

**RIVER THAMES (BENSON TO HURLEY)
PANG & WYE
CATCHMENT MANAGEMENT PLAN**

CONSULTATION REPORT

*National Rivers Authority
Thames Region - West Area
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD*

February 1996

ENVIRONMENT AGENCY



123202

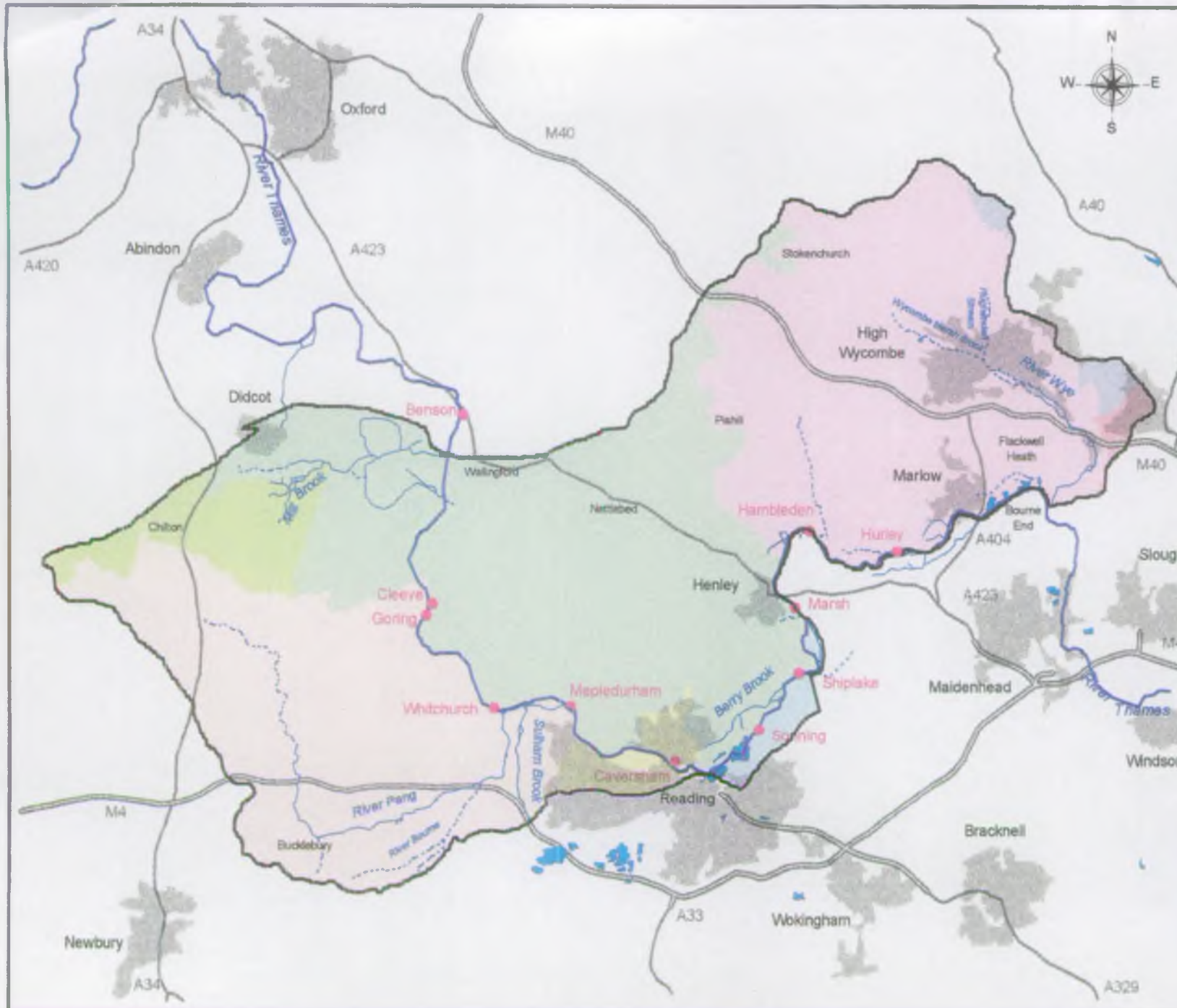
FOREWORD

Sustainable development is at the heart of international and UK policy and must be considered when dealing with all environmental, social and economic concerns for it to be a workable concept. In its role as 'Guardian of the Water Environment', the NRA is placing particular emphasis on planning for environmental sustainability through an integrated approach to river catchment management.

This Consultation Report is the first stage in the catchment management planning process for the River Thames (Benson-Hurley), Pang and Wye catchment. It provides a framework for consultation and a means of seeking consensus on issues, and options for action from those involved, to realise the full environmental potential of the catchment. It also identifies the scope of a subsequent strategy by including a draft vision.

We look forward to receiving comments and contributions from interested organisations, local authorities and members of the public. These will enable a final Action Plan to be produced, balancing the conflicting demands placed upon the natural water environment.

S J Darby
AREA MANAGER (WEST)
NRA Thames Region



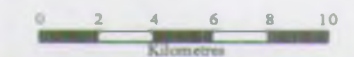
Thames (Benson-Hurley), Pang & Wye CMP Figure 1: Overview of Catchment

- CMP Boundary
- Main River
- Ordinary Watercourse
- River Thames
- Water Body
- Locks

Local Authorities

- Newbury
- Vale of White Horse
- South Oxfordshire
- Reading
- Wokingham
- Wycombe
- Chiltern
- South Buckinghamshire
- County Boundary

- Urban Area
- Primary 'A' Road
- Motorway



YOUR VIEWS

The River Thames (Benson to Hurley), Pang and Wye Catchment Management Plan Consultation Report is the National Rivers Authority's initial analysis of the status of the water environment in this catchment and the issues we believe need to be addressed.

We want to hear your views.

- Have we identified all the major issues?
- Have we identified all the proposals for action?
- Have you any comments on the issues and options listed?
- Do you agree with the catchment vision?

We would like to hear your opinions.

Please send any comments on the River Thames (Benson to Hurley) Pang and Wye Catchment Management Plan Consultation Report to:

Tania Woodward
Catchment Management Officer
National Rivers Authority
Thames Region - West Area
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD

Telephone enquiries: 01734 533309/533304

All comments should reach us by 14 June 1996

Further copies of the document can also be obtained from the above address, (Price £25 for non-consultees).

All comments received on the Consultation Report will be considered in preparing the next phase, the Action Plan. This Consultation Report will not be rewritten as part of the Action Plan process.

The NRA intends that the Action Plan should influence the policies and actions of developers and planning authorities as well as assisting in the day to day management of the catchment.

CONTENTS

FOREWORD

THE DRAFT VISION - RIVER THAMES (BENSON TO HURLEY) PANG & WYE CATCHMENT

	Page
1 INTRODUCTION	1
The National Rivers Authority	1
Sustainable Catchment Management	1
Catchment Management Planning	3
The Consultation Process	3
Structure of the Report	4
2 CATCHMENT DESCRIPTION	5
Introduction	5
Overview of the Catchment	5
Topography	6
Geology and Hydrogeology	8
Rainfall and River Flow	10
3 CATCHMENT USES, RESOURCES AND ACTIVITIES	17
Introduction	17
Strategic and Local Planning	17
Nature Conservation	23
Landscape	28
Heritage	31
Recreation	32
Fisheries	36
Navigation	39
Water Abstraction	43
Effluent Disposal	47
Rural Land Use	51
Built Environment and Development Plans	54
Mineral Extraction and Solid Waste Disposal	57
Flood Defence	61

4	CATCHMENT STATUS	73
	Introduction	73
	Water Quality	73
	Water Resources	92
	Physical Features	95
5	CATCHMENT ISSUES AND PROPOSALS FOR ACTION	99
	Introduction	99
	Alleviation of Low Flows	100
	Future Water Resource's: Meeting Demand for Water	102
	River Wye Improvements	103
	Eutrophication of the River Thames and River Wye	105
	Sewage Treatment Works Improvements - (TWUL Asset Management Plan)	106
	Pollution of Vastern Ditch	107
	Groundwater Ingress into Sewers at Compton and Hambleden STWs	108
	Waste Disposal Sites and Groundwater pollution	109
	In-Channel Islands on the River Thames (& the problem of erosion	110
	Implementation of the Recreation Strategy for the Thames	111
	Caversham Lakes and the Third Thames Crossing	114
	Drainage Strategy for High Wycombe	115
	The Elimination of Problems at Source	116
	Flooding to Persons and Property	117
6	THE NEXT STEPS	125
APPENDICES		
	Appendix A: NRA Aims and Strategies and Organisational Responsibilities	A:1
	Appendix B: Consultation List	B:1
	Appendix C: Results of Informal Consultation/Liaison	C:1
	Appendix D: Supporting Information	D:1
	Appendix E: Glossary	E:1
	Appendix F: Acronyms	F:1

LIST OF FIGURES

Figure 1:	Overview	7
Figure 2:	Topography	9
Figure 3:	Solid Geology	11
Figure 4:	Rainfall and River Flow	12
Figure 5:	Yearly Rainfall	12
Figure 6:	Yearly Percolation	13
Figure 7(a/b/c/d/e):	Hydrographs	26
Figure 8:	Nature Conservation	29
Figure 9:	Landscape and Heritage	33
Figure 10:	Amenity and Recreation	37
Figure 11:	Fisheries	40
Figure 12:	Navigation	45
Figure 13:	Water Resources and Abstraction	48
Figure 14:	Effluent Disposal	49
Figure 15(a):	Number of Consented Discharges over 5m ³ /d	49
Figure 15(b):	Maximum Permissible Volume of Consented Discharges over 5m ³ /d	55
Figure 16:	Urban Land Use	59
Figure 17:	Mineral Extraction and Solid Waste Disposal	62
Figure 18:	Flood Defence	74
Figure 19:	Water Quality: General Quality Assessment	77
Figure 20:	River Quality Objectives Map	81
Figure 21:	Water Quality: EC Directive Designations	83
Figure 22:	Water Quality: Biological	

LIST OF TABLES

Table 1:	Key Statistics of the Catchment	6
Table 2:	Catchment Area by County and District Council	19
Table 3:	Statutory and Land Use Plans Relevant to the Catchment	22
Table 4:	Average Number of Pedestrian Visitors to Hurley Lock (1991)	35
Table 5:	Average Number of Pedestrian Visitors to Hurley Lock (1993/4)	35
Table 6:	Licensed and Actual Abstractions (Ml/day)	44
Table 7:	STW in Thames (Benson-Hurley) Pang & Wye Catchment included in AMP 2	50
Table 8:	Agricultural Land Use Bands	51
Table 9:	Agricultural Land Classification	52
Table 10:	Standards of Service for Flood Defence	66
Table 11:	Descriptions of River Ecosystem Classes	76
Table 12:	River Quality Objectives for Rivers in the Thames (Benson-Hurley) Pang & Wye Catchment	78
Table 13:	Reaches of Watercourses with Poor Biological Communities and Possible Causes	84
Table 14:	Reported Pollution Incidents by Type (1991-94)	89
Table 15:	Programme of Pollution Prevention Visits	90

RIVER THAMES (BENSON TO HURLEY) PANG & WYE CATCHMENT - THE DRAFT VISION

In preparing this catchment vision, the NRA has defined what it would wish the catchment to be like and set out a number of the actions that need to be taken to achieve that vision. The catchment vision may not be totally achievable in the next five years, but we can all work towards it as a goal. Our vision for the catchment is one in which:

- a. habitats of conservation value are retained and degraded ones improved so as to optimise biodiversity;
- b. highly valued river landscapes and heritage features are safeguarded and degraded landscapes are improved;
- c. optimum recreational use is made of all water and waterside areas with improved access, particularly along the River Thames;
- d. all waters support productive, diverse and sustainable fish populations;
- e. the provision of services for those navigating the Thames matches their needs;
- f. water abstraction does not have an adverse impact on aquatic habitats;
- g. water quality objectives are achieved through proper control of effluent discharges and industrial practices;
- h. land use along the river corridors is de-intensified and land use development does not adversely impact on river corridors or the water environment;
- i. flooding is controlled through sensible land use development, control of surface water and maintenance of rivers to appropriate Standards of Service.

Some of the key actions needed to achieve this vision are:

- a. continue to establish the recovery of the River Pang in terms of flows and fishery;
- b. establish and commission a groundwater quality monitoring programme for the catchment by 1998;
- c. monitor environmental improvements resulting from Thames Water Utilities Ltd's agreed capital expenditure programme (Asset Management Plan 2). Consider priorities for capital expenditure in future Asset Management Plans;
- d. encourage the adoption of environmentally sympathetic land management practices through Countryside Management projects such as the Pang Valley, Chilterns and South Bucks Projects;
- e. supervise and facilitate habitat enhancements on the River Wye;
- f. commission and progress a drainage strategy for High Wycombe by 1998;
- g. pursue opportunities for river corridor restoration through High Wycombe during redevelopment.

Achievement of this vision for the catchment will require the joint efforts of the NRA, external environmental organisations, local communities and their representatives, government agencies and industry. The realisation of the vision can only be achieved through a balanced management approach to all activities so that the potential value of the catchment can, as far as practicable, be attained and sustained in active collaboration with all users.

SECTION 1

INTRODUCTION

This section emphasises the importance of integrated management of the water environment and outlines the key role of the NRA in this process. It describes the Catchment Management Planning process and the purpose of this Consultation Report.

1 INTRODUCTION

THE NATIONAL RIVERS AUTHORITY

- 1.1 The National Rivers Authority (NRA) was established in 1989 as an independent public body with statutory responsibilities for safeguarding and improving the water environment in England and Wales. The Authority is responsible for water resources, pollution control, flood defence, fisheries, recreation, conservation and navigation.
- 1.2 In April 1996 the Environment Act will bring together the NRA, Her Majesty's Inspectorate of Pollution and the Waste Regulation Authorities into one single Environment Agency. This new Agency will have wide-ranging powers and responsibilities in terms of environmental management (see Appendix A36).
- 1.3 As Guardians of the Water Environment, the NRA has defined its role in the following mission statement:
- "The National Rivers Authority will protect and improve the water environment. This will be achieved through effective management of water resources and by substantial reductions in pollution. The Authority aims to provide effective defence for people and property against flooding from rivers and the sea. In discharging its duties it will operate openly and balance the interests of all who benefit from and use rivers, ground waters, estuaries and coastal waters. The Authority will be businesslike, efficient and caring towards its employees".*
- 1.4 The NRA is committed to preparing sound and thorough plans for the future management of all river catchments.
- 1.5 The NRA has placed a particular emphasis on planning for environmental sustainability, through adopting an integrated, multi-functional approach to many of its activities and responsibilities.

SUSTAINABLE CATCHMENT MANAGEMENT

- 1.6 Environmental sustainability requires development needs to be met without compromising the ability of future generations to meet their own needs. This requires a full consideration of environmental, social and economic issues during the decision making process. This is an approach that has been backed by the Rio Earth Summit, European Union and the UK Government. This is demonstrated by the following extract from Agenda 21 prepared at the Rio Earth summit in June 1992;
- "By the year 2000 all states should have national action programmes for water management, based on catchment basins or sub-basins, and efficient water-use programmes. These should integrate water resources planning with land use planning and other development and conservation activities, demand management through pricing or regulation, conservation, reuse and recycling of water".*

- 1.7 This theme has been adopted by the UK Government, and is reflected in part by Planning Policy Guidance Note 12 "Development Plans and Regional Guidance" (Department of the Environment (DOE), 1992) which states that;

"the Government has made clear its intention to work towards ensuring that development and growth are sustainable".

- 1.8 The recent publication "Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region" (NRA September 1995), sets out a sustainable strategy for the water environment of the Thames Region. "Thames 21" has three roles:

- a bridge between the NRA and external organisations dealing with strategic planning
- an easy to use summary of current NRA policies for promotion through the statutory land use development plan system
- a regional context for the preparation of catchment management plans with an indication of the development issues which these plans will need to address. This will enable them to promote sustainable natural resource management.

- 1.9 "Thames 21" provide guidance on methods for protecting the water environment for each of the NRA's core functional responsibilities, together with a number of principles which the NRA will follow in advancing sustainable development.

One important change in the future management of the River Thames (Benson - Hurley) Pang and Wye catchment will be the increased opportunity for **community involvement**. It is hoped that local community groups and individuals will be able to part in all aspects of this process. Greater environmental awareness will also bring with it more responsible citizenship, as people become aware of their choices and the consequences of those choices. However, the NRA cannot act on its own in pursuit of this vision. It requires careful planning, shared responsibility amongst the local community and all relevant agencies, and consensus on our long term objectives.

CATCHMENT MANAGEMENT PLANNING

- 1.10 In order to manage the water environment effectively and sustain it for the future, the NRA has adopted the principle of Catchment Management Planning. This entails the preparation of Catchment Management Plans (CMPs) for each river catchment within England and Wales. Through data evaluation, issues analysis, external liaison and consultation, the CMP provides a vehicle to focus attention on the water environment. The process involves all interested parties in planning for the future well-being of the catchment and establishes an integrated plan of action for managing the catchment over a period of five years, after which the plan will be reviewed.
- 1.11 This Consultation Report has been prepared for the River Thames (Benson to Hurley) Pang and Wye Catchment, which lies in the West Area of the NRA's Thames Region (NRA-TR). It describes the catchment, reviews the state of the water environment and identifies key catchment issues. In addition, a draft catchment vision has been formulated, along with potential strategies and actions for addressing the issues. These will only be finalised once the NRA has completed the consultation process and all responses have been reviewed.
- 1.12 To assist in the preparation of this report, a range of organisations and groups were contacted in September 1995. The results of this period of informal consultation are summarised in Appendix C.

The Consultation Process

- 1.13 The NRA recognises the importance of liaison with interested parties and aims to obtain consensus, both internally and externally, through this Consultation Report.
- 1.14 The purpose of the consultation phase is to:
- establish the existing quality of the water environment and the range and extent of catchment uses;
 - obtain views on the issues facing the water environment; and
 - begin the process of identifying and implementing action plans.
- 1.15 This document is, therefore, part of a process that will enable a shared vision of the catchment to be developed, along with a strategy for its future management. This will guide all NRA activities for the next five to ten years and will hopefully influence the activities of other key bodies. The vision and its supporting strategies will be presented in the 'Action Plan', with a series of planned activities for the NRA and others to implement. The timetable for completing the Action Plan is early Spring 1997. Regular monitoring and updating of the plan will be an integral part of the process. To this end annual progress reports will be published and the full consultation process will be repeated every five years.

- 1.16 The NRA welcomes comments on the document. During the consultation period comments can be submitted in writing to:

Tania Woodward
Catchment Management Officer
National Rivers Authority
Thames Region - West Area
Isis House
Howbery Park
Wallingford, Oxon OX10 8BD

Should you require any further information or have any queries on this document, please contact either Tania Woodward or Jamal Hamid on (01734) 533309 or 533304, respectively.

STRUCTURE OF THE REPORT

- 1.17 This report has five main sections. In Section 2 a description of the physical characteristics of the catchment is given. The current and future uses and resources of the catchment are detailed in Section 3 and environmental objectives for each use are outlined. Section 4 compares the current status of the catchment (where it is known) with overall targets and standards (where they are available) for water quality, water resources and physical features. Catchment issues and proposals for action are presented in Section 5. Section 6 outlines the next steps in the consultation process.

SECTION 2

CATCHMENT DESCRIPTION

This section provides a general overview of the catchment's natural features in terms of: topography, geology & hydrogeology, rainfall & river flow. In most cases the description involves a brief outline of the available information, together with a synoptic map.

2 CATCHMENT DESCRIPTION

INTRODUCTION

2.1 This section provides a general overview of the catchment and describes its natural features under the following headings:

- topography;
- geology and hydrogeology;
- rainfall and river flow;

OVERVIEW OF THE CATCHMENT

- 2.2 The River Thames (Benson to Hurley), Pang and Wye catchment area includes a stretch of the River Thames extending from Wallingford through Reading to its confluence with the River Wye to the west of Marlow. Included in the area are two sub-catchments, the River Pang to the west of Reading and the River Wye to the north of Marlow (see Figure 1: Overview inside the front cover). The other major sub-catchment which drains this part of the Thames is the River Kennet but this is dealt with in a separate CMP.
- 2.3 The two major tributaries of the River Thames in this stretch are the River Pang and the River Wye. Other tributaries include the Mill Brook and Sulham Brook. The River Pang is a rural chalk stream, rising north of Hampstead Norreys in Berkshire and flowing a distance of approximately 23km to its confluence with the River Thames at Pangbourne. The River Pang is joined by a number of small tributaries between Bucklebury and Tidmarsh, the largest of which is the River Bourne.
- 2.4 The River Wye rises from chalk springs to the north west of High Wycombe and flows in a south easterly direction for approximately 17km, to join the River Thames at Bourne End. Major tributaries of the River Wye include the Hughenden Stream and the Wycombe Marsh Brook.
- 2.5 The Thames (Benson to Hurley), Pang and Wye is predominantly a chalk based catchment, covering an area of approximately 800km². The River Thames flows across Upper Greensand in the Benson area and then over the Lower, Middle and Upper Chalk from Wallingford to the end of the catchment area. The Pang and Wye tributaries originate as springs on the dip slope of the chalk.
- 2.6 River quality in this catchment is predominantly "good" with eleven out of the nineteen reaches falling into this category (see Section 4, Figure 20). Only two reaches are of "poor" quality with the remaining six being of "fair" quality.

Tomar

2.7 Key statistics of the catchment are:

Table 1: Key Statistics of the Catchment

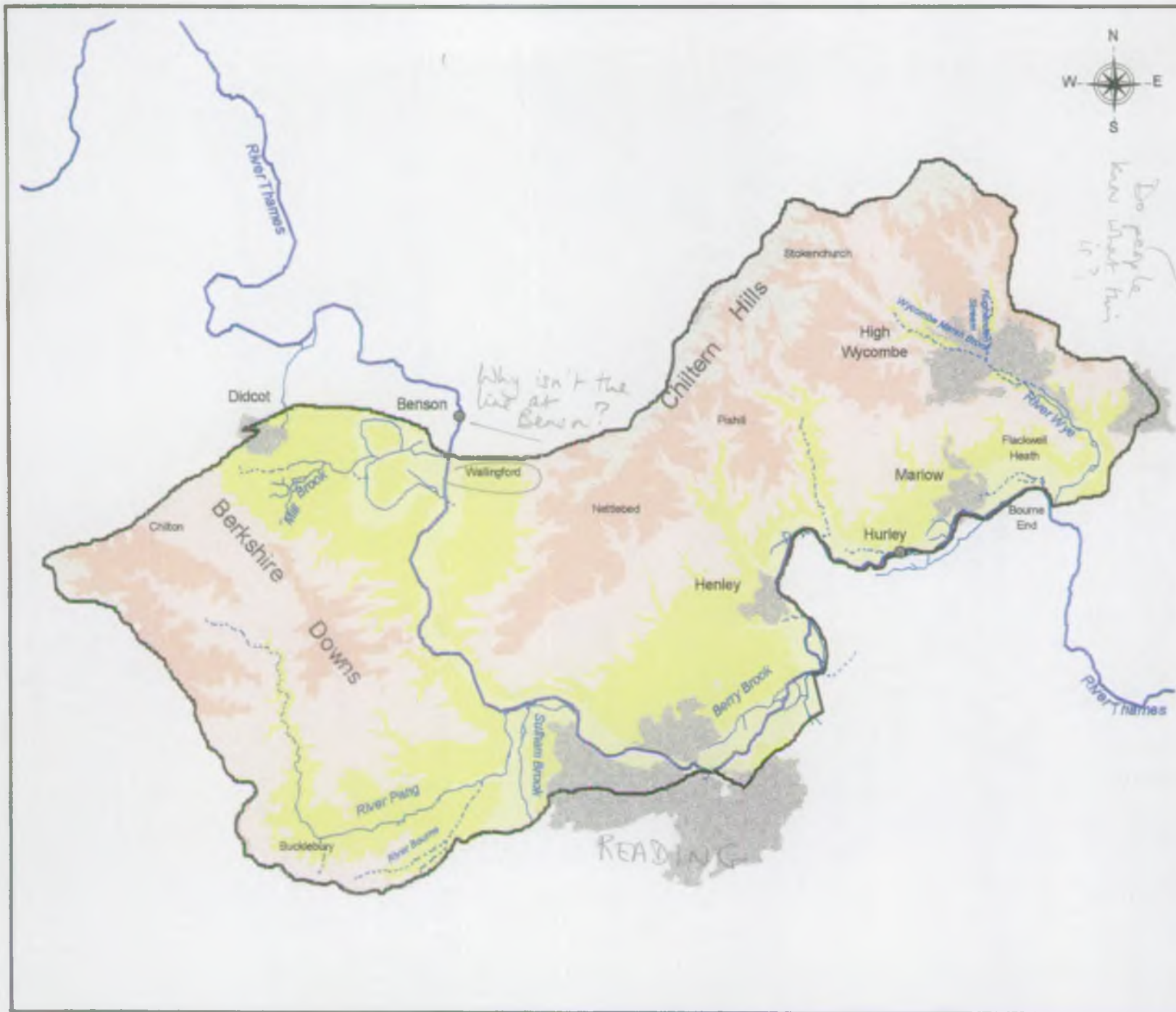
Catchment Area	800 km ²
Population (1986)	300,000
Average Annual Rainfall	722 mm
Total Main River Length	187 km
Number of Local Authorities	11

- 2.8 The middle of the catchment lies within Oxfordshire, and it encroaches into Berkshire to the west and Buckinghamshire to the east. The catchment area is predominantly rural in character, Reading, High Wycombe, Henley, Didcot and Marlow being the main urban areas.

