are not being applied retrospectively to existing licences as such action would render the NRA liable for compensation.

Consumptive Abstractions from Inland Waters (Rivers, Streams, Lakes, Ponds, etc.,)

Policy G1. No licences will be granted allowing the unconstrained abstraction of water in the summer months (April to October) for a consumptive use from an inland water except in cases which can be continuously monitored and with a condition prohibiting abstraction at times when river flows are below a prescribed flow.

Policy G2. Winter abstractions from an inland water will normally be allowed but will also contain a prescribed flow condition.

Consumptive Abstractions from Underground Strata (Aquifers)

Consumptive Abstractions from Confined Aquifers **Policy G3**. Licences may be granted if the aquifer is full to the base of the overlying clay, and groundwater levels do not show an unacceptable trend of long-term decline. As water levels in this type of aquifer fluctuate rapidly in response to pumping all licences will be time limited to review dates at 5 or 10 year intervals and some may be subject to control by a prescribed groundwater level.

Consumptive Abstractions from Unconfined Aquifers **Policy G4**. Within 250m of a perennial, groundwater-fed stretch of river, or within its main flood plain, whichever is the greater, consumptive ground water abstractions will be treated as abstractions from a river (See G.2 above).

Policy G5. Beyond the limits in Policy G4, consumptive groundwater abstractions may be allowed, providing the level of resource utilisation permits, but they will generally be subject to control by prescribed river flow or, less commonly, by prescribed groundwater level.

In some cases some reservoir storage will be required to make such abstractions fully reliable.

Non Consumptive Abstractions

Policy G6. Where a very high proportion (95% or more) of the water taken is returned to the source of supply upstream of or immediately downstream of the point of abstraction a licence will normally be granted provided that any by-passed stretch of channel is adequately protected against low flows.

Very Small Abstractions ('De Minimus')

Policy G7. Very small abstractions for general agriculture and private water undertaking uses, will normally be allowed without constraint of a prescribed flow, a prescribed level or a time limit. The cut off limits for an individual abstraction for these concessions will normally be 5000 cu.m (1.1 million gallons) per year and 20 cu.m (4,400) gallons per day.

NRA POLICY STATEMENTS ON LICENSING ABSTRACTIONS (Continued)

Abstractions for Spray Irrigation

Policy G8. Spray irrigation abstractions from rivers will not be permitted in summer (April to October) but will normally be permitted in Winter with a prescribed flow constraint to protect low winter flows. Reservoir storage for the full annual volume will be required.

Policy G9. Spray irrigation abstractions from groundwater may be permitted in some circumstances, generally in accordance with normal policies on consumptive groundwater abstractions. The imposition of a prescribed flow or a prescribed level may require some reservoir storage but this is optional on the applicant.

Policy G10. For non-agricultural uses (eg golf courses) groundwater licences for direct spray irrigation will include a further restriction on use when restrictions on public water supply are in force.

Abstractions from the Tideway of the River Thames

Policy G11. Abstractions from the tideway of the River Thames will normally be permitted providing there is no conflict with water quality and fisheries.

Appeal. All the statements above are subject to the right of the applicant to appeal to the Secretary of State for the Environment against a refusal by the NRA to grant a licence or against any of the terms of a licence.

FURTHER INFORMATION

For further details on any of the above mentioned documents, aspects of the Plan or general queries about rivers or the NRA, please call our offices on **01992 635566** and ask for:

HYDROMETRY Team — hydrological information

POLLUTION CONTROL Team — surface water and groundwater quality information

BIOLOGY Team — biological information

WATER RESOURCES Team — water quantity and abstraction licencing information

FISHERIES Team — fishery information

CATCHMENT PLANNING Team — development and flooding information

CATCHMENT MANAGEMENT Team — other information and general points.