TOPOGRAPHY





- 2.9 The area of this study includes the eastern part of the Berkshire Downs and the western part of the Chiltern Hills.
- 2.10 The River Pang flows through this part of the Berkshire Downs, deriving much of its flow from the underlying chalk. The Downs rise to over 220 metres AOD.
- 2.11 To the east of the Goring Gap much of the crest of the Chiltern escarpment exceeds 240 metres. In the west of the Chilterns there are no streams of any consequence draining the dip slopes. Dry valleys occur at a relatively high level, the more deeply incised valleys having flowing streams, such as the Hamble Brook and River Wye (see Figure 2).

*not shown on
the figure*









Thames (Benson-Hurley), Pang & Wye
CMP Figure 2:

Topography

-  CMP Boundary
-  Main River
-  Ordinary Watercourse
-  River Thames

Height Above Ordnance Datum (Newlyn) in Metres

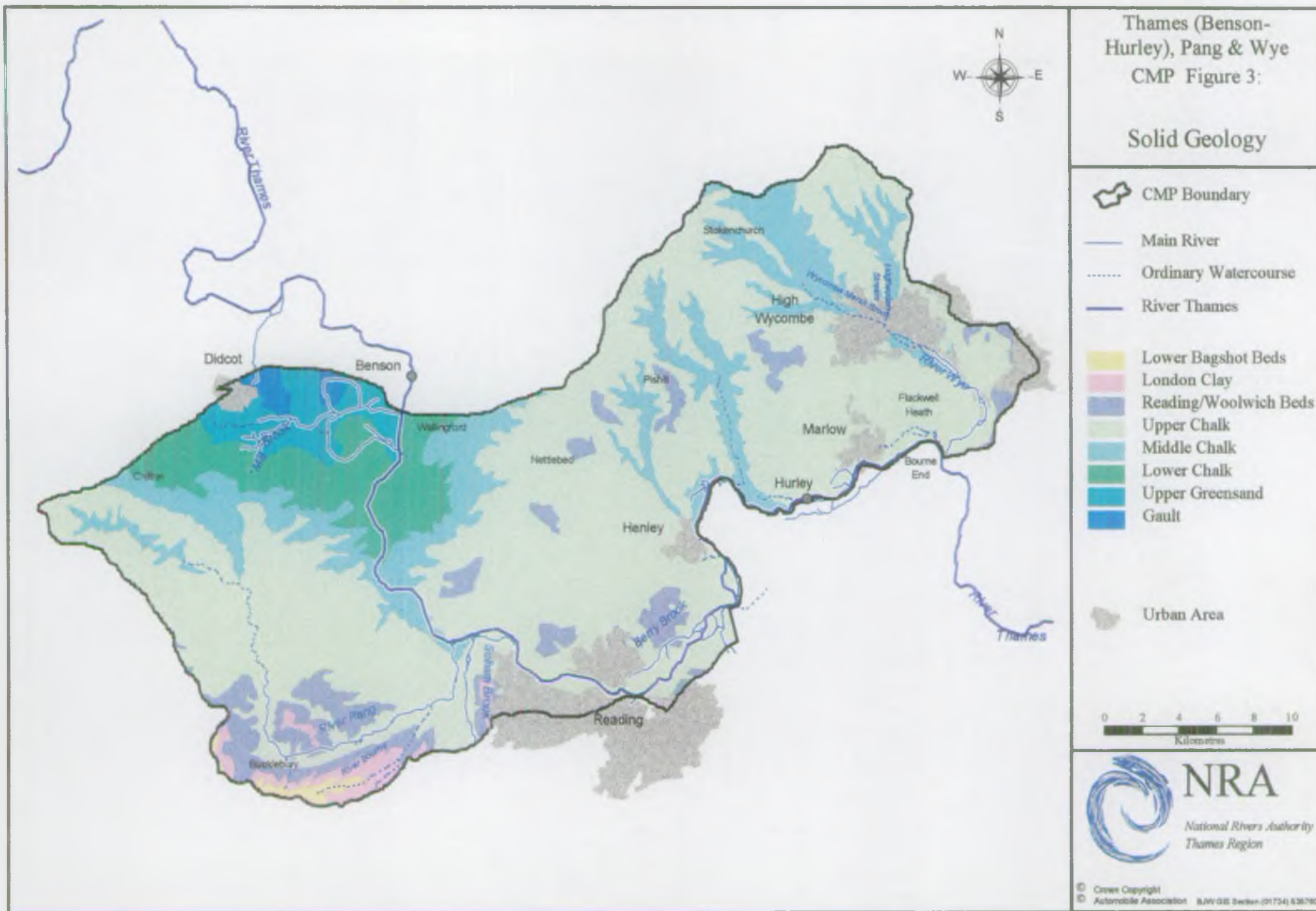
-  0 - 50
-  50 - 100
-  100 - 150
-  150 - 200
-  200 - 250
-  250 +

 Urban Area



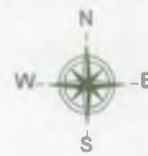
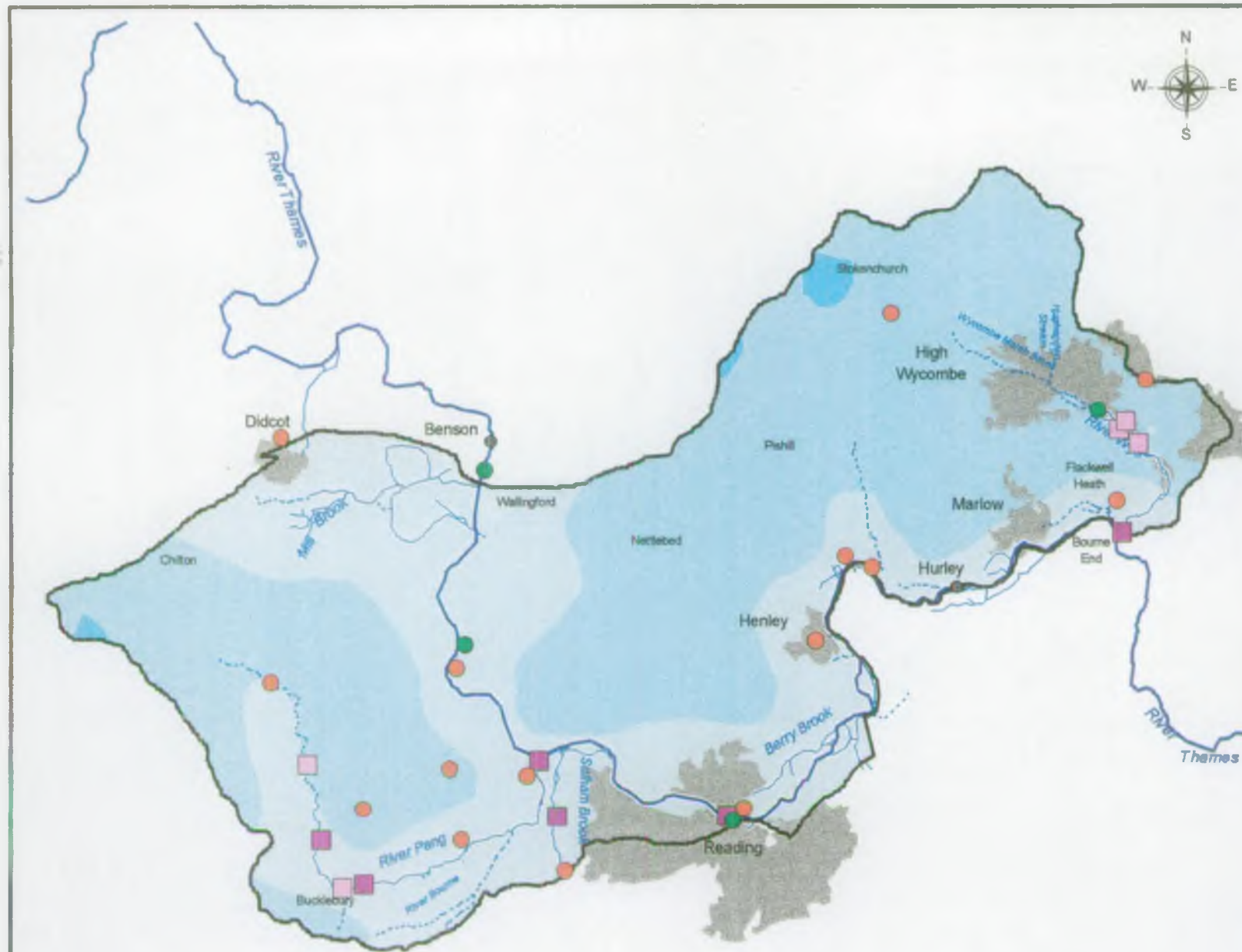
GEOLOGY AND HYDROLOGY

- 2.12 The underlying geology of the catchment consists of Upper Greensand and Lower, Middle and Upper Chalk strata which dip in a south-easterly direction, (see Figure 3). The River Thames flows across the Upper Greensand in the Benson area and onto the Lower Chalk just south of Wallingford. Further south between Cleeve and Whitchurch the river cuts through the Middle and Upper Chalk. This notable valley feature is known as the Goring Gap and separates the Berkshire Downs from the Chilterns. For the remainder of the catchment the Thames flows on Upper Chalk. There are extensive drift deposits overlying much of the higher ground to both east and west of the River Thames. They comprise plateau gravels, clay with flints and head deposits, and are periglacial deposits associated with previous glacial periods.
- 2.13 The Rivers Pang and Wye originate as springs on the dip slope of the Chalk. When groundwater levels are high (usually in late winter and spring) the rivers rise far up the valley. As water levels decline gradually through the summer and autumn the springs decline and the source of the rivers move down the valleys. The intermittent length of the river is known as a bourne and the stretch of the river which flows continually is known as the perennial section, with the perennial head marking the top of such a section.
- 2.14 In hydrogeological terms, the Chalk is the major aquifer and is therefore an important water resource. It supports a number of public water supply abstractions, in addition to many agricultural and domestic supplies. The Upper Greensand contributes to water supply as a minor aquifer and the drift deposits also provide a small supply.



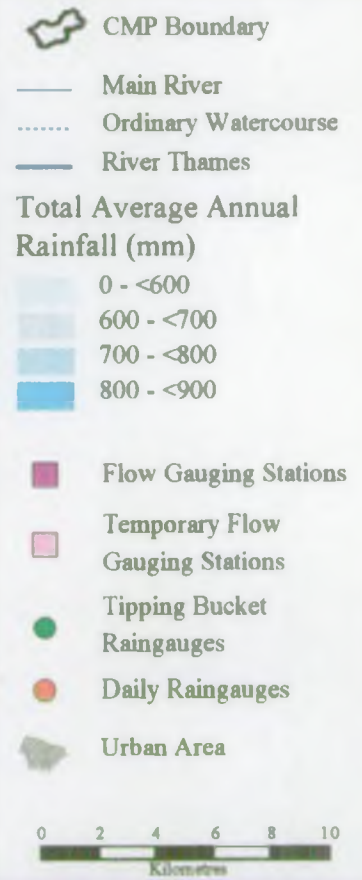
RAINFALL AND RIVER FLOW

- 2.15 This section considers the main features of the natural water resources within the catchment. Section 3 considers the use of these resources for water supply.
- 2.16 The average annual rainfall in the Thames (Benson to Hurley) Pang & Wye Catchment is 722mm. This varies from 800 mm in the north of the catchment to 600 mm in the north west, close to the River Thames (see Figure 4.).
- 2.17 A proportion of the rainfall which falls on the catchment is lost through direct evaporation and transpiration from plants and trees. The remainder is termed the effective rainfall and is the total available water resource to the catchment. The average annual effective rainfall is about 260mm; most of this water becomes recharge to the chalk aquifer. The catchment is predominantly underlain by chalk, so base flows are high and, in the area between the Rivers Pang and Wye, there are a number of major dry valleys.
- 2.18 Yearly rainfall and yearly percolation data for the catchment since 1941 are shown in Figures 5 and 6.
- 2.19 Figure 7a shows hydrographs (1984-1993) for the River Thames at Days Weir and Figure 7b at Old Windsor, located to the north and south east of the catchment respectively. The pattern of flow at the two sites is similar. No long term flow records exist for the River Thames within the catchment itself, although a flow gauging station was installed at Reading Bridge, Reading in 1991 (Figure 7c). The hydrographs show that flow increases between Days Weir and Windsor. This includes inputs from the River Thame whose confluence is outside the present study area, the Rivers Kennet and Loddon, and the Pang and Wye (Figures 7d and 7e respectively).
- 2.20 Water resources data are collected by the NRA from flow gauging stations, groundwater monitoring boreholes, current meter gaugings and rain gauges throughout the catchment.

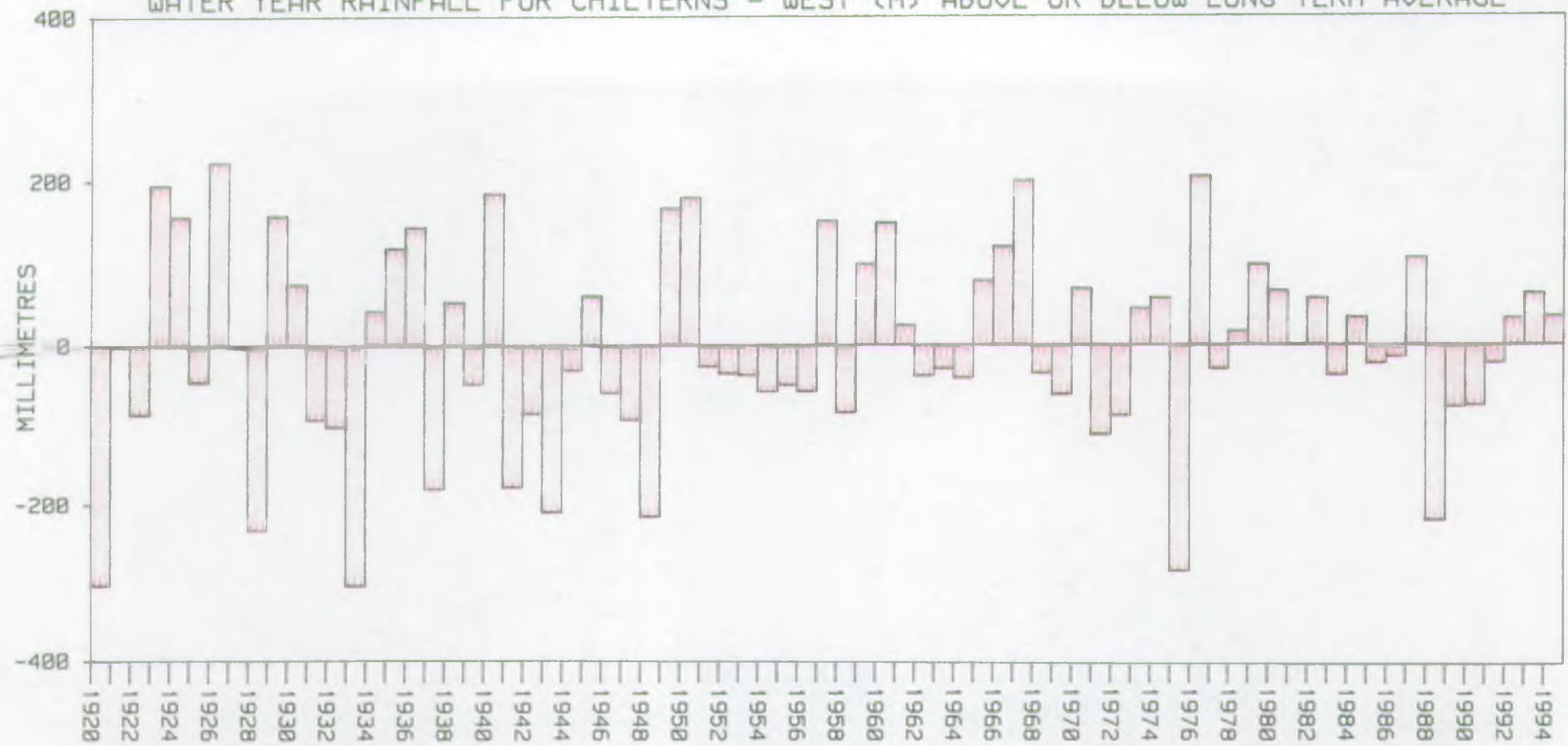


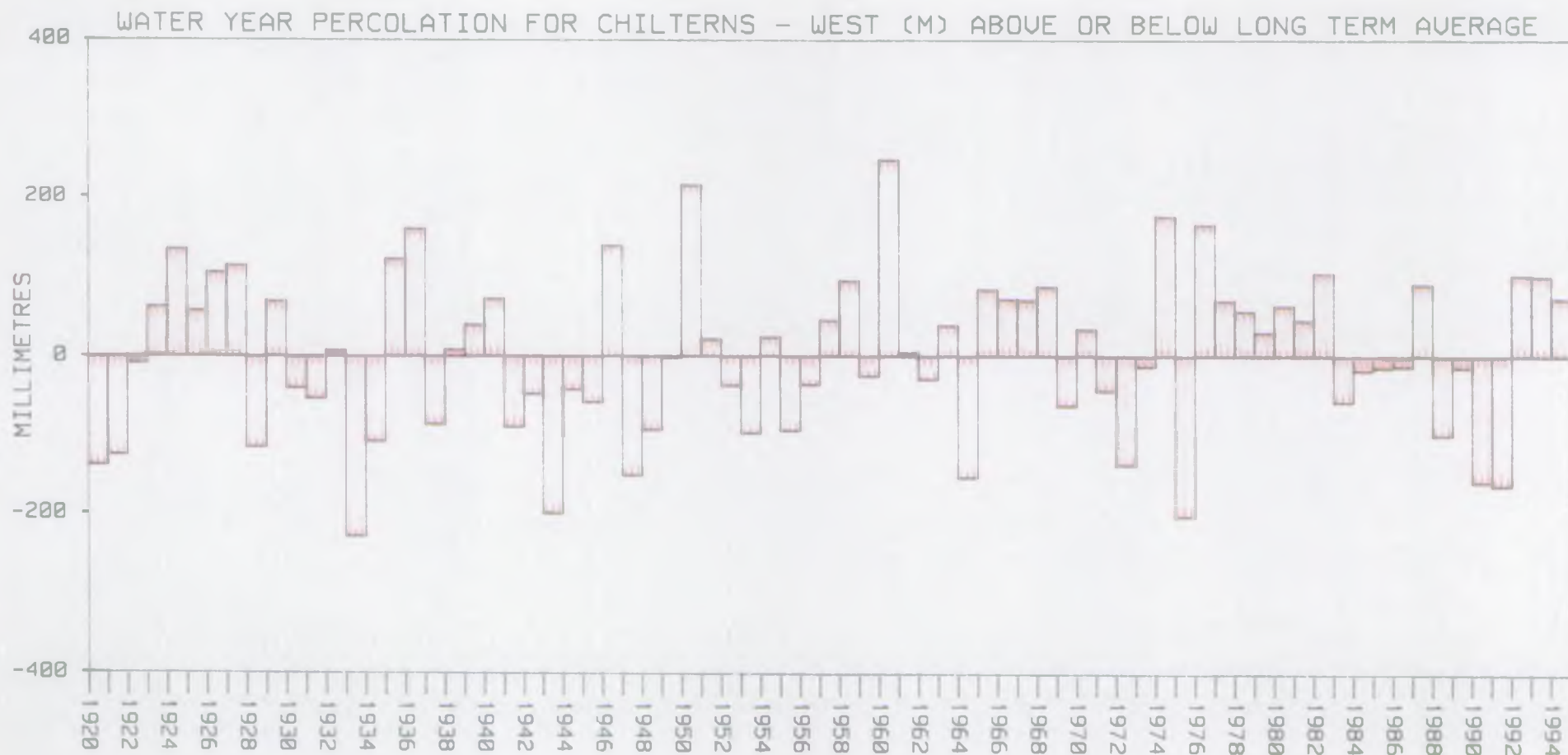
Thames (Benson-Hurley), Pang & Wye
CMP Figure 4:

Rainfall & River Flow



WATER YEAR RAINFALL FOR CHILTERN - WEST (M) ABOVE OR BELOW LONG TERM AVERAGE

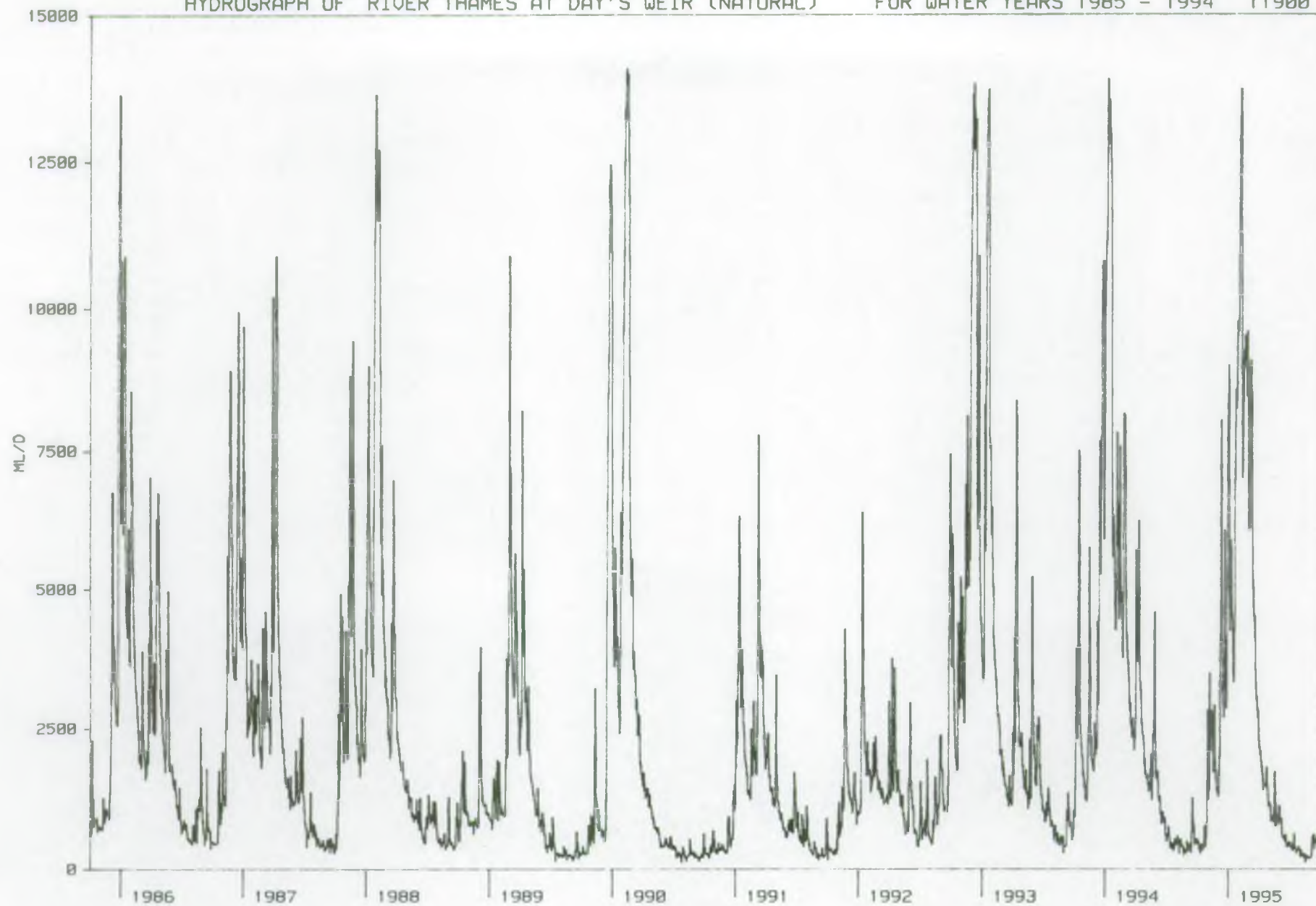


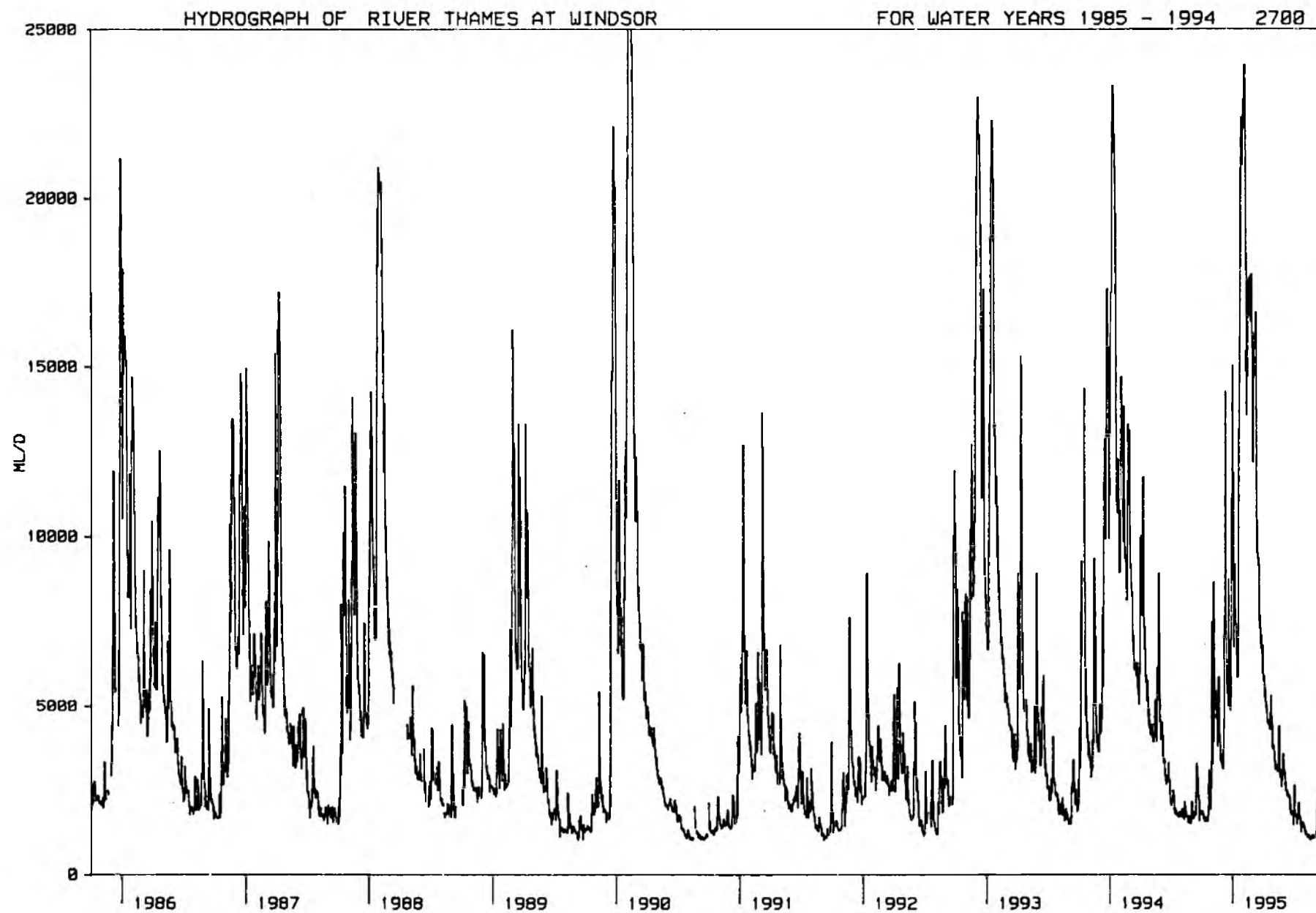


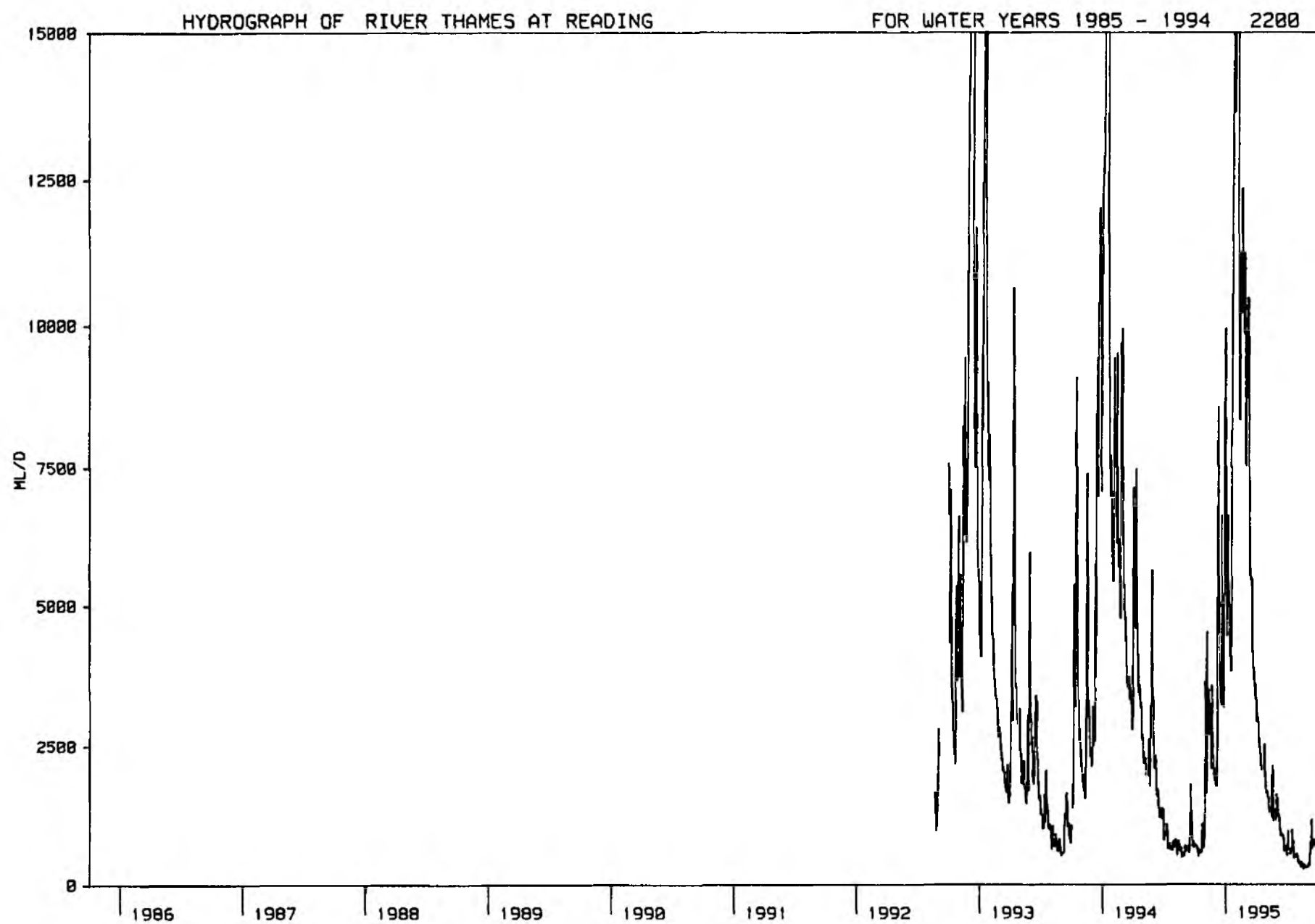
HYDROGRAPH OF RIVER THAMES AT DAY'S WEIR (NATURAL)

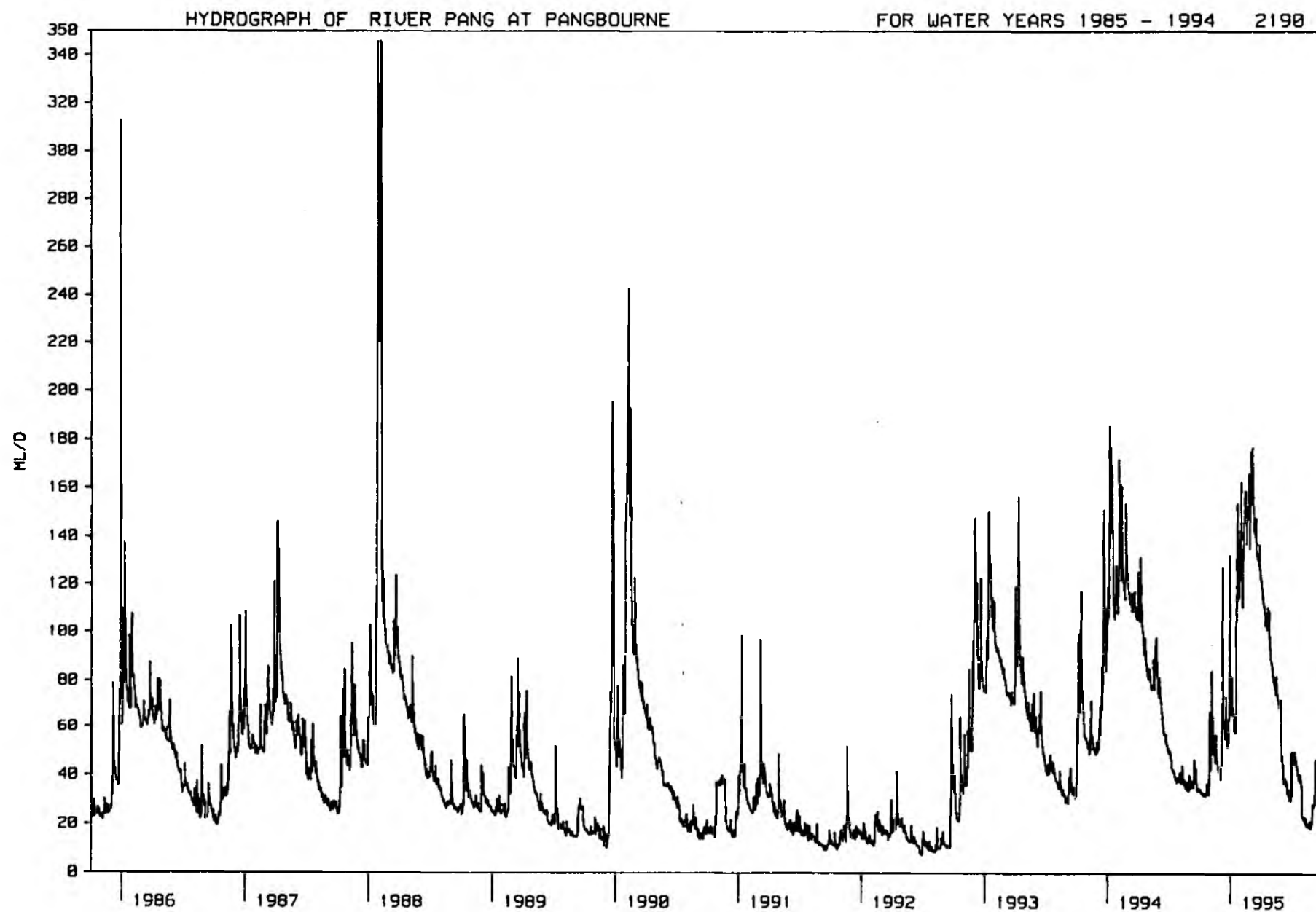
FOR WATER YEARS 1985 - 1994

11900



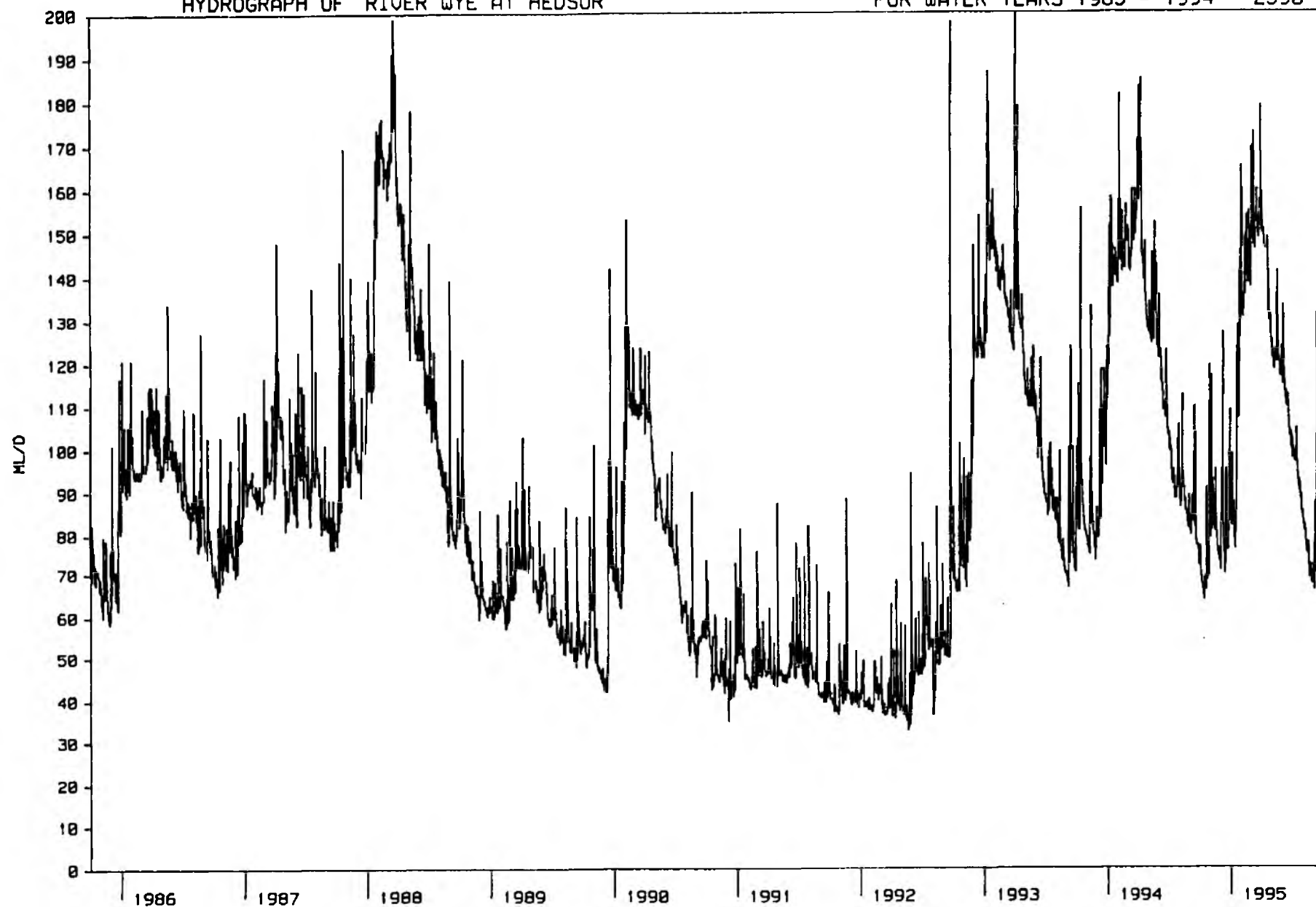






HYDROGRAPH OF RIVER WYE AT HEDSOR

FOR WATER YEARS 1985 - 1994 2590



SECTION 3

CATCHMENT USES, RESOURCES AND ACTIVITIES

This section reviews the resources of the catchment, the uses we make of the water environment and the activities likely to affect it. Environmental objectives are proposed, which are broad based and aim to conserve and enhance the water environment. Maps are used to enhance the information in the text and highlight the physical context of the use or resource.

3 CATCHMENT USES, RESOURCES AND ACTIVITIES

Introduction

3.1 This section describes current and future uses, and the natural resources of the water environment within the catchment. For each of the catchment uses the following information is provided:

- **General** - an overview of catchment uses, resources and activities;
- **Catchment Perspective** - how the uses and resources manifest themselves within the catchment with details of current and future activities;
- **Environmental Objectives** - broad-based objectives for the conservation and enhancement of the use and/or the water environment.

STRATEGIC AND LOCAL PLANNING

General

3.2 The NRA is consulted regularly on planning matters falling within its terms of reference, both in the preparation of statutory plans and waste disposal plans and in connection with individual applications for planning permission. Recent guidance on development and flood risk from the Department of the Environment (Circular 30/92) and the resulting Memorandum of Understanding between the NRA, the county councils, district councils and metropolitan authorities, have strengthened the links between the NRA and the local planning authorities, but ultimate planning control remains with the latter. This communication process is a fairly recent and vital approach which the NRA has adopted to influence LA forward planning.

3.3 Waste disposal plans are prepared by county council waste regulation departments in accordance with section 50 of the Environmental Protection Act 1990.

3.4 Catchment management plans can be considered as complementary to the Statutory Development Plans of local planning authorities. By clearly stating the catchment vision and actions needed to achieve it, it is hoped that CMPs will make a positive input to the formal planning process, which is the responsibility of the district and county councils.

3.5 In taking decisions regarding particular developments, provisions under the Town and Country Planning Act 1990 require that local planning authorities should have regard to the contents of relevant development plans. Section 54A of the Town and Country Planning Act 1990 specifically states that "*decisions are to be in accordance with the plan, unless material considerations indicate otherwise*". The plan framework required by the 1990 Act requires the preparation in non-metropolitan areas of the following plans, (all but (b) are dealt with by the county council):

- (a) **County Structure Plan:** This provides the broad strategic planning framework and should ensure that the provision for development is realistic and consistent with national and regional policy;
- (b) **District or Local Plan:** This plan is prepared by district councils and sets out detailed policies and specific proposals for the development and use of land. The local plan should be in general conformity with the structure plan;
- (c) **Minerals Local Plan:** Minerals local plans cover the exploitation of mineral resources in detail. They should indicate the areas where provision is made for mineral working and the disposal of mineral wastes as well as the areas where mineral resources are to be safeguarded for future working. The plans should also set out development control criteria and requirements for the restoration and aftercare of such sites;
- (d) **Waste Local Plan:** The Waste Planning Authority can integrate waste disposal policies into the minerals local plan or prepare a separate waste local plan. The plan should examine land use implications and identify suitable locations for further waste disposal facilities.

3.6 The NRA is a statutory consultee for both local authority development plans and planning applications and therefore has the opportunity to make any comments or objections to the policies contained in plans or to recommend conditions for (or advise refusal of) planning permissions. By responding to the planning system in this way, the forward planning and planning liaison sections of the NRA can play their part towards securing the future protection of the water environment. It is important that the water environment is considered fully in development plan policies as they will be implemented directly by local authority planners when planning applications are determined.

- 3.7 Issues which the NRA would like to see included in development plans have been set out in a document titled 'Guidance notes for Local Planning Authorities on the Methods of Protecting the Water Environment through Development Plans' (NRA June 1993). The forward planning section of the West Area of NRA-TR aims to promote the statements contained in this document at the preliminary stages of the development plan, favouring this proactive approach rather than waiting to respond to the plan at the deposit stage. In addition the NRA also aims to translate the aspirations set out in CMPs into policies and actions that can readily be incorporated into development plans.

Catchment Perspective

- 3.8 Table 2 summarises the distribution of the total catchment area of 800km² between county councils and other local authorities within the catchment boundary.
- 3.9 Most of the local authorities have recently revised, or are currently revising their statutory land use development plans. These documents, when considered in conjunction with regional planning guidance, provide the best means of establishing possible future land use trends which could have an impact on, or interact with, the water environment.
- 3.10 Regional Planning Guidance 9 for the South East, produced by the DoE, aims to secure the best environmental strategy for a catchment and includes advice on rivers, water supply and waste water disposal. Consultation with the NRA has enabled NRA views on the extent and location of residential development, mineral extraction, waste disposal and large scale infrastructure schemes to be taken into account. These views should be reflected in future structure plans.

Table 2: Catchment Area by County and District Council

County Councils	%	District Councils	%
Buckinghamshire	32%	Wycombe DC	30%
		Chiltern DC	1%
		South Bucks DC	1%
Berkshire	28%	Newbury DC	25%
		Reading Borough Council	2%
		Wokingham DC	1%
Oxfordshire	40%	Vale of White Horse DC	5%
		South Oxfordshire DC	35%
TOTAL	100%	TOTAL	100%

3.11 Particular provisions which may affect this CMP include:

Regional Planning Guidance for the South East: (1.10) *"All development should be planned in ways which work towards securing the objectives of sustainable development.....Development should respect the region's valuable environmental features...."*;

(4.25) *"Local authorities are encouraged to provide and support initiatives which seek to conserve, restore or enhance the natural elements of river valleys and the water environment."*;

(4.26) *"Flooding may be an issue on the floodplains of major rivers, such as the River Thames, or at the confluence of rivers. Local authorities should, in consultation with the NRA, take land instability and flooding into account in the planning process and should resist inappropriate development, including raising land within floodplains where such development would be at risk from flooding or may cause flooding elsewhere. PPG 14 "Development on Unstable Land" and Circular 30/92 "Development and Flood Risk", give advice on these matters."*

3.12 The NRA's involvement with, and representations on, development plans and other planning documents has raised awareness of the need to conserve and enhance the water environment. It is hoped that these representations and the subsequent inclusion of NRA interests in development plans will help to establish CMPs firmly in the development planning process.

3.13 Table 3 lists the most recent versions of development plans which are relevant to the study area.

3.14 Other strategies relevant to the water environment include: County Strategies for Agenda 21, Biodiversity Action Plans, An Environmental Strategy (Oxfordshire County Council 1994/95), Nature Conservation Strategy for Oxfordshire (Oxfordshire County Council 1993), Nature Conservation Strategy for Berkshire (Berkshire County Council 1994), State of the Environment Report (Berkshire County Council 1995), a Landscape Strategy for Berkshire (Berkshire County Council 1995), Nature Conservation Strategy for Buckinghamshire, Strategy for the Buckinghamshire Countryside (Buckinghamshire County Council 1994), The River Wye Study (Wycombe District Council 1991) and The Waterways Plan (Reading Borough Council 1992).

3.15 The DoE Circular 30/92 on development and flood risk, published in December 1992, requires the NRA to provide local authorities with data on flood risk areas. In March 1994 the NRA joined with representatives of local planning authorities across England and Wales to sign a Memorandum of Understanding on development and flood risk. The Memorandum sets out how the NRA will embark on an appropriate data collection and modelling exercise in order to supply local authorities with information on flood risk areas. In turn the local authorities, by signing, confirmed their intention to take full account of NRA advice or to give reasons for choosing to oppose it.

- 3.16 This new agreement will help to ensure that planning decisions take account of any risk of flooding. The survey work which underpins the agreement will be carried out under Section 105 of the Water Resources Act (1991).
- 3.17 In September 1995 NRA-TR published a strategic planning document entitled "Thames 21 - A Planning Perspective and a Sustainable Strategy for the Thames Region". This provides a regional context for the preparation of CMPs by identifying strategic development issues which these plans need to address. In this catchment, Caversham Lakes and a third river crossing of the River Thames at Reading has been identified as a development pressure point. Thames 21 also provides a set of sustainability principles and criteria against which NRA functional activities can be assessed.