APPENDIX IV GLOSSARY

AMP	-	Asset Management Plan
AOD	-	Above Ordnance Datum
AONB	-	Area of Outstanding Natural Beauty as designed by the Countryside Commission
Aquifer	-	A layer of underground porous rock which contains water and allows water to flow through it
ASPT	-	Average Species Per Taxa
BC	-	Borough Council
BMWP	-	Biological Monitoring Working Party
BOD	-	Biochemical Oxygen Demand - a measure of the amount of oxygen required to breakdown all organic material in a water body.
BW	-	British Waterways
Catchment	-	Area from which rainfall flows into a river
CC	-	County Council
CMP	-	Catchment Management Plan
Consent	-	The statutory document issued by NRA under schedule 10 of the Water Resources Act 1991 to indicate any limits and conditions on the discharge of an effluent to a controlled water.
CSO	-	Combined Sewer Overflows, sewers which carry both surface and foul water need overflow facilities into rivers for heavy storms.
Culvert	-	Placing a river underground in a pipe.
Cyprinid	-	Coarse fish of the Carp family i.e. roach, dace, bream
DC	-	District Council
Directive	-	A type of legislation issued by the European Community which is binding on the member states
DoE	-	Department of the Environment
DO	-	Dissolved Oxygen
DWI	-	Drinking Water Inspectorate
E. COLI	-	Escherichia Coli
EC	-	European Commission
ECC	-	Essex County Council
ECSR	-	Eastern Council for Sports and Recreation
ELRI	-	East London Rivers Initiative
Environmental Capacity	-	The point at which development passes from being sustainable to unsustainable
Eutrophic	-	Water with very high nutrient levels
EQI	-	Ecological Quality Index
Faecal coliform		Bacteria of the intestine
Fauna	-	Animals, birds, insects
Flood Plain	-	This includes all land adjacent to a watercourse over which water flows or would flow but for flood defences in times of flood
Flora	-	Plants
GQA	-	General Quality Assessment
Groundwater	-	Underground water contained in the pores and fissures of aquifers (water bearing strata)
HMIP	-	Her Majesty's Inspectorate of Pollution
Hypertrophic	-	Water with nutrient levels even higher than eutrophic
LB	-	London Borough
LFRC	-	River Lee Flood Relief Channel
LLP	-	Lower Lea Project
Local Plan	-	Statutory plan to shape development within each district outside London
LVRPA	-	Lee Valley Regional Park Authority
MAFF	-	Ministry of Agriculture, Fisheries and Food
Misconnection		Connected foul water pipes to the surface water sewer
MOD	-	Ministry of Defence

MPPA	-	Million Persons Per Annum
MRL	-	Main River Limit
NGR	-	National Grid Reference
NRA	-	National Rivers Authority
NRA TR	-	National Rivers Authority Thames Region
NVZ	-	Nitrate Vulnerable Zone
NWC	-	National Water Council
OFWAT	-	Office of Water Services
PLA	-	Port of London Authority
PWQO	-	Provisional Water Quality Objectives
Q95	-	Flows exceeded for 90% of the time
RE	-	River Ecosystem
Riparian Owner		A person/organisation with property rights on a river bank
RQO	-	River Quality Objective
Salmonids	-	Fish classified as belonging to the Salmon family ie salmon, trout, char etc
SoS	-	Standards of Service
SPA	-	Special Protection Area
SSSI	-	Site of Special Scientific Interest
STW	-	Sewage Treatment Works
SWQO	-	Statutory Water Quality Objective
Taxa	-	Classification of groups of fauna
TVWS	-	Three Valleys Water Services
TWUL	-	Thames Water Utilities Limited
UDP	-	Unitary Development Plan - statutory plan to shape development within each
WQO	-	Water Quality Objective

Units

Length: 10mm = 1cm (equivalent to 0.394 inches)
100cm = 1m (equivalent to 39.37 inches)
1,000m = 1km (equivalent to 0.621 miles)
Area: 10,000 m^2 = 1 ha (equivalent to 2.47 acres)
Flow: 1,000 l/s = 1 m^3/s (equivalent to 35.31 cusecs)
1,000 m^3/d = 11.6 l/s (equivalent to 0.41 cusecs)
1 Ml/d = 11.6 l/s (equivalent to 0.224 mgd)