Table 3: Statutory Land Use Plans Relevant to the Catchment

STRUCTURE PLANS		
Local Authority	Title of Plan	Current Stage
Berkshire County Council	Berkshire Structure Plan 1991-2006 (Deposit Draft November 1992)	Adopted November 1995
Buckinghamshire County Council	The New Buckinghamshire County Structure Plan 1991-2001 (Deposit Draft April 1994)	Further modifications October 1995
Oxfordshire County Council	Oxfordshire Structure Plan "Oxfordshire 2001" (Fourth alteration approved January 1992)	Public Consultation on the Structure Plan review August 1995
LOCAL PLANS		
Berkshire		
Newbury District Council	Newbury District Local Plan (Adopted December 1993)	Preparing Local Plan Review
Reading Borough Council	Reading Borough Local Plan (Composite working draft March 1994)	Modifications
Wokingham District Council	Wokingham District Local Plan Public Consultation Draft (June 1995)	Reconsultation (May/June 1996) on housing issues due to changes in Berks County Council Structure Plan Deposit draft expected Feb 1996
Buckinghamshire		
Wycombe District Council	Wycombe District Local Plan (Deposit Draft July 1992)	Notice of Adoption
Chiltern District Council	Chiltern District Local Plan (Deposit Draft May 1995)	Preparing for Public Inquiry February 1996
Oxfordshire		
Vale of White Horse District Council	Vale of White Horse Local Plan (Deposit Draft October 1995)	Consultation Deposit Draft
South Oxon District Council	South Oxfordshire Local Plan (Deposit Draft December 1993)	Public Inquiry held Oct 1994
MINERALS PLAN		
Berkshire County Council	Berks replacement Minerals Plan (Adopted November 1995)	Modifications
Bucks County Council	Bucks replacement Minerals Plan (Adopted 17/01/95)	
Oxon County Council	Oxfordshire Minerals and Waste Plan (Deposit Draft 1993)	Inspectors Report received 1995
WASTE PLANS		
Berkshire County Council	Waste Local Plan for Berkshire (Adopted July 1995)	Public Inquiry held summer 1995, Inspectors Report awaited
Bucks County Council	Draft for Public Consultation (February 1995)	Preparing Deposit Draft
Oxon County Council	Oxfordshire Minerals and Waste Plan (Deposit Draft 1993)	Inspectors Report received 1995

NATURE CONSERVATION

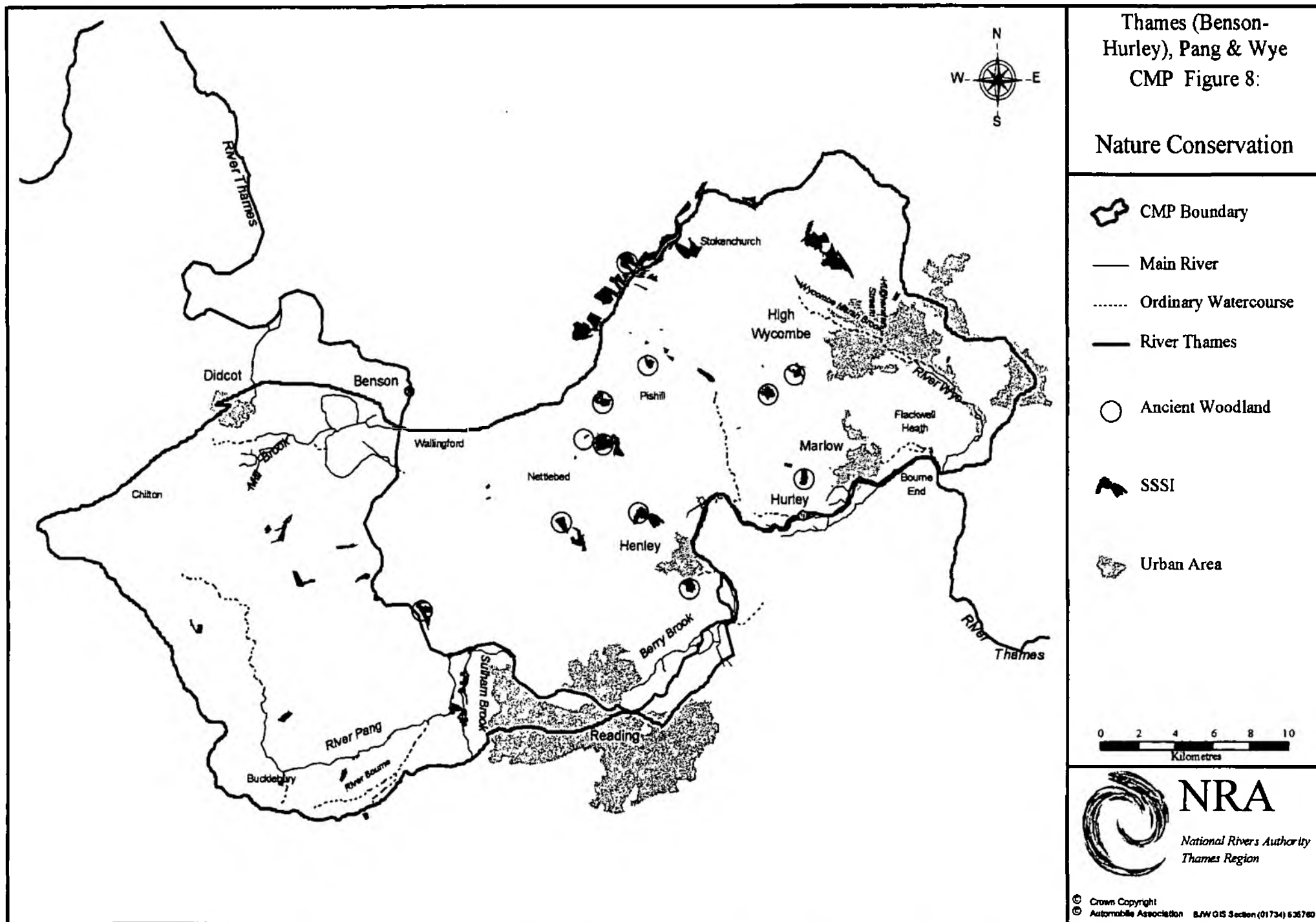
General

- 3.18 Nature conservation in this section relates to the protection of the aquatic flora and fauna and ecology of the river corridor, including organisms which are dependent upon the river itself, and plants and animals which are able to exploit the river banks and associated land. A healthy river and adjacent corridor environment are characterised by ecologically diverse and abundant plant and animal communities which enhance the overall quality of the landscape.
- 3.19 The character of the river and its corridor are highly dependent upon the geology, the adjacent land use and the way in which the river is managed. Rivers have been used by man for thousands of years and man's influence over them has increased in the same period. The construction of mills, creation of water meadows, pollarding of willows and other anthropogenic factors can all contribute to the diversity of the river environment, both ecologically and visually. However, more recent measures such as river realignment or re-sectioning, removal of bankside trees and draining of wetlands have significantly altered parts of the environment to the detriment of semi-natural habitats and of species diversity. Modern farming has often led to the removal of riverside vegetation and utilisation of the land up to the banks of the watercourse for intensive agricultural production. This practice effectively removes beneficial shading and cover from the river and can often result in increased soil erosion and siltation of the river bed, as well as loss of important riparian habitat and significant reduction in the integrity of the river corridor.
- 3.20 The NRA's conservation duties are set out in Sections 2.2 and 16 of the Water Resources Act 1991, and require the NRA, whilst carrying out its own functions or dealing with proposals by others, to further the conservation of flora, fauna, geological and physiographical features of special interest, and the enhancement of natural beauty.
- 3.21 Many other statutory and voluntary bodies have roles and responsibilities regarding nature conservation. English Nature is the official body primarily responsible for nature conservation and has the functions of establishing, maintaining and managing National Nature Reserves (NNRs), advising the government, providing general information and advice, giving grants and supporting research. English Nature is also required to notify Sites of Special Scientific Interest (SSSIs) which are protected by the Wildlife and Countryside Act 1981. County Wildlife Trusts also own and/or manage a number of nature reserves as well as playing a major role in the identification of non-statutory sites of high conservation value. The Royal Society for the Protection of Birds also plays an important role in wildlife conservation and establishing nature reserves.

- 3.22 The Countryside Commission is responsible for conserving and enhancing the natural beauty and amenity of the countryside. It is empowered to designate, for confirmation by the Secretary of State for the Environment, National Parks and Areas of Outstanding Natural Beauty (AONB). The Commission operates the Countryside Stewardship Scheme which offers grants to landowners for the conservation and restoration of valued landscape and wildlife habitats; this includes a category of "Waterside Landscapes". The stewardship scheme is due to transfer to MAFF in April 1996.
- 3.23 Since 1993 English Nature have been working on a new geographic framework which cuts across traditional administrative units and is referred to as the Natural Area Strategy. This approach to working provides a practical scale for characterising features, species and habitats and taking an integrated approach to their conservation needs. The natural areas identified show a coherence of characters such as geology, soils, topography and climate which influence the vegetation, landscape, patterns of land use and distinctive wildlife. Although the Natural Areas approach has been conceived by English Nature it is envisaged that identified priorities will be tackled in partnership with a whole range of organisations. The Countryside Commission have simultaneously been working on the Countryside Character Programme and map, which will be amalgamated with the Natural Areas Map to produce a single Joint Character Map. This map will reflect the shared interests of the two agencies at a strategic level and will be used to frame objectives and priorities in the future. The majority of this catchment falls within the Chilterns Natural Area, with the western-most portion falling within the Wessex Downs Natural Area.
- 3.24 The National Trust, an independent charity, owns and protects a variety of properties and areas of natural beauty and/or nature conservation interest and makes many of these open to the public.
- 3.25 Berkshire, Buckinghamshire and Oxfordshire County Councils have all produced nature conservation strategies which aim to maintain and enhance the natural environment of the counties. As part of these strategies each county has identified the location of important wildlife habitats and geological sites. All three counties now have developing local biodiversity action plans, designed to deliver the UK's biodiversity responsibilities at a local level. These were co-ordinated and produced by BBONT, and launched in January 1996.

Catchment Perspective

- 3.26 There are forty three SSSIs within the catchment (these are listed in Appendix D9 and shown on Figure 8); The majority are located outside the river corridor. However, there are some important water-dependent SSSIs within the catchment, such as Temple Island Meadow, a species rich wetland, with several floral species of local and national importance, including the Loddon Lily (*Leucojum aestivum*). The Loddon Lily is of particular importance because it is a Red Data Book plant of national rarity and its occurrence is dependent on the retention of habitats created by seasonally flooded willow thickets and the edges of backwater channels, thus it is very important that these are protected. Another notable SSSI is Sulham and Tidmarsh Woods and Meadows, a mosaic of damp copses and seasonally flooded water meadows which is of particular importance for its invertebrate species. There are two nationally rare molluscs found in suitable fen habitats beside the river in the upper stretch of the catchment. Both are terrestrial snails; *Perforatella rubiginosa* (German Hairy Snail) known at only eight sites in England, and *Vertigo moulinsiana* which is listed in the EC Habitats and Species Directive. Other habitats represented within the SSSI list for the catchment include ancient woodlands, calcareous grasslands and geological sites.
- 3.27 Other notable sites within the catchment include:
- Cholsey Marsh Nature Reserve, an example of the riverside wetland habitat once prevalent throughout the region;
 - reed beds at Child Beale Wildlife Park, one of the largest such sites in Berkshire;
 - gravel pits and the Thames Valley Business Park Nature Reserve between Sonning and Reading which provide important habitats for wintering birds and have a population of breeding common terns (*Sterna hirundo*);
- 3.28 Three sites in the catchment have been identified for the production of Water Level Management Plans (WLMPs). These are Sulham and Tidmarsh Woods and Meadows, Rodbed Wood and Temple Island Meadows. The purpose of WLMPs is to provide a means by which water level requirements for a range of activities, including flood defence, navigation and recreation, and agriculture, can be balanced and integrated with nature conservation requirements. They are intended to be agreements between operating authorities (eg. the NRA, local authorities), English Nature and landowners.
- 3.29 As both the Rivers Pang and Wye are chalk fed rivers they have a potentially high ecological value. This high value is illustrated by the high macro-invertebrate diversity found in the River Pang. The River Wye however achieves well below its potential due to the pressures exerted on it from its mainly urban catchment area.



- 3.30 Surveys on the Wycombe Marsh Brook in 1989 and 1991 revealed the presence of native crayfish (*Austropotomobius pallipes*). These populations are threatened by pollution and the introduction of non-native crayfish species which carry the virulent fungal disease crayfish plague, to which native crayfish are extremely susceptible. In addition non-native crayfish are larger and may out-compete natives. Despite several outbreaks of crayfish plague, there are still believed to be isolated native populations present in the River Wye.
- 3.31 Some rivers in England and Wales have suffered drastic losses of native crayfish attributable to crayfish plague. The NRA recognises the need to protect populations of native crayfish through the implementation of a crayfish conservation plan, involving continued monitoring of native crayfish populations, dissemination of information on crayfish plague, pollution prevention, the promotion of research and controlling the spread of non-native crayfish, encouraging their consented removal and resisting the development of crayfish farming in areas where this may threaten populations of the native species.
- 3.32 Much of the past wetland resource of the catchment has been lost, largely through river engineering, river regulation on the Thames and land drainage. There is great potential for wetland restoration. Among the species which may benefit is the water vole, now becoming rare and of conservation concern in the Thames catchment but still found in reasonably good numbers on the Pang catchment.

Environmental Objectives

- To promote the conservation of all aquatic life and associated non-aquatic wildlife in the corridor, and to protect the integrity of all habitats of acknowledged conservation value, i.e. to conserve the existing biodiversity of the catchment.
- To carry out channel and riparian enhancement schemes on currently degraded reaches and river corridors to improve biodiversity status.
- To produce Water Level Management Plans (WLMPs) for all water-dependent SSSIs in the catchment area.
- To ensure species and habitats of conservation value retain a favourable status into the future.
- To improve existing habitats to encourage the return of lost species.
- To produce a biological inventory of habitats and species occurring within the river corridors and monitor the status of important habitats and species.

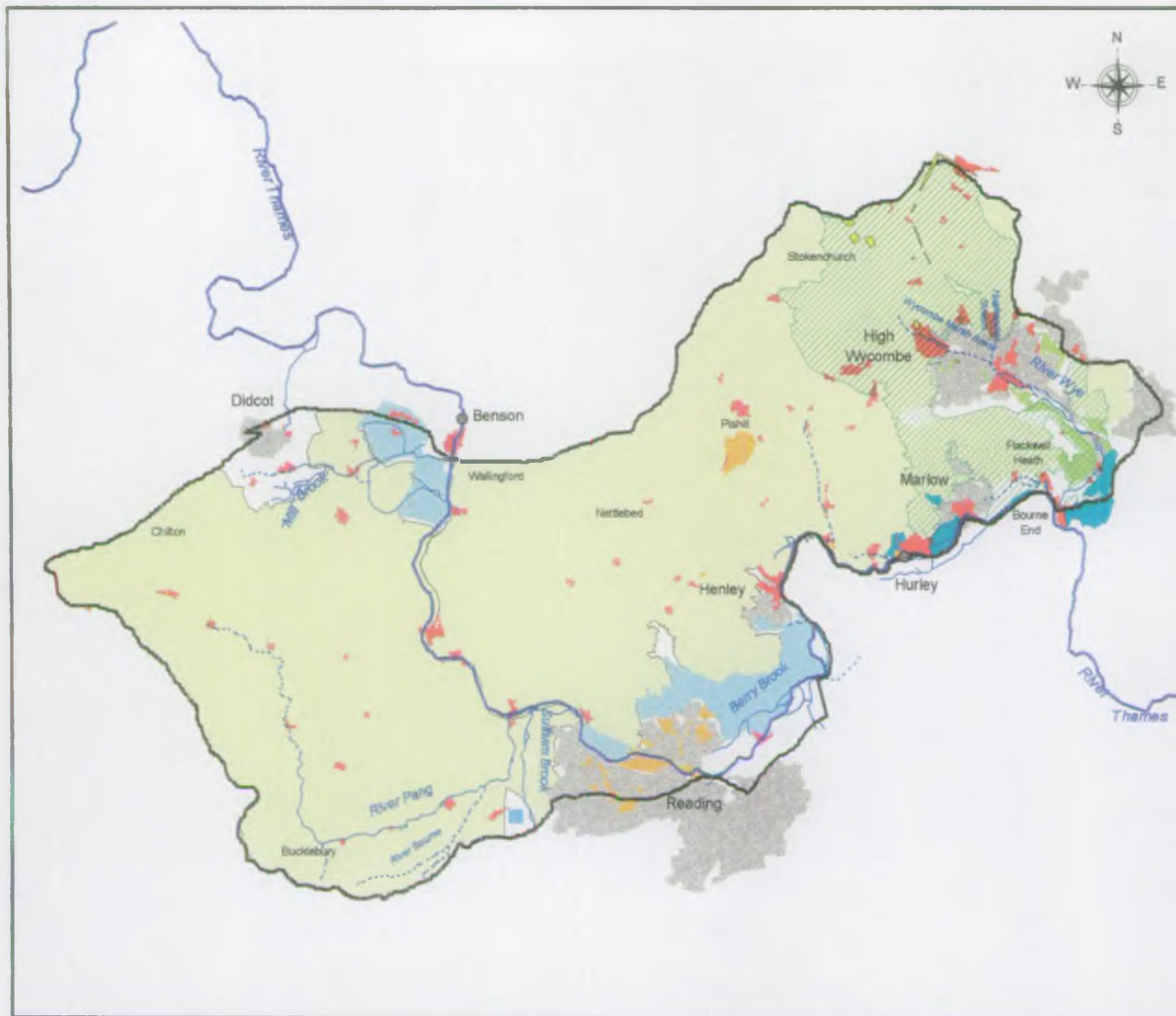
LANDSCAPE

General

- 3.33 The landscape of an area reflects the complex interplay between the natural environment and man's activities. Geomorphology, geology, topography and drainage provide the basic elements of the landscape and, together with associated vegetation and settlement patterns, determine the essential landscape character of an area.

Catchment Perspective

- 3.34 The landscape of the Thames Valley is characterised by areas of open pasture and flood meadows with contrasting built-up frontages within urban areas, some of considerable historical and archaeological importance. This stretch of the River Thames features a number of lock sites of unique character and landscape importance, including Goring Lock, Marsh Lock, Hambleden Lock and Hurley Lock.
- 3.35 The River Pang rises in the rolling and open landscape of the Berkshire Downs. The catchment is predominantly rural in character, with a lowland agricultural landscape of fields, hedgerows, copses and small villages.
- 3.36 The upper reaches of the River Wye are rural in character, with open fields and hedgerows. Further downstream, the river enters High Wycombe and the character becomes more urban and confined, with the watercourse culverted under the town centre. Once through High Wycombe, the valley becomes more varied, with residential and commercial areas interspersed with areas of public open space. Historic mill structures exist along much of the length of the River Wye. The immediate river landscape through High Wycombe is considerably degraded.
- 3.37 The catchment contains two designated Areas of Outstanding Natural Beauty: the North Wessex Downs AONB and the Chilterns AONB. These are shown in Figure 9 and together they cover the majority of the catchment. The boundary of the two AONB areas is marked by the River Thames. Although both are chalk upland, their character differs. The North Wessex Downs AONB includes both open uplands and lower land towards the Thames, while the Chilterns AONB is generally of a more enclosed and wooded nature.



Thames (Benson-Hurley), Pang & Wye
CMP Figure 9:

Landscape & Heritage

- CMP Boundary
 - Main River
 - Ordinary Watercourse
 - River Thames
 - AONB
 - Adopted Green Belt
 - Wycombe Local Landscape Area
 - South Oxfordshire Area of Great Landscape Value
 - Berkshire Area of Special Landscape Importance
 - Wycombe Area of Attractive Landscape
 - Parks & Gardens of Special Historic Interest
 - Scheduled Ancient Monuments
 - Designated Conservation Area
 - Urban Area
- 0 2 4 6 8 10
Kilometres



- 3.38 In October 1994 the Chilterns AONB Management Plan "A Framework for Action" was produced on behalf of the Chilterns Conference, which is a co-ordinating group consisting of the 15 local authorities which cover the AONB plus a wide range of other organisations with an interest in the area. An AONB officer has been appointed to implement the management plan. The aim of the plan is to assist in reconciling the competing land uses within the Chilterns, to promote landscape conservation, and to guide the work of members of the Standing Conference for at least the next 10 years so that the natural beauty of the area can be safeguarded. The Plan outlines a number of objectives for the protection of the water environment within the Chilterns, and current negotiations are taking place to try and integrate the aims of the Chilterns Management Plan with those of CMPs.
- 3.39 The Chilterns Conference has now divided the AONB into 22 zones and a zonal management plan will be prepared for each zone to compliment the AONB wide plan. The first of these zonal plans was produced in July 1995 and covers the Wye Valley/West Wycombe and Stokenchurch area.
- 3.40 Most of the remainder of the catchment area is designated as Areas of Great Landscape Value, Areas of Attractive Landscape or Areas of Special Landscape Importance. These are also shown in Figure 9. Although these are not national designations, the areas generally have an unspoilt nature and are of high landscape quality.
- 3.41 The particular value and sensitivity of the river and water environment in the catchment has only partially been evaluated through general surveys of the landscape, such as the River Wye study carried out by Wycombe district Council in 1991. This study provided an examination of the opportunities and constraints to improving the physical environment and the recreational potential of the River Wye and its tributaries. Recommendations made by the study have since been implemented and further improvements are currently being discussed between Wycombe District council and the NRA (see Issue 3, Section 5) A landscape assessment of the River Pang was carried out in 1993 as part of the Alleviation of Low Flows (ALF) scheme.

Environmental Objectives

- To safeguard the special landscape interest of designated areas including the North Wessex Downs and the Chilterns AONB.
- To protect and conserve highly valued river landscapes and enhance degraded river landscapes.
- To carry out a landscape assessment of the River Thames (Benson to Hurley) and the Mill Brook.

HERITAGE

General

- 3.42 Heritage in this section relates to sites or areas which are deemed to be of historical or archaeological importance. Archaeological and heritage resources include not only obvious and well-known sites such as stone circles, castles and historical industrial buildings, but also the buried remains of rural and urban settlements and other activities, many of which have left no surface trace.
- 3.43 Under the 1991 Water Resources Act, the NRA has a duty to protect and conserve buildings, sites and other objects of archaeological, architectural or historic interest when undertaking its statutory duties.
- 3.44 Lists of buildings of special architectural or historical interest are compiled by the Secretary of State for the Environment. English Heritage is responsible for protecting and conserving the architectural and archaeological heritage by designating sites as Scheduled Ancient Monuments (SAMs), managing ancient monuments and providing advice and information. Local planning authorities can also designate 'conservation areas' of particular interest for special protection.

Catchment Perspective

- 3.45 The counties of Berkshire, Buckinghamshire and Oxfordshire contain a wealth of archaeological features, which vary from deserted medieval villages and monastic sites, to broad tracts of countryside where the range of features creates an archaeological landscape. Figure 9 shows the location of scheduled ancient monuments within the catchment.
- 3.46 Settlements within the catchment can be traced back to prehistoric times in some areas and there is also evidence of Roman occupation. The catchment has many features representing saxon and medieval settlements and the landscape has been characterised by early activities and development.
- 3.47 Buildings of special historic or architectural importance within the catchment have been listed by the Secretary of State for National Heritage. In Buckinghamshire there are over 6,000 listed buildings ranging from Stowe House to small country churches. The county also contains some of England's finest eighteenth century landscaping and English Heritage have, for this reason, put the landscape under special protection.
- 3.48 There are many parks and gardens found in the catchment, one parkland of particular note is at Fawley Court on the River Thames and includes Temple Island.

- 3.49 The collective character of many towns and villages within the catchment has been recognised by the local authorities and " Conservation Areas" have been designated in some districts. The Thames itself is of significant heritage value and has influenced the development of settlements and the landscape along its length. Several local authorities have recognised this by designating riverside land as "Areas of Special Landscape Character".
- 3.50 In the course of its duties the NRA seeks to protect ancient monuments, listed buildings and archaeological features as it recognises the contribution made to the environment by features of historic interest. Future activity within the river corridors in the catchment should be sensitive to the archaeological and heritage interests of the area.

Environmental Objectives

- To protect and conserve the archaeological and heritage interest of relevant sites within the river corridor.
- To conserve areas of archaeological and heritage value.

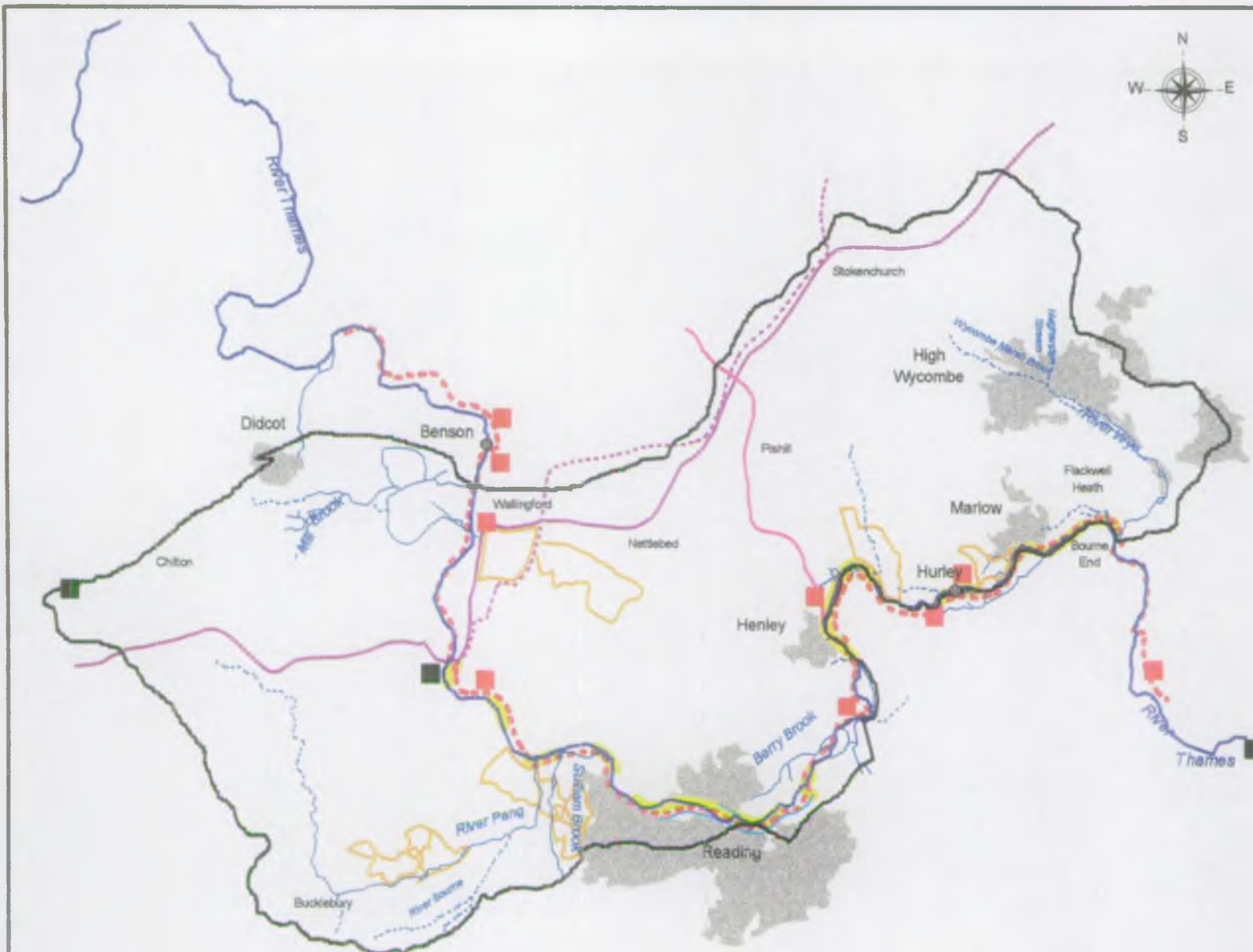
RECREATION

General

- 3.51 The amenity and recreation duties of the NRA are laid down in Section 6(1) of the 1995 Environment Act, which empowers the NRA to conserve and enhance the natural beauty and amenity of inland and coastal waters and associated land, as well as to promote the use of such waters and land for recreational purposes. The NRA is also required to have regard to the desirability of preserving public freedom of access and to take into account, either in relation to its own activities or those of others, the likely effect specific action would have on any such freedom of access.

Catchment Perspective

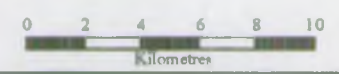
- 3.52 The catchment is of high value both for informal countryside recreation and leisure, and organised sports activities (see Figure 10). The area lies within a short travelling time of a large population. The high profile of the River Thames and the AONB designations of the Wessex Downs and Chilterns combine to make the catchment an attractive destination for visitors from the London conurbation and elsewhere, as well as for residents within the catchment.
- 3.53 Water based recreation activities within the catchment are heavily concentrated around the River Thames which is used for both formal and informal recreation. Difficult access in some areas constrains the extent to which the river is used. Where access is good, such as in towns, villages and at bridging points, recreational use can be very heavy.



Thames (Benson-Hurley), Pang & Wye
CMP Figure 10:

Amenity & Recreation

- CMP Boundary
- Main River
- Ordinary Watercourse
- River Thames
- Thames Path
- Ridgeway Path
- Swan's Way
- Oxfordshire Way
- Promoted Cycle Routes
- Promoted Recreational Walks & Rides
- Key Riverside Access/ Recreation Locations
- Youth Hostels
- Riverside Campsites
- Urban Area



- 3.54 The Recreation Strategy for the River Thames was published in 1995 and reflects the views, opinions and hopes of people with a diverse range of interests. The Strategy was needed to update the 1980 Report of the Working Party on the River Thames Leisure Policy and to adapt to the general growth in popularity and diversity of outdoor activities while protecting the environment on which they all depend. It aims to optimise the recreational potential of the River Thames and the land alongside it, while conserving and enhancing the ecological, landscape and heritage value. The Strategy provides guidelines for the management of the river as a recreational resource for years to come.
- 3.55 Water-based activities on the River Thames include rowing, canoeing, sailing and motor cruising. There are rowing clubs in most towns along this stretch of the river, and several school and college clubs. The most famous of all rowing venues, Henley, home of the Henley Royal Regatta and the River and Rowing Museum, is located within the catchment. The museum is the only one which focuses specifically on the River Thames and includes information and exhibits on all aspects of the river.
- 3.56 Nationally, canoeing is a growth activity and this is reflected within the Thames Region. The catchment is the home of a number of canoe clubs, mostly located in towns or villages. Hambleden and Hurley weirs are both used for national white water canoeing events and are popular with canoeists throughout the year. The County Centre (water sports centre) at Pangbourne offers canoe training, as does the Castle Hill Centre Canoe School at Hurley Lock. There are also several river-based sailing clubs within the catchment area.
- 3.57 This section of the River Thames is one of the most popular in terms of cruiser traffic, with several of the locks being amongst the busiest on the river. Cruiser ownership and hire supports a number of boatyards and other boating related businesses along the river. The passage of cruisers and other craft along the river is an essential part of its character and its attraction to residents and visitors.
- 3.58 Waterside recreation is heavily concentrated on publicly accessible land and lock sites adjacent to the River Thames. These include Wallingford Riverside, Goring Lock, Mapledurham Lock, Pangbourne Meadows, Sonning Lock, Caversham Lock, Reading Riverside Parks, Shiplake Lock, Marsh Lock, Henley Mill Meadows, Hambleden Lock, Hurley Lock, and Hurley Farms (see Figure 10).
- 3.59 Tables 4 and 5 show the daily number of pedestrian visitors at Hurley and Hambleden Locks (1991) and at Hurley Lock in 1993. Figures are based on the results of a recreation survey carried out on behalf of the NRA. These figures show the way that locks create foci of attraction for visitors disproportionate to the sites' size. Although pressure is highest at summer weekends, the most popular sites, such as Hurley Lock, attract visitors throughout the year.

- 3.60 The towpath alongside the River Thames has for many years been used and promoted as a long distance walking route. In 1996 the Countryside Commission will officially launch the Thames Path National Trail (186 miles from the source to the Thames Barrier) which is likely to markedly increase the use of the towpath for walking. The extra visitors will create an added demand for other facilities such as car parks and refreshments.
- 3.61 The NRA have camping facilities, open from April to October, at Shiplake and Hurley Locks. In addition there are other campsites near the river, a Youth Hostel at Streatley and the proposal for another near the Thames Valley Business Park in Reading. All of these will have a part to play in providing accommodation for river users and Thames Path walkers.

Table 4: Average Number of Pedestrian Visitors to Hurley and Hambleden Locks (1991)

Day/Time	Hurley	Hambleden
July weekday	632	378
August weekday	1,254	407
August Saturday	1,496	1,227
August Sunday	2,894	2,174
August Bank Holiday	3,342	2,304

Table 5: Average Number of Pedestrian Visitors to Hurley Lock (1993/4)

Day/Time	Hurley
July Wednesday	687
August Wednesday	475
July Saturday	1,339
July Sunday	2,187
Summer Average (Sunday)	1,378
Total for year	160,000

- 3.62 Angling takes place throughout the catchment. On the River Thames, busy areas tend to be at selected weirs and other sites where the banks are publicly accessible. However, at many locations anglers have formal access arrangements with landowners. There are over twenty angling clubs within the catchment.
- 3.63 Recreation on the Rivers Pang and Wye is largely informal bankside use. Neither rivers have statutory rights of navigation but some stretches are used by small craft, primarily canoes. The close proximity of the Pang Valley to Reading and Newbury, and the rights of way network within the valley, make it a valued area for walking and informal leisure.

- 3.64 Other water based recreation in the catchment is primarily based on flooded gravel pits. In the Reading area these are used for canoeing, sailing, windsurfing, jet skiing and water skiing. There is potential to extend the recreational after use of redundant gravel pits in conjunction with safeguarding their ecological value.

Environmental Objectives

- To protect, promote and enhance all suitable water related recreational uses while conserving the natural environment.
- To improve recreational access, where possible and appropriate, and ensure that it is compatible with other values of the waterside and river corridor.
- To maintain and enhance water quality, river flow and channel characteristics for the provision of water based recreation.

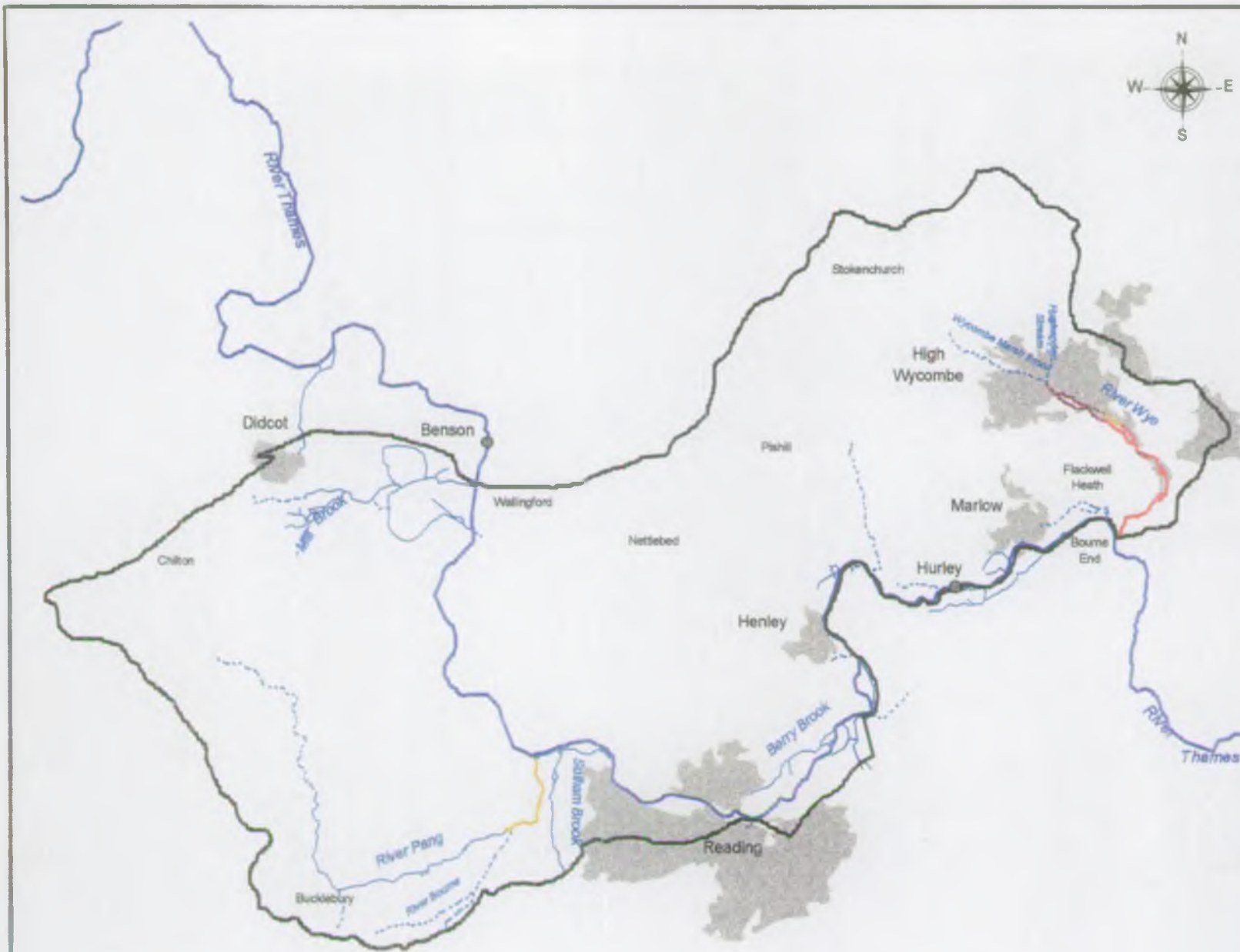
FISHERIES

General

- 3.65 This use relates specifically to the maintenance of sustainable breeding populations of salmonid (game) and cyprinid (coarse) fish. The European Community (EC) Freshwater Fisheries Directive (78/659/EEC) sets out water quality criteria to protect fish life in the designated reaches outlined in Figure 21. Additional reaches may be designated or existing reaches upgraded periodically.
- 3.66 Fish populations provide useful information on the general health of the aquatic ecosystem because:
- They are biological indicators of changes in river flow, habitat and water quality.
 - They are exploited by commercial and recreational fisheries.
 - They contribute to the diversity of the aquatic ecosystem.





Catchment Perspective

- 3.67 The River Thames is designated an EC cyprinid fishery in this part of the catchment. Existing knowledge on the status of fish populations in the River Thames within this catchment area has previously been limited but recent developments in fishery survey techniques mean that they will be surveyed for the first time in 1996. The River Thames forms a very important recreational and match fishery utilised by a large number of angling clubs and visitors. However there is some concern that changes in the bankside habitat of the channel in this part of the river may have an impact on its quality. There is also concern that changes in land use in the catchment and high winter flows are having an effect upon the quality of the fishing at times.





Thames (Benson-Hurley), Pang & Wye
CMP Figure 11:

Fisheries

-  CMP Boundary
-  Main River
-  Ordinary Watercourse
-  River Thames

Biomass of Major Fish Species >10cm in Length.

-  <10g/m²
-  10-20g/m²

 Urban Area

0 2 4 6 8 10
Kilometres



NRA

National Rivers Authority
Thames Region

- 3.68 The River Thames is utilised by returning salmon stocked as part of the River Thames salmon rehabilitation project. Fish passes have been constructed on eight of the eleven weirs in the catchment area.
- 3.69 As part of a routine monitoring project, the NRA regularly collects small samples of pike from the River Thames at Whitchurch at the request of MAFF and the AWRE, who use these samples to help in monitoring the quality of discharges from the AWRE site at Aldermaston.
- 3.70 The River Pang from Stanford Dingley to its confluence with the River Thames is designated as an EC salmonid fishery. Historically, this river was known as a high quality trout fishery but, over recent years, low river flows in its upper reaches have led to a substantial reduction in the fish population. Downstream of Stanford Dingley moderate wild brown trout populations exist and these are augmented by stocking activities of angling clubs. Important grayling and coarse fish populations are present in the lower reaches of the river, which has also been used as a nursery area for juvenile salmon stocked as part of the rehabilitation scheme. A forthcoming fishery survey of the River Pang will provide useful contemporary information to enable further assessment of the status of fish populations in this part of the catchment.
- 3.71 The River Wye is not a designated EC fishery but in the distant past it was known as a very good trout, salmon and sea-trout river. Recent low river flows in the headwaters of the catchment, together with numerous river impoundments, increasing urbanisation of the channel and floodplain and pollution incidents have had a significant impact on the quality and quantity of fish. The impoundments on the River Wye form a significant barrier to the passage of all types of fish, limiting their access to suitable breeding and nursery habitats. The NRA actively encourages the construction of fish passes on existing structures, especially where associated redevelopment is taking place (for example at Soho Mill a fish pass was installed as part of a business site development). Until a recent catastrophic pollution the Wye supported moderate to poor fish populations of mixed coarse and salmonid species. Following the pollution incident, which virtually destroyed fish populations over 20km of the river, over 1,500 brown trout and over 3,000 coarse fish (including sticklebacks, gudgeon and chub) were stocked in the affected reach. The Hughenden Stream supports excellent brown trout populations, re-established by the NRA following the drying up of the channel in recent years. The Wycombe Marsh Brook supports poor fish populations of mixed species. The principal factors affecting fish populations in this river are the quality of instream and bankside habitat, sporadic poor water quality and pollution incidents and the regular lack of river flow, particularly in the upper reaches of the catchment.
- 3.72 The NRA regularly undertakes surveys of fish populations and collates data on river habitat, fish abundance (weight of fish per square metre of water surface) and other qualitative measures of the populations. The River Thames, Pang and Wye fishery surveys are programmed to commence in 1996/97.

- 3.73 TWUL have voluntarily limited their abstraction at Compton on the River Pang and a programme is under way to monitor the impact on river flows and the aquatic ecology. In the River Wye, a number of candidate sites are being considered for enhancement of the aquatic environment, returning the channel to a more natural state. The NRA will encourage the construction of fish passes on existing river control and impoundment structures.
- 3.74 A number of stillwater fisheries fall within the catchment area. These hold coarse fish populations that are occasionally augmented by stocking or other management activities. Some of these fisheries form important commercial concerns and are used by significant numbers of anglers.

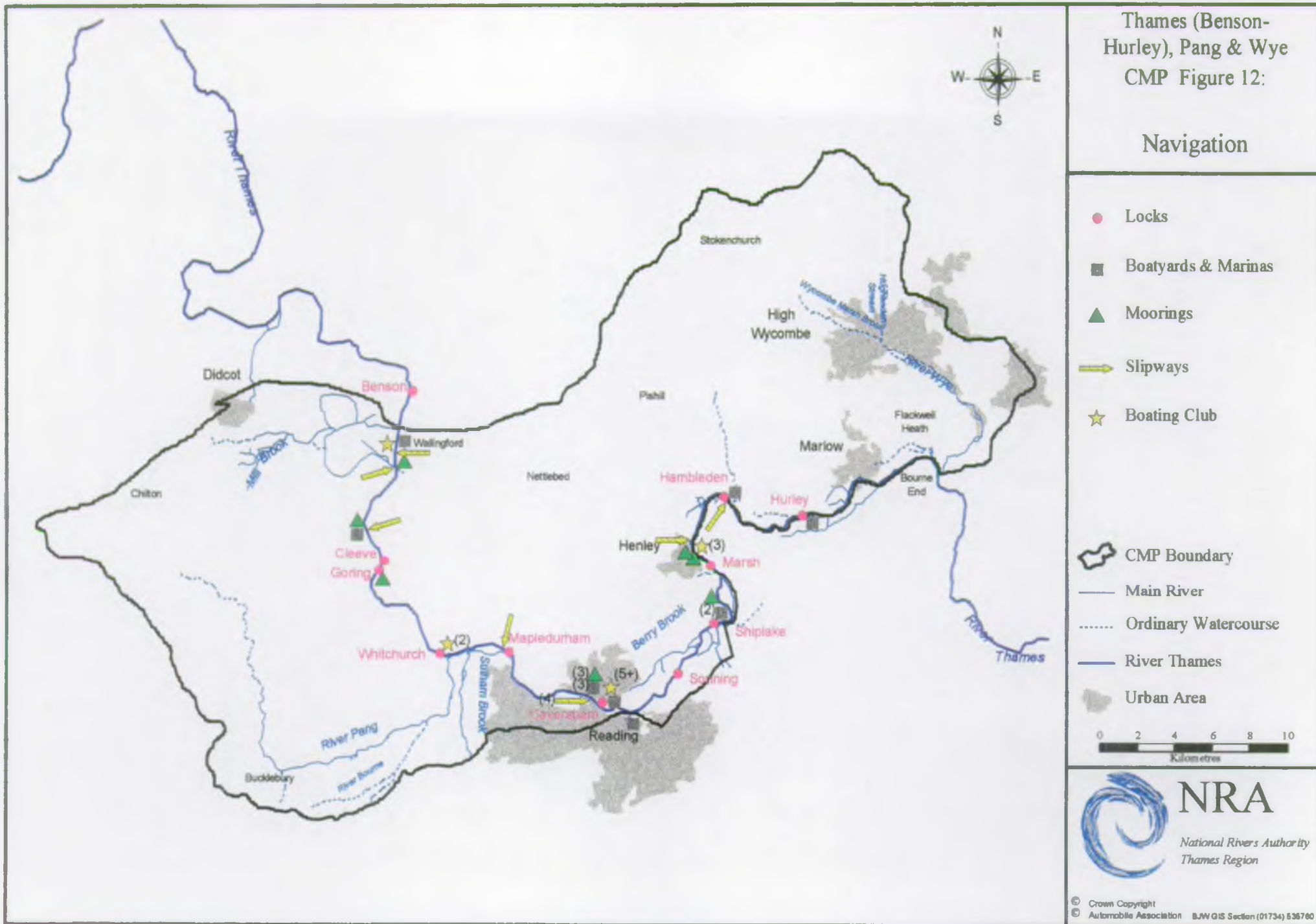
Environmental Objectives

- To promote a productive, diverse and sustainable fish population within the catchment.
- To identify and address physical, chemical and biological factors preventing the achievement of the above.
- To safeguard and maintain the water quality of all designated fisheries.

NAVIGATION

General

- 3.75 There is a statutory right of navigation over the River Thames but not the Rivers Pang and Wye, although unpowered craft are used on both rivers. The Navigation powers and duties of the NRA are set out in the Thames Conservancy Acts 1932-1972 extended by the Water Resources Act 1991. Principal of these is the improvement of the navigation together with the duty to maintain and protect it for the public's use.
- 3.76 Public rights of navigation over non-tidal waters can be acquired by immemorial use, by express grant of the riparian owner of the bed and soil of the waterway or by statute. The NRA has powers under the Water Resources Act 1991 to make byelaws and charges to regulate the use of waterways over which there is a public right of navigation but where there is no effective navigation authority.
- 3.77 The NRA has determined and published levels of service which it provides for navigation and facilities on the River Thames. These are detailed in Appendix A31.
- 3.78 The NRA has a statutory duty to maintain its locks for safe use by the public. It periodically inspects and surveys the structural and operational integrity of these and undertakes necessary repair work and, where possible, improvements.



- 3.79 The Thames navigation is by nature a big infrastructure necessitating regular replacement of locks, laybys and facilities. It is important to note that funding of capital replacement is presenting a challenge yet to be resolved. When replacing structures the NRA will take into account the views of user representatives and, when possible, include improvements and additional facilities to the navigation.

Activity on the River

(see also Recreation Section, page 32)

- 3.80 A total of 21,000 vessels were registered for annual use on the freshwater River Thames during 1993, of which some 70% were power driven. In addition, short period registration was granted to 12,000 vessels visiting the River Thames. Craft visiting from other navigations is currently a very important area of growth. During 1993 a total of 757,000 lock passages were made.
- 3.81 In the fifteen years up to 1993 there was an overall decline in the volume of traffic on the River Thames as a whole. This was largely as a result of economic factors, a change in the pattern of use of the river in recent years, the decline in the number of hire boats from unsustainable numbers in the early 1980s and restrictions on the number of main river base moorings imposed by the limitations of the River Thames Leisure Policy report published in 1980.
- 3.82 During 1994 and 1995 the volume of lock traffic increased on the river as a whole by 11,500 lock passages, compared with 1993, the greater part of this increased traffic occurring between Marlow and St Johns (Lechlade). It is expected that as the economy recovers this upward trend will continue, especially in the number of craft visiting from other navigations. Opportunities exist to develop river-related activities further, such as the promotion of the river for passenger boat trips and small boat hire. There are opportunities for modest expansion to the hire cruiser trade to replace the four hire boat bases lost in the catchment during the last ten years.
- 3.83 Access to the river is poor in many areas and there are only a limited number of slipways to which the public has access, in either private or local authority ownership, between Benson and Hurley. These are located at:
- Wallingford Cruiser Station;
 - Papists Way, Cholsey;
 - Scours Lane, Tilehurst;
 - Reading;
 - Wargrave;
 - Henley: New Street and Wargrave Road;
 - Aston: North and South banks;
 - Medmenham;
 - Hurley Farms,

and are illustrated in Figure 12. A fee is charged for access to some slipways

which are commercially operated. Many of the slipways are only suitable for small craft and lack adequate parking facilities. The situation could be improved and there is the opportunity to do this in certain areas, such as at Scours Lane and Deans Farm.