APPENDIX V BODIES BEING CONSULTED OVER THIS PLAN

Assoc. of British Chambers of Commerce
Barnet Cncl. for Sports and Recreation
Barnet & District Local History Soc.
British Agg. & Construction Mat. Ind.
British Ass. of Chambers of Commerce
British Naturalist Ass. Essex Branch
British Rail Property Board
British Telecom, East Anglia
British Telecom, Northern London
British Telecom, S.Midlands & Chilterns
British Waterways
Broxbourne Boat Club
Broxbourne Borough Council
Broxbourne Centre
Broxbourne Cruising Club
Broxbourne Woods Area Cons. Soc.
CBI - Eastern Region
CBI - London Region
CBI - South East and Southern Region
Commission for New Towns
Common Ground
Commons, Open Spaces Footpaths Society
Cons. Trust c/o Environmental Council
Conservatory of Epping Forest
Community Forum
Council for British Archaeology
Council for the Protection of Rural England (CPRE)
CPRE - Essex Branch
CPRE - Hertfordshire Branch
CPRE - North London Branch
Countryside Commission
Crown Estates Commissioner
Department of National Heritage
Dept. of Trade and Industry, S.East
Dept. of Transport (Highways Agency)
Department of the Environment
East Anglia Tourist Board
East Herts. District Council
East Herts Archaeological Society
East London Partnership
East London Rivers Initiative
Eastern Electricty Board
Eastern Enfield Study Group
Eastern Gas
Enfield Lock Conservation Group
Enfield Preservation Society
English Heritage
English Nature - Essex Herts & London
English Nature - South East Region
English Tourist Board
Epping Forest Chamber of Commerce
Epping Forest District Council
Epping Forest Dist. Sports Council
Essex Birdwatching & Preservation Society
Essex Bridleways Ass.
Essex County Council
Essex Ecology Services Ltd.
Essex Field Club
Essex Wildlife Trust
Essex Water Company
Essex Herts & London Narrowboats
Farming & Wildlife Advisory Group
Fed. of Epping Forest Amenity Soc.
Forestry Authority - EnglandForestry Authority - Thames & Chilterns Conservancy
Forestry Commission - East Anglia Conservancy
Friends of the Earth - Enfield Branch
Friends of the Earth - Haringey & Wood Green Branch
Friends of the Earth - River Lea Action Group
Government Office for London
Greater London Council for Sport & Recreation
Herts. Archaeological Trust
Herts. Chamber of Commerce & Industry
Herts. Conservation Society
Herts. County Council
Herts. District Councils Association
Herts. Federation of Amenity Society
Herts. Groundwork Trust
Herts. & Middlesex Wildlife Trust
Herts. Chamber of Commerce & Industry
Herts. Development Organisation
Herts. Federation of Amenity Services
Herts. Young Mariners
Herts. & N.Middlesex Ramblers Ass.
Hertsmere Borough Council
House Builders Federation
H.M. Inspectorate of Pollution
Inland Waterways Association
Inland Waterways Ass - Herts Branch
Institute of Fresh Water Ecology
Laburnum Boat Club
Lea Valley Narrowboat Co. Ltd
Lee Valley Anglers Consultative Ass.
Lee Valley Association
Lee Valley Regional Park Authority
Lee and Stort Cruising Club
London Borough of Barnet
London Borough of Enfield
London Borough of Hackney
London Borough of Haringey
London Borough of Newham

APPENDIX V - BODIES BEING CONSULTED OVER THIS PLAN

London Borough of Redbridge
London Borough of Tower Hamlets
London Borough of Waltham Forest
London Cycling Campaign
London Docklands Development Corporation
London Ecology Unit
London Electricity Plc
London Fire & Civil Def. Auth. (LFCDA)
London Green Belt Council
London Middx. Archaeological Society
London Natural History Society
London Planning Advisory Committee
London River Authority
London Tourist Board
London Waste Regulation Authority
London Wildlife Trust
Lower Lea Project
Middlesex University Business School
Ministry of Agriculture, Fish. & Food
Monken Hadley Common Trustees
Museum of London
National Association of Boatowners
National Farmers Union, Herts.
National Playing Fields Association
National Trust
National Trust, Thames/Chilterns Region
Nazeing Conservation Society
Newham Chamber of Commerce
North London Chamber of Commerce
North Thames Gas
Open Spaces Society
Planning Aid for London
Port of London Properties Ltd.
Ramblers Association
Ramblers Association - Essex
Ramblers Association - Herts & N Middx.
Ramblers Association - London
Rammey Marsh Cruising Club
Ridge Parish Council
River Thames Society
River Thames Soc. - Lower Tideway
Royal Commission on the Historic Monuments of England
Royal Soc. for the Protection of Birds
Rural Community Council of Essex
Salmon & Trout Association
Sand and Gravel Association
SERPLAN
Society for the Protection of Ancient Bldgs
Southern Lea Valley Federation
Sports Council - Eastern Region
Sports Council - London Region
Springfield Marina
Stratford Development Partnership
Thames Water Utilities Ltd.
Three Valleys Water Plc.
UK2000
University of Hertfordshire
Waltham Abbey Historical Society
Waltham Forest Chamber of Commerce
Waltham Forest Environmental Forum
Walthamstow Marsh Society
Welwyn Hatfield District Council
West Essex Archaeological Group
West Essex Group Ramblers Assoc.

Information Services Unit

Please return or renew this item by the due date

Due date

14 FEB 2008	