- 3.84 There are a total of 2,099 mooring sites on the River Thames in this stretch, between Benson and Hurley. These are largely located on the main channel with a few back-stream moorings. Of the total 875 moorings are within marinas, the main one being the Thames Kennet Marina in Reading. There are permanent NRA mooring sites at Cleeve, Goring, Shiplake, Mapledurham and Hambleden Locks, with approximately 25 berths in total.
- 3.85 Whilst new permanent moorings on the main channel will be discouraged, there are opportunities to provide additional short stay visitors moorings in areas of public interest. The NRA operate four 24 hour mooring sites in the area.
- 3.86 The move to more modern toilet arrangements on boats has increased the demand for riverside disposal facilities. This demand is not being met by the diminishing number of boatyards.

Environmental Objectives

- To maintain and improve the Thames navigation infrastructure.
- To maintain the existing levels of service.
- To improve facilities such as sewage and refuse disposal and short stay mooring sites.
- To encourage sustainable use of the river by vessels.
- To manage the different types of boating use on the river to avoid conflict whilst maintaining the public right of navigation.

WATER RESOURCES AND ABSTRACTION

General

- 3.87 One of the key roles of the NRA in managing water resources is the licensing of abstractions from surface and ground water for potable (i.e., for public and private water supply) and non-potable (e.g., industry and agriculture) use.

Abstraction is the removal of water from rivers or groundwater. 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 supply.

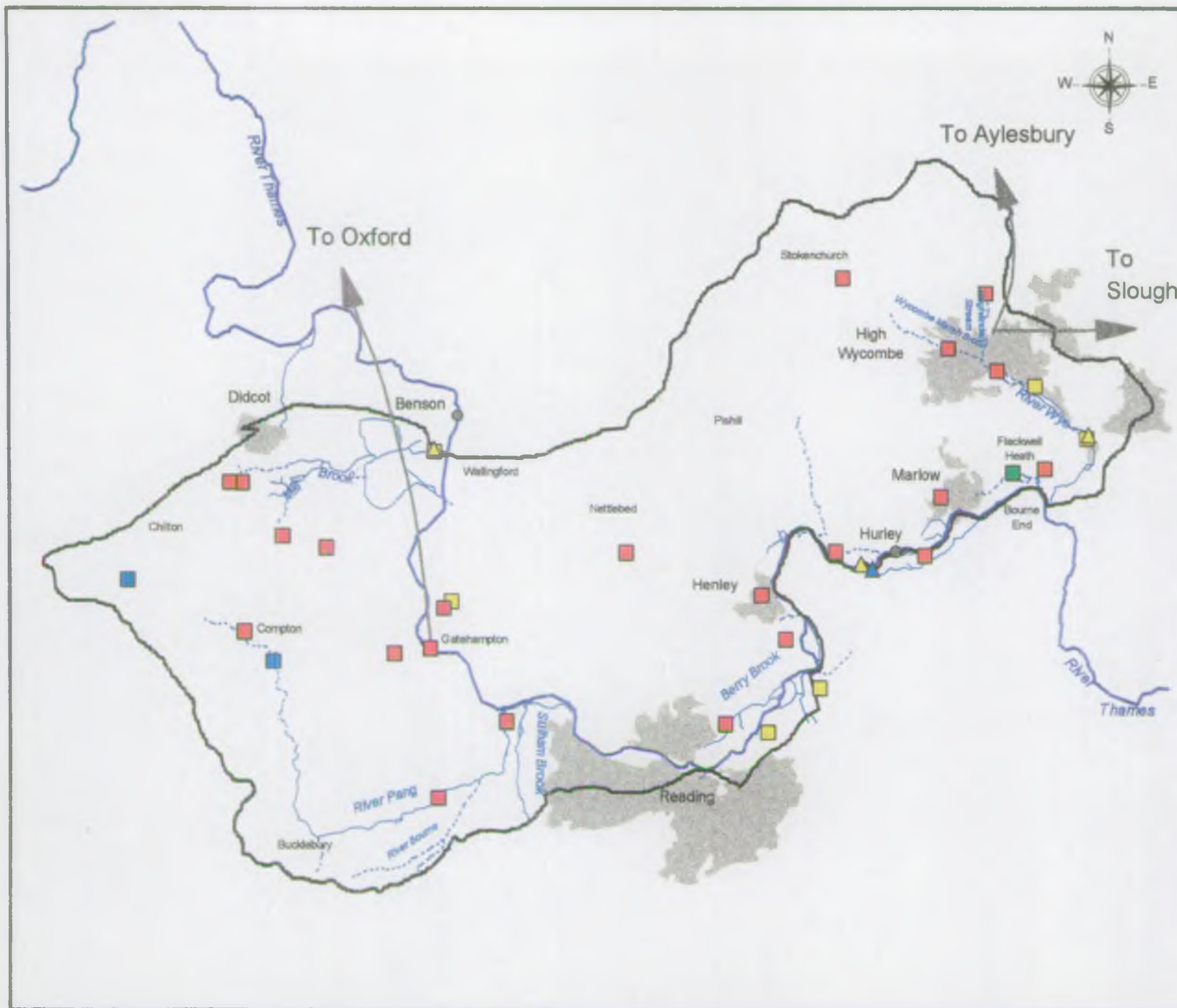
Abstraction Licensing Policy

- 3.88 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 that 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 (eg. 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 the water may be used and any necessary conditions to protect the environment.
- 3.89 Under the Act there are exemptions to the licensing system for abstractions of less than 20 cubic metres a day for domestic or agricultural use from surface water. There are also exemptions for small abstractions from boreholes and springs.
- 3.90 In some cases abstracted water is returned directly to the river with minimal losses, as for example with some cooling water or gravel washing. Part or all of the public water supply abstraction may be for customers within the catchment in which case a significant proportion may be returned to the river via consented effluent discharges. This return of effluent can play an important part in the maintenance of river flows.
- 3.91 In response to its duties under the Water Resources Act 1991 the Thames Region of the NRA has developed a set of formal policies for handling applications for licences and changes to existing licences (see Appendix D7). These policies do not, in general, allow the abstraction of water from rivers (or nearby groundwater) for a consumptive use in the summer months, but encourage the development of winter storage for uses such as spray irrigation.

- 3.92 The Water Resources Act 1991 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 in the understanding of the flow levels and regimes required to sustain all the essential elements of a healthy river ecosystem and to use this knowledge to gauge the impact and acceptability of proposed abstractions.
- 3.93 There are 203 abstraction licences within the catchment area. Figure 13 shows the location of the major abstraction points and flow gauging stations within the catchment. Table 6 details licensed and actual abstractions for 1991. The total licensed abstraction from the catchment is 412 MI/d of which 78% is abstracted for public water supply, 16% for augmentation to support the environment and indirectly public water supply (see section 3.88) and the remaining 6% for agriculture, industry and private water supply. Major potable abstractions in this catchment are made by Thames Water Utilities Ltd. with small abstractions by Three Valleys Water Services.

Table 6: Licensed and Actual Abstractions (MI/day)

Use	Mean Licensed Abstraction			Actual Abstraction (1991)		
	Surface	Groundwater	Total	Surface	Groundwater	Total
Public water supply	-	316.9	316.9	-	181.1	181.1
Private water supply	-	0.9	0.9	-	0.5	0.5
Agricultural spray irrigation	0.8	1.8	2.6	0.1	0.4	0.5
Non-agricultural spray irrigation	-	0.2	0.2	-	0.1	0.1
Agriculture	-	1.4	1.4	-	1.2	1.2
Cooling	0.5	2.4	2.9	0.5	1.0	1.5
Washing	-	3.6	3.6	-	3.0	3.0
Industrial process	3.0	15.0	18.0	0.9	11.9	12.8
Transfer	-	0.1	0.1	-	0.1	0.1
Augmentation	-	65.0	65.0	-	0.2	0.2
Total catchment	4.3	407.3	411.6	1.5	199.5	201



Thames (Benson-Hurley), Pang & Wye CMP Figure 13: Water Resources & Abstractions

- CMP Boundary
 - Main River
 - Ordinary Watercourse
 - River Thames
 - Surface Water Abstractions
 - Ground Water Abstractions
 - Public Water Supply (>1Ml/Day)
 - Mineral Washing (>1Ml/Day)
 - Other Abstractions (>1Ml/Day)
 - Other Abstractions (<1Ml/Day)
 - Direction of Water Movement outside the Catchment
 - Urban Area
- 0 2 4 6 8 10
Kilometres



- 3.94 The abstraction made by TWUL at Gatehampton is of note. This abstraction is a riverside groundwater abstraction from the chalk and is the largest groundwater source in the United Kingdom. The location of the abstraction beside the river, combined with the fact that the majority of the water is used upstream, results in no adverse environmental impact. TWUL are licensed to abstract 70 Ml/d at Gatehampton though they are not currently using this amount. The licence also has a flow constraint to restrict abstractions made under low flow conditions.
- 3.95 Abstraction licence inspections are carried out to ensure that the licence holder understands what the licence says and is complying with the conditions of the licence. The frequency of visits depends upon the potential environmental impact of non-compliance.
- 3.96 The Pang Valley benefits from the West Berkshire Groundwater Scheme which is used in drought conditions to augment river flows to support public water supply abstractions and as a consequence the environment. The scheme was developed in the 1970s and in its 20 year history has been used twice, first in 1976 and most recently in 1990. There is a need for the NRA and TWUL to consider alternative scheme operating strategies to provide the most effective management of the water resource.

Environmental Objectives

- To manage water resources to achieve an acceptable balance between the needs of the environment and those of abstractors.
- To ensure that licence holders understand and comply with the terms and conditions of the licences.
- To ensure that abstraction does not cause any deterioration of water quality or have an adverse impact on aquatic or other water dependent habitats.
- To alleviate environmental problems due to low flows caused by abstractions where solutions are justified.

EFFLUENT DISPOSAL

General








- 3.97 Effluent disposal is the disposal of domestic, industrial and agricultural effluent to the river system and/or to ground. The discharge of effluent can affect both the quality and flow of a river and can play an important part in the maintenance of flows in rivers from which water is being abstracted.
- 3.98 Most discharges direct to rivers in the catchment are controlled by means of either NRA consents or HMIP authorisations. Consents and authorisations are legal agreements issued by the regulators which impose conditions on the quantity and quality of a discharge in order to protect the environment. The regulators have powers to monitor both the quantity and quality of these discharges and if the conditions are not being met, to take enforcement action to ensure compliance.
- 3.99 Various effluents, both domestic and industrial, as well as sludges and solid material, are potentially disposed of to ground in accordance with Schedule 3 of the Waste Management Licensing Regulations exemptions for the land spreading of waste. The exemptions which cover this activity are Numbers 7 and 8. Exemption 8 specifically covers the land spreading of sewage and septic tank sludges. These activities must be notified in advance, together with the provision of specified information, to the local WRA. The general proviso of such spreading is that the waste should be beneficial to agriculture, e.g. have fertiliser value, or produce ecological benefit. Quality limits also apply.

Catchment Perspective

- 3.100 Within the catchment, there are 62 sampled consented discharges of over 5m³/day. Figure 14 shows those that are from sewage treatment works. Figure 15a gives a breakdown of these consents by type, whilst figure 15b identifies the maximum permissible volumes of consented discharges over 5m³/day.
- 3.101 There are three processes authorised by HMIP under the Environmental Protection Act, 1990 (EPA90) within the catchment and one of these releases cooling water into the River Wye.

Thames (Benson-Hurley), Pang & Wye CMP Figure 14:

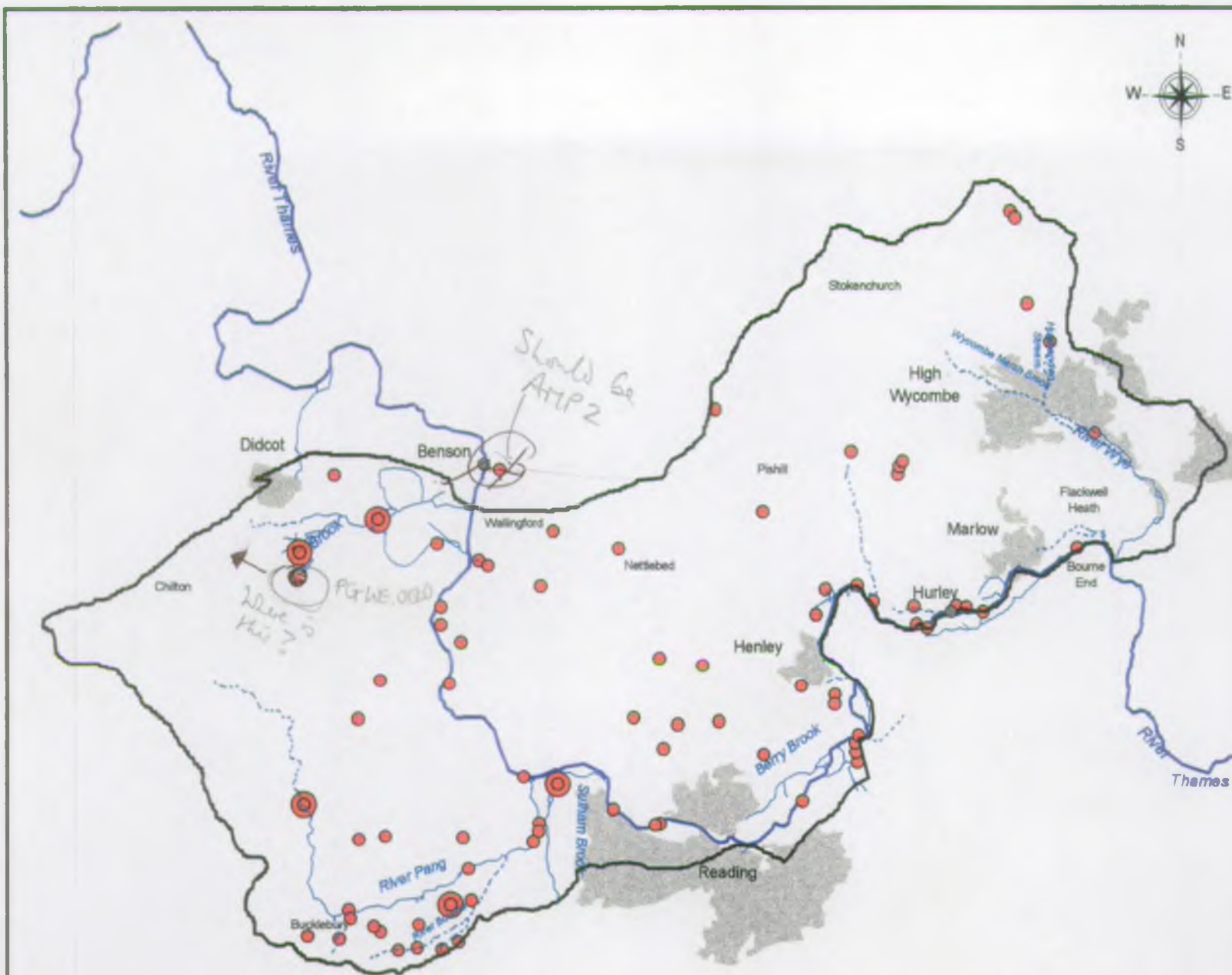
Effluent Disposal

-  CMP Boundary
-  Main River
-  Ordinary Watercourse
-  River Thames
-  Thames Water STW Proposed for AMP2 Improvement
-  All Sampled Consented STW Discharges Except Crown Exemptions
-  Urban Area

0 2 4 6 8 10
Kilometres

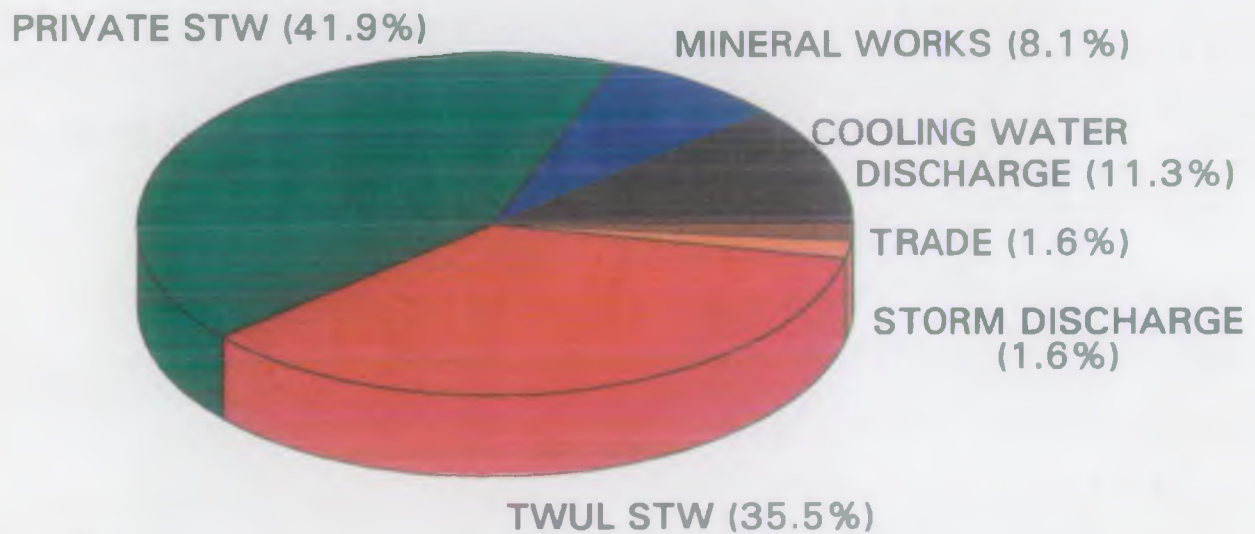


© Crown Copyright
© Automobile Association SJW GIS Section (01734) 636760



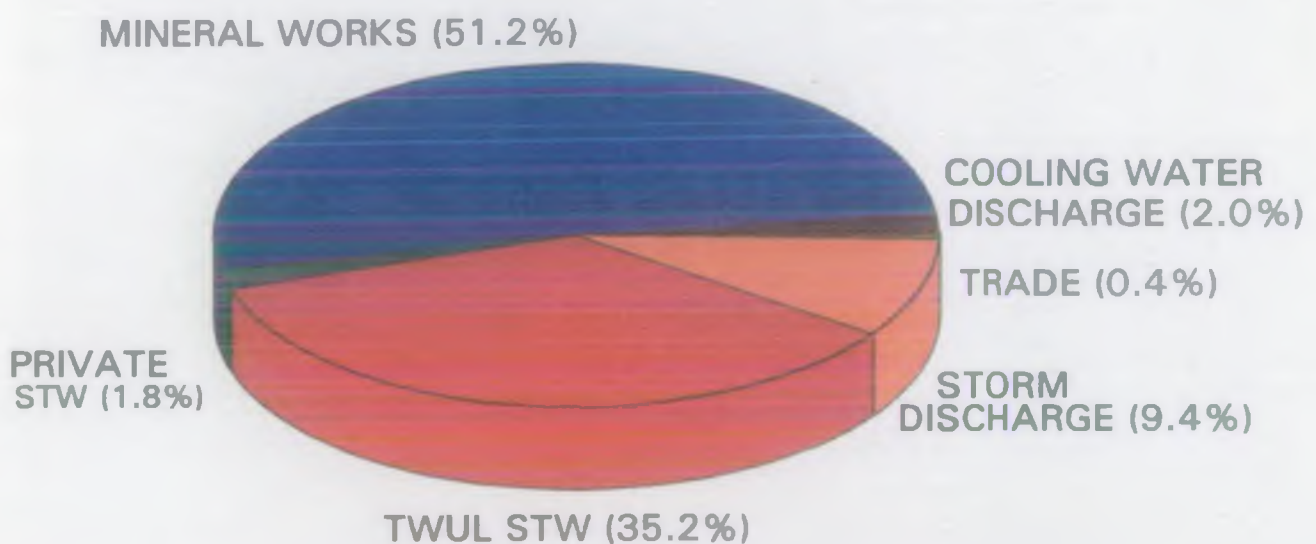
Handwritten note: 'Have been explored in the past yet'

Figure 15(a): Number of Consented Discharges Over 5 m³/day



Total Number of Discharges Over 5 m³/d = 62

Figure 15(b): Maximum Permissible Volume of Consented Discharges Over 5 m³/day



Total Volume of Discharges Over 5 m³/day = 74515 m³

3.102 In recent years improvements have been carried out to a number of sewage treatment works (STWs):

- **Cholsey STW** - improvements have been ongoing for the past five years and the reach of the Cholsey Brook, from the STW to the Thames, has improved over the past three years;
- **Henley STW** - alterations to the treatment process have resulted in improved water quality over the past two years;
- **High Wycombe STW** - new upward flow sand clarifiers were fitted in 1991;
- **Theale STW** has been demolished and the sewage is now pumped to and treated at Reading STW, resulting in a reduction in the amount of effluent discharged to the Sulham Brook.

3.103 The sewage treatment works within the catchment area which are included in TWUL's Asset Management Plan 2 (AMP2) for improvement are shown in Table 7.

Table 7: Sewage Treatment Works in Thames (Benson-Hurley) Pang & Wye Catchment Included in Amp 2

pg 106
has 6
works.

STW Name	River	CAPITAL EXPENDITURE			Provisional Completion Date
		Meet EC Directives	Improve River (inc aesthetics)	Protect River Quality	
Benson					
Blewbury	West Hagbourne Brook		*		2001-2005
Bradfield South End	Buscot Gully	*		*	Sep 1996
Compton	River Pang	*		*	Mar 1997
Pangbourne	Sulham Brook	*	*		2001-2005
South Moreton	Mill Brook		*		2001-2005

Environmental Objectives

- To regulate the discharge of effluent to the water environment so as to ensure that water quality objectives are achieved and that nature conservation, fisheries, recreation, navigation and water resources interests are not compromised.

RURAL LAND USE

General

- 3.104 This section details the type and location of the main rural land uses within the catchment and identifies pressures on the land, along with agricultural and conservation policies developed to protect these areas.

Catchment Perspective

Agricultural Land Use

- 3.105 Within the River Thames, Pang and Wye CMP area there are approximately 52,275 ha of agricultural land (based on MAFF 1994 census data). The land use within this area is summarised in Table 8.

Table 8: Agricultural Land Use

Land Use	Area (ha)
Grassland	14,883
Rough Grazing	1,182
Crops and Fallow	25,235
Farm Woodland	3,342
Other Land	1,477
Set-Aside	6,156
Total	52,275

3.106 Cropping

The agricultural land use within the catchment area is principally combinable cropping followed by grassland. Cereals cover 18,753 ha which is 36% of the total agricultural area. Combined break crops - field beans, peas, oilseed rape and linseed cover 4,433 ha. Horticultural crops, sugar beets and potatoes are grown to a lesser extent and cover 397 ha. Over the last decade the area of cropped land has declined by approximately 22% which is principally due to a decline in the cereal area.

Since the introduction of CAP Reform in 1992 the area of arable land has decreased. These reform measures require all but the smallest farms to set-aside a percentage of land growing cereals, oilseed and protein crops in order to receive arable area payments. The area that had to be set-aside up to 1995 was 15% but that has now been reduced to 10%. On this land agricultural crops for food production cannot be grown for the duration of the set-aside period. In addition farmers are not allowed to apply artificial fertilisers or pesticides apart from

applications of non-residual herbicide. They are also encouraged to manage the land in an environmentally beneficial manner.

3.107 Livestock

Grassland (including rough grazing) occupies 14,883 ha which is approximately 28% of the total agricultural area. This area has fallen by 12% over the last decade.

Cattle numbers have fallen by 17% over the last decade. This has largely been due to the fall in the dairy herd which in turn has been partly compensated by a rise in the beef herd. In contrast sheep numbers have increased by 12%. Pig and poultry numbers have also seen contrasting fortunes with a 26% increase in pig numbers and a 54% decrease in poultry. The increase in pig numbers has been due to the advances that have been made in keeping pigs outdoors on a semi free range basis.

3.108 Agricultural Land Quality

The Ministry of Agriculture, Fisheries and Food Agricultural Land Classification (ALC) system provides a classification of land which is used for strategic planning purposes and provides an appropriate framework for determining the physical quality of land at national, regional and local levels. Based on the provisional ALC maps, which are "reconnaissance" in nature, it is estimated that the land quality of the catchment area is:-

Table 9: Agricultural Land Classification

Land Quality	Area (km ²)	%
Grade 1 and 2	153	18.6
Grade 3	469	57.1
Grade 4	23	2.8
Grade 5	1	0.1
Non-agricultural	111	13.5
Urban	64	7.8
Total	821	100

The most productive and flexible land falls into grades 1,2 and sub-grade 3a. It is government policy that such land should normally be protected from irreversible development. The majority of farms in the catchment area are likely to be good to moderate quality i.e grade 3 land. This category includes land with moderate limitations and is further sub-divided into:-

- Sub-grade 3a - good quality agricultural land;
- Sub-grade 3b - moderate quality agricultural land.

It would be necessary to carry out detailed survey work in order to determine the extent of these grades in the catchment area.

- 3.109 There are a total of 620 holdings in the catchment of which approximately 57% are part time holdings. Of the full time holdings the predominant ones are cattle and sheep.
- 3.110 There is a significant proportion of woodland in the catchment, with 18 out of the 43 designated SSSIs containing ancient woodland. The local authorities are keen to preserve as much woodland as possible and development in these areas is strictly controlled.

The Pang Valley Countryside Project is a joint venture funded by Berkshire County Council, Newbury District Council, the local Parishes in the Pang Valley, Pang Valley Conservation Trust, English Nature, the Farming and Wildlife Advisory Group (FWAG) and the NRA. The aim of the project is to encourage environmentally sensitive land management through education and liaison with landowners and farmers, with the objective of de-intensifying agriculture along the Pang Valley to the benefit of nature conservation, landscape and the water environment. This initial three-year project employs a full time project officer through FWAG and is approaching the end of its third year. The project will now be extended for a further three years. It is proving very successful with a large number of organisations and interest groups joining together to achieve a common goal. The project has a high national profile.

- 3.111 There are two other similar countryside management projects operating within the catchment; the Chilterns Project within the Chilterns AONB and the South Bucks Project in South Bucks outside the AONB. Both projects work in close partnership with numerous individuals and organisations including district councils, English Nature, the Countryside Commission, farmers and private landowners. The aim is to promote the long term sustainable management of the county's ecological, archaeological, landscape and recreational resource.
- 3.112 Pressures for housing and industry are not confined to urban areas within the catchment but extend to varying degrees throughout the countryside. South Oxfordshire, Buckinghamshire and Wycombe are all under pressure to develop. All three local authorities follow the same guidelines, which are to protect the green belt, countryside and landscape, and to enhance the rural character and amenities of the countryside.
- 3.113 Planning policies have traditionally sought to restrain the overall amount of development within the catchment; some areas, such as Didcot, are an exception to this rule. Development within the green belt is strictly controlled within the catchment.
- 3.114 *Nitrate Vulnerable Zones (NVZ)* require farmers, in areas where water resources are high in nitrate, to observe a programme of compulsory measures such as limiting the timing and volume of organic manure and inorganic fertiliser

application. An NVZ has been proposed to protect the groundwater abstraction at Twyford.

Environmental Objectives

- To influence future rural development in order to protect the water environment.
- To seek enhancements to the water environment through rural development and countryside initiatives.
- To de-intensify land use along river corridors in order to establish buffer zones and optimise the use of 'set-aside' for the benefit of the water environment and nature conservation.
- To realise opportunities for environmentally sensitive agricultural practices in terms of pollution prevention measures, e.g. through NVZs, Countryside Stewardship and agri-environment schemes.
- To continue co-funding the Pang Valley Countryside Project in order to develop the educational aspects of the initiative.

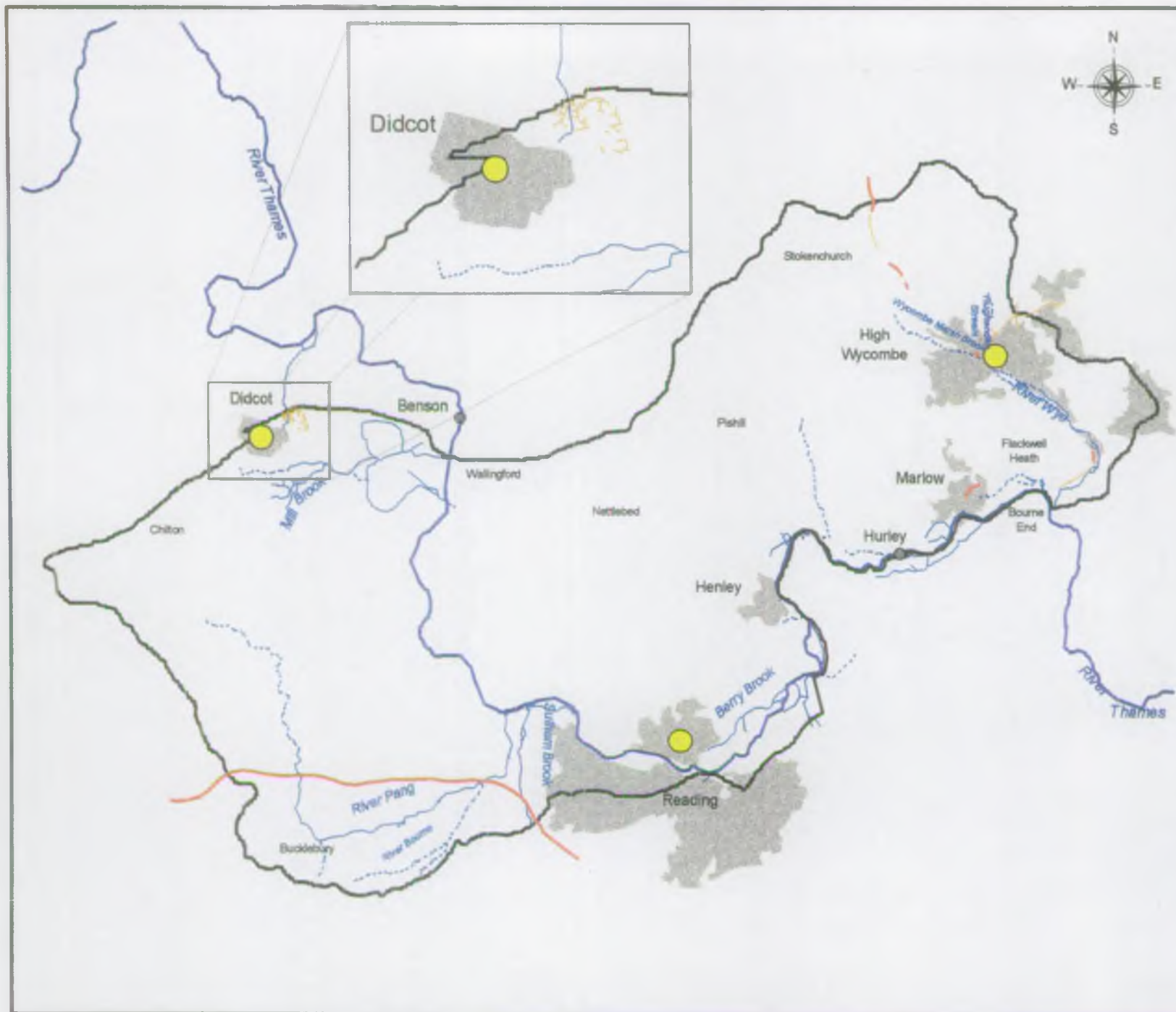
BUILT ENVIRONMENT AND DEVELOPMENT PLANS

General

- 3.115 Urban land use covers urban development, such as road construction and the growth of urban centres. This section details existing and proposed urban land use within the catchment and its associated implications for the water environment. Regional Planning Guidance for the South East (RPG9) encourages Local Planning Authorities to promote and support initiatives to conserve, restore and enhance river valleys and the water environment.









Catchment Perspective

- 3.116 Development in urban areas, such as High Wycombe and Reading, has moved away from heavy industry towards light commercial, residential and retail developments. Redevelopment presents an opportunity for opening up the river corridor and creating a landscape feature out of the river. The NRA endeavours to obtain enhancements to the river environment and liaises closely with developers and local authorities to achieve this aim; examples are the installation of a fish pass at Soho Mills, Woburn Green and the redevelopment of the Wycombe Marsh Mills site.
- 3.117 The eastern section of the catchment lies within the Metropolitan Green Belt and any future development within the green belt would be strictly controlled by the local authority to safeguard the countryside and prevent further urban encroachment.



Thames (Benson-Hurley), Pang & Wye
CMP Figure 16:

Urban Land Use

-  CMP Boundary
-  Main River
-  Ordinary Watercourse
-  River Thames
-  Strategic Growth Settlement
-  New/Improved Roads
-  Proposed Roads
-  Urban Area

0 2 4 6 8 10
Kilometres



NRA

National Rivers Authority
Thames Region

- 3.118 Due to the large areas of AONB within the catchment the local authorities aim to divert future development and growth away from the rural areas to Reading, Didcot, High Wycombe, and some of the smaller towns. Provision has been made in the Structure Plans for the construction of the following new dwellings within the catchment:

Didcot - 4,600 new homes between 1986 and 2001. Further development here will depend on the Oxfordshire structure plan which should be completed in 1997. The new plan will cover the period to 2011.

Reading - 5,250 new homes between 1991 and 2006. This housing allocation is for the whole of Reading and most of it will be built in other catchments.

High Wycombe - 7,200 new homes between 1991 and 2011.

These towns will be the principal locations for housing, employment and shopping development in the catchment, with potential implications for future water resources, the protection and enhancement of river corridors, flood risk areas and the control of excessive surface water run-off from new development. In addition major road schemes such as the proposed widening of the M40 and the M4, and a possible third Thames river crossing at Reading will have implications for the water environment in the catchment.

Environmental Objectives

- To influence future urban development in such a way that the environmental values of the river corridor are maintained and enhanced, and to protect or restore the integrity of the river corridor through urban areas.
- To seek enhancements to the water environment through urban development and redevelopment.
- To ensure that the necessary water resource infrastructure required for urban development is provided in advance of its need and in such a way that the water environment is not compromised.
- To advise on the need for surface water source control in order to reduce the impacts of excessive surface water run-off from existing and new development.

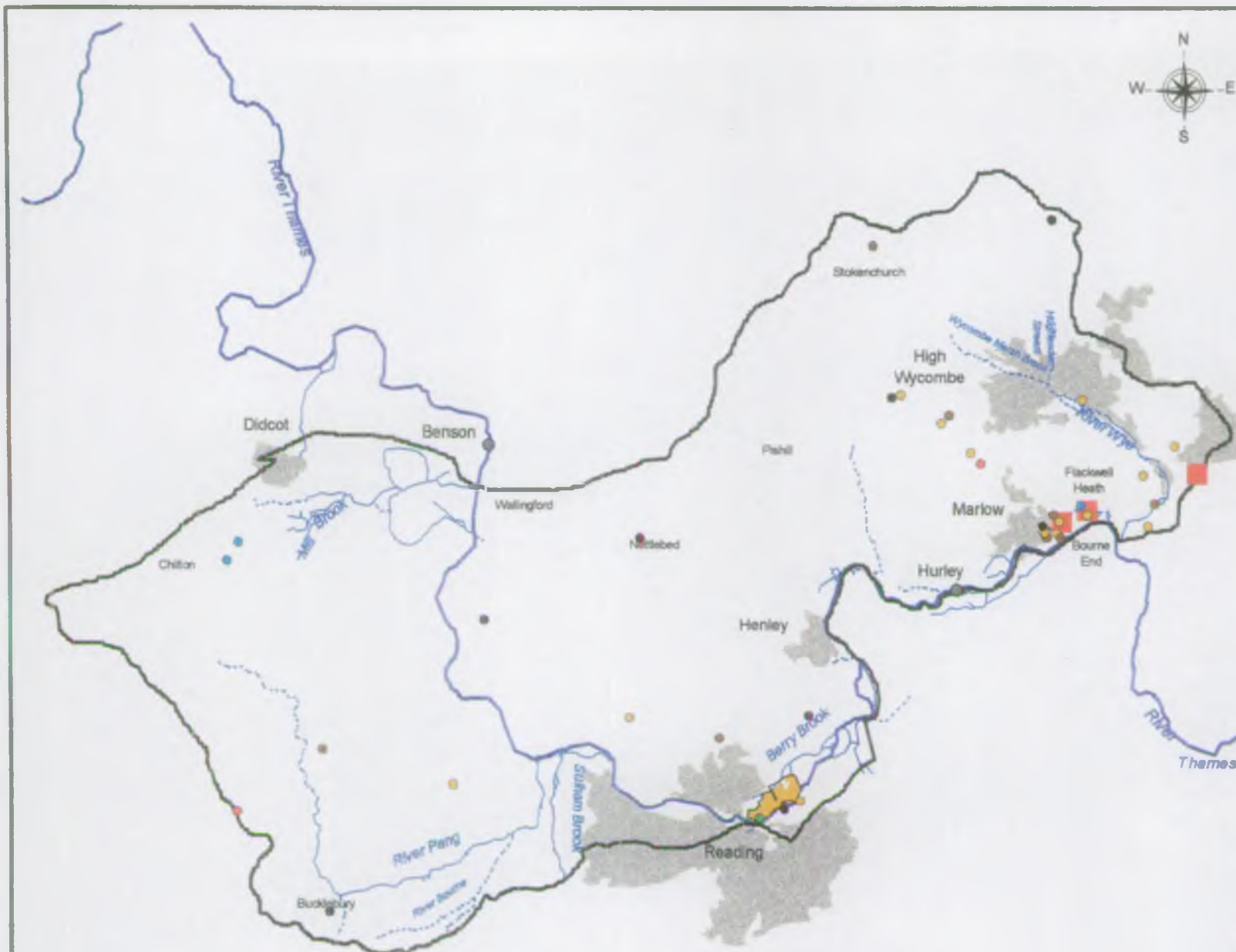
MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

General

- 3.119 Sand and gravel can only be extracted where they occur naturally and county councils have to plan to ensure an adequate and steady supply for industry. However, mineral extraction has the potential to affect the catchment, both as a direct result of the extraction works themselves and through the discharge of effluent. In addition, the after-use of pits and other extraction sites may be of concern. The use of exhausted mineral workings as solid waste disposal sites has implications for groundwater and surface waters. It is now recognised that the suitability of exhausted mineral workings as sites for the disposal of waste materials will depend on a number of factors including:
- the type of waste, i.e. inert or putrescible.
 - the underlying geological strata, e.g. whether the site is located on an aquifer or clay.
 - the existence, location and quality of abstractions.
- However, waste disposal requirements are generated by the population and should be met in the most practicable and environmentally sensitive way.
- 3.120 Waste Regulation Authorities (WRAs) presently issue licences to permit the handling (transfer), treatment and disposal (including disposal by landfill) of controlled wastes under the Environmental Protection Act 1990. Before such licences can be issued, a full, valid planning permission (or exemption from the need for planning control) must exist covering the intended operations. The NRA is a statutory consultee on applications for all waste management licences as well as for modifications to existing licences and for certificates of completion.
- 3.121 The Waste Management Licensing Regulations 1994 introduced the possibility of some activities being exempted from licensing control. The conditions under which an exemption is valid are set out in Schedule 3 of those Regulations.
- 3.122 Properly managed and planned, the presence of mineral workings is not necessarily incompatible with water protection (resources or quality). Lost habitats cannot be replaced but their loss can be made up for by restoration, which can provide water-based recreational opportunities or could be designed to create diverse wetland habitats which may add significantly to the nature conservation resource and help replace the types of habitats long lost from our floodplains.

Catchment Perspective

- 3.123 The relevant minerals and waste policies are detailed within the structure, minerals and waste plans listed in Table 3, page 22.
- 3.124 Mineral extraction in the catchment is generally controlled by the planning authorities through the application of a hierarchical set of constraints. The strictest controls are generally placed on nationally designated areas such as AONBs and SSSIs, and the strength of the constraints generally reduces for areas of more local importance such as river valleys and flood-plains or Special Landscape Areas (SLAs). Some constraints are not constraints on extraction, but influence the type of process and restoration.
- 3.125 In Oxfordshire sharp sand and gravel reserves are found in the Chilterns, north of Reading and east of Wallingford. The plateau gravel usually occurs above the water table and the workings are generally restored to agricultural use. Sand and gravel has been worked over many years in the Caversham area and several workings have been restored as lakes for sailing, nature conservation and a marina linked to the River Thames. Sand and gravel is presently worked north of Caversham and Oxfordshire County Council's Minerals and Waste Local Plan does not propose any further sand and gravel working in the catchment, beyond that which is permitted already.
- 3.126 In Buckinghamshire extensive deposits of valley gravel and alluvium exist around Marlow and there is a band of plateau gravel in the east of the catchment at Beaconsfield. There are three active sand and gravel workings and permitted reserves in this area (see Figure 17). This area has also been identified as a preferred area for future gravel extraction within Buckinghamshire.
- 3.127 Berkshire also contains extensive reserves of sand and gravel, particularly within the Kennet Valley (Kennet catchment), the Pang Valley and the Thames Valley to the west and east of Reading, but there are no existing works or areas of search north of the A4.
- 3.128 Chalk reserves are found in the Chilterns. There is an existing cement works at Chinnor, Oxfordshire, which uses the chalk for cement production, a chalk quarry at Ambrose Farm and an active chalk pit at Play Hatch.



Thames (Benson-Hurley), Pang & Wye CMP Figure 17: Mineral Extraction & Solid Waste Disposal

- CMP Boundary
- Main River
- Ordinary Watercourse
- River Thames
- Sand & Gravel (Active Workings)
- Area Permitted or Already Worked
- Afteruse Negotiated

Active Waste Disposal Site

- Household Waste, Commercial & Industrial
- Construction & Demolition
- Excavated Natural Material, Clean Soils & Hardcore

Closed Waste Disposal Site

- Household Waste, Commercial & Industrial
- Construction & Demolition
- Excavated Natural Material, Clean Soils & Hardcore
- Urban Area



NRA

National Rivers Authority
Thames Region

- 3.129 The NRA will liaise with planning authorities and others to encourage the locations of new landfill sites in areas where groundwater is least vulnerable to pollution, particularly on non-aquifers. Waste disposal by landfill within the catchment is likely to be restricted to disused or worked out mineral extraction sites, disused railway cuttings (usually only small volumes of inert waste due to the small volume available and the expense of and space taken up by installing site linings) or other man-made voids. In areas unaffected by planning constraints the need to protect aquifers and watercourses from the effects of leachate pollution is recognised and the NRA will implement policies on landfill as described in the 'Policy and Practice for the Protection of Groundwater'. Waste disposal issues are assuming an increasing significance in regional terms as the requirement for landfills is likely to exceed the capacity of available sites. This is despite the UK government's environmental strategy for sustainable development, seeking to minimise waste at source and encouraging recycling schemes, thus reducing the reliance on landfill.
- 3.130 Investigation of old waste sites is the responsibility of the local authorities. Infilling of the chalk valley at High Heavens landfill to the north of Marlow has led to contamination which the NRA is currently monitoring. Redevelopment of a number of old waste disposal sites within the valley gravels in the Marlow area is of concern, due to the potential contamination arising from construction activity.

Environmental Objectives

- To provide high quality advice and information concerning the water environment as it relates to the formulation of national and local minerals policies and mineral planning decisions.
- To ensure the sustainable use of resources whilst protecting the conservation value of the catchment and maximising the potential for enhancement.
- To ensure that waste disposal and mineral working activities do not affect the water environment adversely.

FLOOD DEFENCE

The Nature of Flooding

- 3.131 The river network acts as the conveyance for surplus water from land to the sea as part of the hydrological cycle. In lowland watercourses flooding results from prolonged rainfall, thunderstorms or rapid snowmelt. The peak flow of a flood is measured and expressed in terms of the frequency at which that flow is likely to recur; for example 1 in 10 years or "10% chance in any one year".
- 3.132 Similar types of watercourse will respond differently to the same rainfall conditions due to variations in catchment areas and land use. For example, an urbanised catchment with an associated high proportion of impervious paved surfaces 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 and slower runoff; associated river levels will therefore rise less rapidly but remain at the higher level longer.
- 3.133 Watercourses have a finite hydraulic capacity; when this is exceeded flooding occurs and water flows into the floodplain, which is as vital to the river systems as the channel which carries normal flows. These natural floodplains of the river system provide extra capacity for the storage and conveyance of flood water. This capacity is reduced if significant areas of floodplain have been raised, embanked, or built upon. The loss of storage volume can lead to higher river levels elsewhere. For this reason it is not possible (or desirable) to alleviate flooding in all areas. The priority for flood alleviation now lies in urban areas as there is a general acceptance that floodplains should be allowed to play their role and that the continuity between the river and its floodplain is an essential part of the hydro-ecological cycle.
- 3.134 Localised flooding may also occur where watercourses become blocked at particular points such as under bridges or in culverts. Often debris gathering at these points includes garden waste and other rubbish which has been deposited on river banks, and it can be a major problem in urban areas. Flooding can also occur where surface water drains are unable to discharge into swollen watercourses, or if further back in the surface water drainage system their capacity is exceeded.
- 3.135 The objective of the NRA is to provide effective alleviation for people and property against flooding from rivers and the sea and to provide adequate arrangements for flood forecasting and warning.

Thames (Benson-Hurley), Pang & Wye
CMP Figure 18:

Flood Defence



- CMP Boundary
- Main River
- Ordinary Watercourse
- River Thames
- Urban Area
- Areas Known to Have Flooded
- Sites at Risk

0 2 4 6 8 10
Kilometres



NRA

National Rivers Authority
Thames Region

Main River

- 3.136 All rivers are classified as either 'main river' or 'ordinary watercourse'. Main river is covered by the Water Resources Act 1991 and is defined on maps held by the NRA and MAFF. In broad terms main river includes all watercourses of value for strategic arterial drainage; ordinary watercourses may be more significant locally. Ordinary watercourses are covered by the Land Drainage Act 1991.
- 3.137 Revisions to main river are lodged with MAFF to take into account any physical changes such as straightening and realignment. The NRA has undertaken a national review of what is included as main river to obtain a consistent approach. The use of consistent criteria could increase the length designated as main river significantly. A review will take place for this catchment over the next few years.

Flood Risk Areas and Thames Non-Tidal Floodplain Policy.

- 3.138 It is preferable to reduce the risk from flooding through control of development than to alleviate problems once they occur. However, the relevant authority for controlling development in the floodplain is not the NRA but the local planning authority. A policy, known as the Non-Tidal Floodplain Policy, has been prepared and adopted by the NRA and recommends close liaison with the local planning authorities to ensure its implementation.
- 3.139 The NRA will continue to try and influence structure plans, local plans and individual development proposals to help safeguard people and alleviate flood risk.

DoE Circular 30/92, Section 105 Surveys.

- 3.140 Local planning authorities and the NRA are required by the Department of the Environment Circular 30/92, on Development and Flood Risk to liaise closely on flooding and surface water runoff matters. The aim is to ensure that the flood risks of development are an integral part of the decision making process undertaken by local planning authorities on relevant planning applications and are taken fully into account when they are preparing land use development plans.
- 3.141 In this respect the NRA has 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 was the subject of a 'Memorandum of Understanding' in March 1994 between representatives of local planning authorities and the NRA. In turn, the local authorities, by agreeing the Memorandum of Understanding, confirmed their intention to take full account of NRA advice or to give reasons for choosing to oppose it. It is hoped that the output from these surveys can be put to good use in making all parties potentially affected by river flooding aware of the risks.

Water Level Management Plans.

- 3.142 Recent guidance has been issued by the government on the preparation of WLMPs for Sites of Special Scientific Interest or other areas of high ecological or landscape importance. Where the NRA is the operating authority it will liaise with English Nature to agree a programme of works which safeguards key water levels where the river forms part of, or runs adjacent to a designated site.
- 3.143 A timetable with priorities has been established for the eighty Thames Region sites where the NRA's flood defence activities make the NRA the operating authority. A further 20 sites within the region lie on ordinary watercourses so responsibility falls to the local authority.

Consents for Physical Work to Watercourses and Adjacent Land.

- 3.144 NRA consent is required for works on or near the bank of a main river. This includes structures in, over, or near the watercourse, planting of trees and mineral extraction. In addition, on ordinary watercourses, consent is required for building any structure that would affect the flow. These powers are used primarily to safeguard people upstream and downstream from increased risk of flooding. In addition the NRA will consider whether the proposed works conserve and enhance the natural environment and may include conditions to cover this.
- 3.145 During the course of this CMP, the powers of the Land Drainage Byelaws will be extended by virtue of the redefinition of land drainage within the Environment Act 1995 to include activities pertaining to water level management allowing main river management to be undertaken to achieve WLMP objectives.

Surface Water Runoff/Source Control

- 3.146 Surface water runoff is likely to be increased to some degree as a result of development where more impermeable surfaces such as roofs and pavements are created. The impacts of such development, however small, are cumulative and can lead to significant problems in due course.
- 3.147 Increases in both the amount and rate of water reaching rivers can, if unmanaged, lead to greater risk of flooding. The NRA will seek to ensure that new development is carefully located and designed. Where appropriate the NRA will require measures to control surface water at source to be incorporated into the scheme.

River Control Structures.

NRA Owned.

- 3.148 River control structures generally control water levels upstream but can be opened fully to allow storm water to pass downstream. The NRA and its predecessor organisations have constructed a significant number of gates and weirs to complement river channel improvements. These are kept in good repair and operated so as not to disadvantage riparian owners.
- 3.149 There are also control structures affording level control on the River Thames with weirs at each lock. These weirs are operated for navigation, water resources and flood defence purposes. Of the ten weir complexes within this catchment, around £70,000 is spent annually on planned preventative maintenance schedules and structural surveys, to ensure the safe and reliable operation of these control structures. In addition, it is proposed to upgrade the operating machinery and safety features of these control structures owing to the age of some of the equipment. The following works are planned to take place within the next three years:
- Major refurbishments to replace the weir gates and motorize the operation are programmed at - Hurley weirs "A" and "B" during 1996/97 and 1997/98.
 - Marsh Buck weir during 1997/98.
 - Hambleton Buck weir during 1996/97.
 - Refurbishment/replacement of the Deep and Hand radial gates, bearing and seals are programmed at Benson, Cleeve and Caversham.
 - Feasibility studies are planned to investigate the options for motorization of deep radial weir gates at Benson, Cleeve, Whitchurch, Sonning and Shiplake.
 - Designs are also in hand to install new weir guard piles with twin grab ropes at Benson, Caversham and Shiplake.

Privately Owned.

- 3.150 Other privately owned structures are common on watercourses for a variety of traditional water uses such as operation of mills, creation of navigation channels and fish farming and amenity. By law these must be maintained and operated properly by their owners if they affect river levels and flows. The condition of privately owned structures is often a concern. NRA staff are always available to advise on reducing problems of maintenance and operation and will often help clear obstructions when floods or storms cause problems.
- 3.151 The NRA periodically surveys the structural and operational integrity of privately owned controls and may assist their owners in refurbishing equipment should a risk of flooding be apparent through non - operation or collapse.

Flood Defence Works and Permissive Powers.

- 3.152 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 extends to the centre line of the watercourse. Fence lines at the top of the banks, even if shown on deeds, are not in themselves proof of actual boundary location. Ultimate responsibility for the upkeep of a watercourse rests with the riparian owner. On main rivers the NRA has permissive powers to minimise the risk to existing and future uses e.g. development. For ordinary watercourses local authorities have permissive powers to carry out works.
- 3.153 Regular maintenance may be essential if the hydraulic capacity of the river system is to be optimised to deliver adequate levels of service for flood defence. Access along banks for NRA maintenance purposes should be preserved wherever possible and necessary, especially for emergency works. The NRA will oppose any development within eight metres of a main river watercourse which compromises our ability to carry out our statutory duties in respect of flood defence.

Flood Defence Standards of Service.

- 3.154 As an aid to decisions on priorities for works the NRA has determined Standards of Service for flood defence based on land usage within the flood plain. A hierarchical series of five "land use bands" has been established, based on the presence and intensity of certain features of land use. These include housing, commercial property, agriculture and transport networks. Such features are allocated a value relative to one another. This value is a theoretical one, based on the potential losses that would ensue if the features were subjected to flooding.
- 3.155 Each land use band has a target for the maximum flood risk to which it should ideally be subjected. The standards are expressed as a percentage which reflects the likelihood that during that year a flood event may occur which exceeds the magnitude for which protection would ideally be provided.
- 3.156 For example, a standard of 2% means that, the likelihood of a flood flow occurring which exceeds the capacity of the particular river channel to contain it, is 50 to 1.
- 3.157 Details of targets and land use bands are given in Table 8. Appendix D8 gives the land use bands for the River Thames (Benson - Hurley) Pang and Wye catchment.
- 3.158 It should be noted that not all flood plain within the area which has been allocated a land use band need be protected to the maximum flood risk target which has been set. Standards of protection should apply to the current land use not its potential. Differing actual risk would reflect a particular feature's proximity to the watercourse or flood flow channels, or differing threshold levels within the flood plain. Although good drainage has significant benefits for arable farming; certain regimes of flooding are desirable as an important contribution to wetland habitats.

Thus there has to be a firm understanding that flood risk to people and property is of paramount concern whilst a balance could be achieved between the interests of farmers and the environment as a whole.

- 3.159 Improvement and maintenance works can be targeted towards those rivers which do not meet their target standards, particularly where more urban land use bands (A,B,C) are involved.

Table 8: Standards of Service for Flood Defence

STANDARDS OF SERVICE FOR FLOOD DEFENCE - Land Use Bands and Targets		
Land Use Band	Description of Typical Land Use	Target Standard
A (High Density Urban)	High density urban areas containing significant amounts of both residential and commercial property at risk.	1% - 2%
B (Medium Density Urban)	Medium density urban areas, some parks and open spaces, or high grade agricultural use at risk.	1% - 4%
C (Low Density Urban)	Low density urban areas or rural communities. Typically large areas of high grade agricultural land with some properties also at risk from flooding.	2% - 20%
D (Arable Farmland)	Generally farmland with occasional properties at risk. Medium productivity agriculture which may also be prone to the effects of waterlogging.	10% - 80%
E (Grassland)	Typically low grade agricultural land or public open space, often grassland or scrub, with very few properties at risk.	Greater than 40%
<p><i>* A range is given for standards of protection in acknowledgement of practical issues of implementation. They act as a starting point to guide the investigator of a potential flood alleviation scheme. The resulting Standard of Protection would be the outcome of a case specific and appropriately detailed appraisal. This has to include feasibility of options, their incremental costs in relation to benefits and any other significant factors like environmental impact.</i></p>		

Routine Maintenance Regime.

- 3.160 The NRA's powers to undertake maintenance are only permissive, not mandatory, and can only be used on those watercourses designated 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 maintenance works include vegetation control, obstruction and blockage removal and dredging undertaken in accordance with conservation guidelines to protect the natural environment.
- 3.161 Maintenance of the integrity of the banks themselves is the responsibility of the riparian owner. The regime of maintenance which has been undertaken can contribute significantly to reducing the risk of flooding.
- 3.162 At times of heavy rainfall operational priorities are to check river control structures and clear debris and identified obstructions where possible.

Capital Improvements.

- 3.163 In addition to general watercourse maintenance work, the NRA uses its right to exercise powers to provide effective protection for people and property from flooding through the construction and maintenance of specific flood defences. Such defences are designed to deal with floods of a certain magnitude. Different land uses may require protection against different levels of flood.
- 3.164 The NRA will continue to investigate the feasibility of carrying out further improvement works. It is important to note that funding for such schemes can only be invested within certain government guidelines. These include the requirement that the cost of any scheme is equalled or exceeded 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.

Conservation Duty.

- 3.165 All new schemes and maintenance works are carried out after consultation with the NRA's conservation staff to ensure that the work is done in an environmentally acceptable manner. Under Section 16(1) of the Water Resources Act 1991 and Section 61A(1) of the Land Drainage Act 1994 there are three duties which arise when the NRA is formulating its own proposals or considering proposals from other parties; to take into account the impact of proposals on natural features, to have regard to protecting features of historic interest and to further the conservation and enhancement of flora, fauna and other natural features.

In recognition of the latter duty, the NRA has made a significant contribution to environmental enhancements in the area including:

- i) A wader scrape at the BBONT reserve, Cholsey Marsh
- ii) Substantial willow pollarding at Shillingford

Flood Warning & Flood Warning Responsibilities.

- 3.166 The NRA recognises that irrespective of attempts to minimise the risk from flooding through the implementation of various policies and actions, flooding can occur and on occasion represents a risk to human life. With regard to public safety the NRA operates a flood forecasting service in the catchment which uses relayed rain gauge and river level data from a number of sites, radar and rainfall forecast data from the Meteorological Office in Bracknell, and information from flood defence staff in the field.
- 3.167 Flood warnings are issued by the NRA via public media such as local radio and Ceefax, as well as to the police and also to local authorities to enable them to take precautionary action when floods are threatened. Annual flood warning seminars are also held to review the effectiveness of the flood forecasting and warning process.

Flood Warning Standards of Service.

- 3.168 In order to ensure that timely warnings are issued to the right people, the NRA operates a system of flood warning standards of service. By defining lengths of river, or reaches, with common land use interests, those areas with a high population concentration can be treated as a priority. It is the NRA's aim to provide a minimum two hour warning of commencement of flooding.
- 3.169 In September 1996 the Environment Agency will take over from the Police as the lead agency for the dissemination of flood warnings.

Emergency Response.

- 3.170 The NRA is often considered by the public to be the agency to contact when a flooding problem occurs. However, once warnings have been issued the NRA's prime objectives are efficient operation of control mechanisms, ensuring that rivers flow as freely as possible and monitoring developments.
- 3.171 District Councils have permissive powers to offer assistance during floods. This may include placing sandbags, moving possessions and evacuating people. The fire service provide help in flood emergencies if they are able to do so. The County Council are responsible for public highways and would deal with any flooding problems associated with road drainage. Public surface water sewerage systems are the responsibility of Thames Water Utilities Ltd., who may sometimes use District Councils as their agents.

Catchment Perspective

- 3.172 The rivers covered by this CMP can be split according to the way in which they react and respond in times of high rainfall.
- 3.173 The Rivers Pang and Wye are both spring fed, from chalk aquifers, and react to fluctuations in the level of the water table. This means that, in general, they are slower to respond to high rainfall than clay catchments where runoff is the key factor. As such, it is easier to predict flooding than in clay catchments.
- 3.174 The River Wye, however, is in an urbanised catchment and runoff from high intensity rainfall can cause problems of an immediate nature.
- 3.175 The River Thames is a much larger river and reacts to flows draining into it from further upstream. This means that there is more time available to predict how it will react and to compare conditions with historical events.
- 3.176 Smaller tributaries to all these rivers will react quickly to high intensity, prolonged rainfall such as thunderstorms, and these are rarely predictable.
- 3.177 During times of high river flows or susceptibility to storms NRA staff carry out flood patrols and visit sites of potential blockages twice daily. In addition, field data on river levels is collected and transmitted to an operational control centre at Wallingford to enable managers to decide on the need for emergency response activities, or updates on flood warning status.
- 3.178 Figure 18 shows the areas within the catchment known to have flooded in the past century, other sites at risk and the limits of main river, over which the NRA has permissive powers for river maintenance.
- 3.179 Many areas within the catchment are liable to flooding. Some of the more notable ones include:
- **River Wye, Station Road, Loudwater:** The River Wye is culverted beneath Station Road and the culverts are liable to blockages, which has resulted in flooding on a number of occasions. The installation of trash grids may be a viable solution as the culvert is at an awkward angle. The structures need to be maintained regularly by the NRA;
 - **Portman Road, Reading:** The road and properties adjacent to the two railway bridges along Portman Road are liable to flooding from an adjacent ordinary watercourse. The local authority has permissive powers to carry out works to address the problem, should they wish to do so;
 - **River Pang, Pangbourne/Tidmarsh:** The River Pang has flooded consistently over the past three years. Some localised works have been carried out and the NRA is undertaking studies to determine a more permanent solution.

- **River Pang, Bucklebury:** Flooding took place in this village in 1993. Since then the NRA have performed annual river maintenance and must continue to do this to provide effective flood alleviation.
- **River Wye, Bourne End:** Various structures and low lying banks cause flooding of isolated properties a short distance upstream of the confluence with the River Thames. Joint action by the NRA and riparian owners is under way to improve flood protection.
- **River Thames, Purley, Pangbourne, Sonning, Shiplake, Medmenham and Marlow:** Low lying areas in the Thames floodplain are particularly vulnerable. Property is at risk at the above locations during more extreme events with Purley being especially at risk.

3.180 Flooding has occurred due to problems at Stanford Dingley Mill owing to blockages under the mill control gear, and this has been improved by the NRA to reduce the risk of recurrence.

3.181 Local plan policies which control development within the floodplain should be consistently applied to prevent the worsening of flooding problems. In order to relieve pressures on the urban environment it is important to preserve the flood plain in rural areas. In addition, greater attenuation of run-off is required via source control, eg. soakaways, flood storage ponds, grass swales, etc. An operational investigation is to be commissioned to assess best practice for the creation and operation of balancing ponds, and a multi-functional group has been set up within Thames Region of the NRA to investigate the future use and implementation of source control techniques.

Water Level Management Plans

3.182 Within this catchment there are three sites where WLMPs are to be prepared; Sulham and Tidmarsh Woods and Meadows; Rodbed Wood; Temple Island Meadows. It is the NRA's intention to produce interim management statements by 1996 and full WLMPs by the end of 1998.

Consents for Physical Works to Watercourses and Adjacent Land

3.183 There are on average 25 applications for such consents processed each year for this catchment. The number varies according to the economic fortunes of the country.

Routine Maintenance Regime

3.184 In this catchment an annual allocation in the region of £50,000 is made by the NRA for routine maintenance work, with an additional contingency for unplanned urgent works.

3.185 Maintenance generally is carried out annually to the River Pang - owing to prolific weedgrowth - and on other watercourses every two to ten years as needs arise.

Capital Improvements

- 3.186 A local example of capital improvements is the recently completed study into protecting Purley from flooding. The Engineering Appraisal identified a number of options but it was found that the benefit/cost ratio did not meet MAFF guidelines, so the proposals had to be shelved. An enhanced flood warning system will be developed during the currency of this CMP.

Environmental Objectives

- To continue weed cutting, dredging and other minor channel works as necessary to minimise flood risk whilst ensuring that conservation guidelines for good working practice are followed, and thus ensure environmental sensitivity during river management operations.
- To continue to provide an effective emergency response service during floods.
- To implement the Standards of Service (SOS) policy.
- To improve arrangements for flood forecasting and warning.
- To establish an understanding of the effect of increased run-off from urban or other drained areas on flood risk in the catchment.
- To continue to disseminate information on flooding and flood protection measures to local authorities.
- To investigate opportunities for surface water source control using a multi-functional group within the NRA.
- To take into account the impact of proposals on the natural features; to have regard to protecting features of historic interest and to further the conservation and enhancement of flora, fauna and other natural features.
- To produce Water Level Management Plans (WLMPs) for all water-dependent SSSIs in the catchment area.
- To become the lead authority for the dissemination of flood warnings.

SECTION 4

CATCHMENT STATUS

This section compares the current status or condition of the catchment (*where it is known*) with overall standards/targets (*where they have been developed*) in respect of water quality, water resources and physical features.

4 CATCHMENT STATUS

INTRODUCTION

- 4.1 In this section the current status of the catchment is compared with the environmental objectives set out in Section 3 and existing NRA standards and targets. Catchment status is considered in terms of water quality, water resources and physical features.
- 4.2 Comparison of the 'current status' with the 'overall objective' enables issues, which may be problems due to failures to meet targets (where applicable) or conflicts due to differing uses having opposing requirements, to be identified.
- 4.3 A range of data and information has been used to assess the catchment status. The assessment incorporates the results of the informal consultation exercise and analysis of existing publicly available data on the catchment.

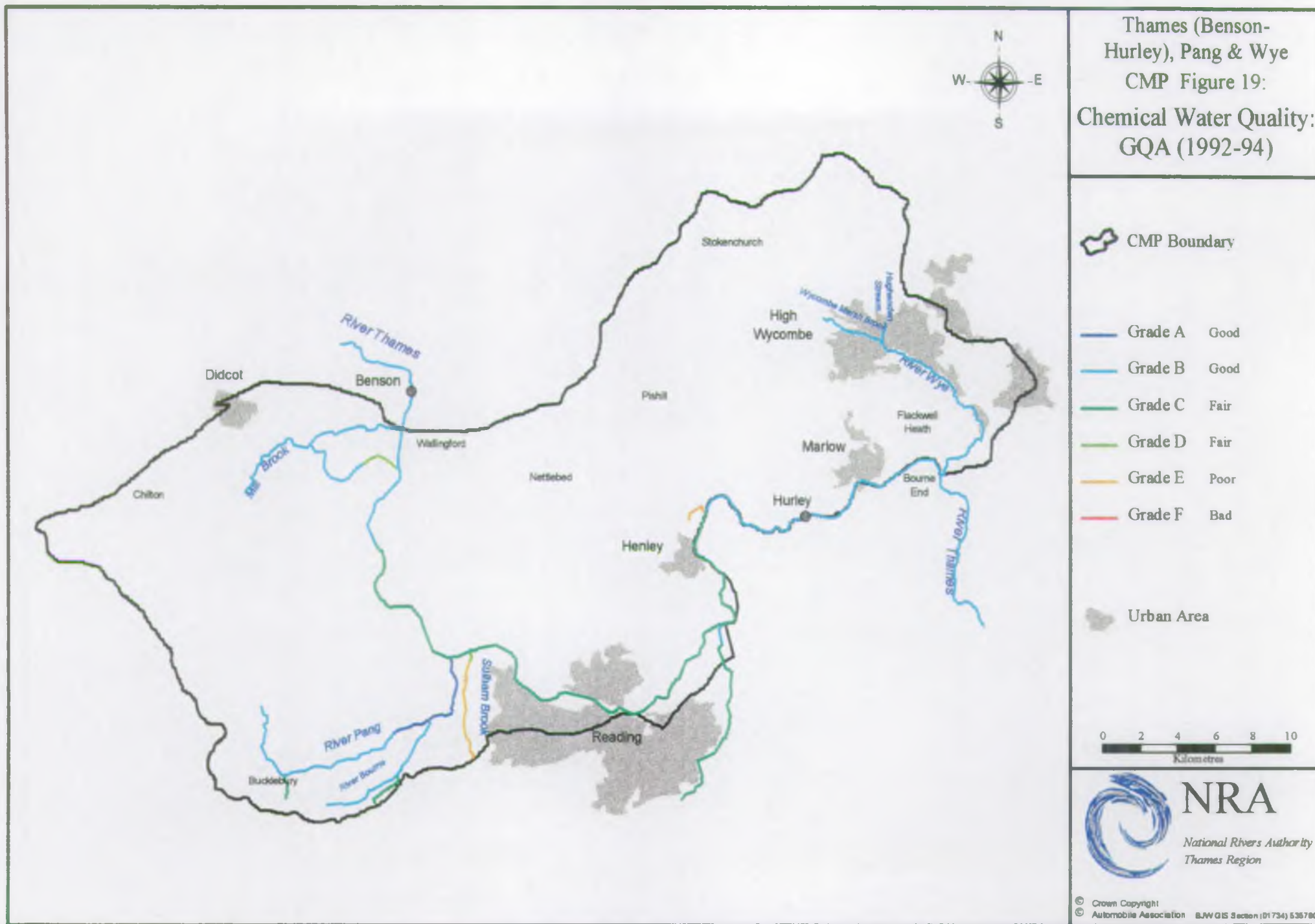
WATER QUALITY

Introduction

- 4.4 A principal aim of the NRA Water Quality Strategy 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 that all waters are of an appropriate quality for their agreed uses. It is also the aim of the NRA to protect the quality of groundwater through the control of pollution. In many cases in this catchment the enhancement of the surface water environment is dependent on the proper management of groundwater.
- 4.5 Water quality improvements cost money and, in most 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 its benefits when deciding whether individual schemes should go ahead and in assigning priorities.

Surface Waters

- 4.6 Recent river surveys show river water quality in this catchment to be predominately "good" with eleven of the nineteen reaches falling into this category. Six reaches are of "fair" quality and two are "poor".



Assessment of Surface Water Quality

- 4.7 The NRA uses two schemes for the reporting and management of river quality: the general quality assessment (GQA) scheme which allows monitoring of changes in river quality over time and in different areas, and the water quality objectives (WQO) scheme which is used to set targets for water quality based on uses.

General Quality Assessment

- 4.8 Four components are being developed for the GQA assessment: general chemistry, nutrients, aesthetics and biology - each providing a discrete 'window' on the quality of the river stretches. The general chemistry component of the GQA is now in use. It is made up of six grades defined by standards for dissolved oxygen, BOD and total ammonia (see Appendix D3). The remaining three windows are still under development and will be applied when available. The GQA chemical quality of watercourses in this catchment is shown in Figure 19.

Water Quality Objectives

- 4.9 The WQO scheme establishes quality targets based on the uses of the watercourse to provide a commonly agreed planning framework for regulatory bodies and dischargers. The proposed WQO scheme is based upon the recognised uses to which a river stretch may be put. These uses could eventually include: riverine and special ecosystems, abstraction for potable supply, agricultural/industrial abstraction, and watersports. The standards defining the five river ecosystems (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.) The five RE classes are described in Table 9. For each stretch of river an RE class WQO will be assigned, including a date by which this water quality target should be achieved. Until WQOs are formally established by legal notice served by the Secretary of State, and therefore exist on a statutory basis, they will be applied as non-statutory RQOs, with appropriate RE classes and target dates for achievement.
- 4.10 River Quality Objectives (RQOs) have been derived for the catchment by translating the old RQOs 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' objectives. The short-term objectives indicate the quality that is achievable within a five to ten year horizon of committed investment and/or actions by dischargers and the NRA. These targets show the target class, eg. RE2, and, where known, the date by which it will be achieved, eg. RE2 (2001). A list of proposed short-term RQOs for watercourses in the River Thames (Benson to Hurley) Pang and Wye catchment is given in Table 10. The compliance of watercourse reaches with their objectives is judged against a rolling, three calendar year period. In this report compliance was judged using data for the years 1992 to 1994, see Figure 20.

- 4.11 Substantial growths of planktonic algae can occur in nutrient-rich rivers. Where the algal growth is dense, the algal cells themselves can produce a high BOD result in laboratory analysis. However these elevated BOD values do not necessarily represent the BOD exerted in rivers. In those river stretches where the NRA considers that exceptional conditions exist because planktonic algae are the predominant cause of anomalously high BOD results, the affected BOD data may be set aside when assessing compliance with the RQO. In this catchment, BOD data has been set aside due to the presence of algae when assessing RQO compliance of the River Thames from Goring STW to its confluence with the Fawley Court Stream.
- 4.12 The NRA is also setting long-term objectives. These are objectives which we hope to attain beyond the next ten years. In order to set long-term objectives it is important to determine the need for further water quality improvements within the catchment. A public view on the required uses for a watercourse would be valued (e.g. if a river does not currently support a fishery and the public feels that it should support a cyprinid fishery). It is hoped that the public will take the opportunity presented by this CMP consultation document to express any views they may have on present and potential river uses in this catchment.

Table 9: Descriptions of the River Ecosystem Classes

Class RE1	Water of very good quality suitable for all fish species
Class RE2	Water of good quality suitable for all fish species
Class RE3	Water of fair quality suitable for high class coarse fish populations
Class RE4	Water of fair quality suitable for coarse fish populations
Class RE5	Water of poor quality 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

Chemical standards have been derived for each of these classes and details of these standards are given in Appendix D2.

- 4.13 The objectives have been set by the NRA but they are not yet statutory. The statutory scheme will require public consultation. These objectives are to assist the NRA in planning work until they become statutory. Since the system is new, several of the objectives may need to be reset as further information on the watercourse is gathered. This will be done over the next few years before statutory objectives are implemented. Once the objectives become statutory the NRA will review them at least once every five years.





Thames (Benson-Hurley), Pang & Wye
CMP Figure 20:

Water Quality: RQOs

 CMP Boundary

RE2 River Quality Objective

RQO Compliance

-  Pass
-  Marginal Pass
-  Fail
-  No RQO Assigned

 Urban Area

0 2 4 6 8 10
Kilometres



NRA

National Rivers Authority
Thames Region

© Crown Copyright
© Automobile Association. BAW GIS Section (01734) 535700



**Table 10: River Quality Objectives for Rivers in the Thames (Benson to Hurley)
Pang & Wye Catchment**

River	Reach	Short-term RQO *(Target Date)	Length (km)
Bradford's Brook	Mill Brook to Thames	RE2	2.1
Bourne	Chapel Row to Pang	RE2 (1997)	7.6
Cholsey Brook	South Moreton to Cholsey STW	RE2	4.6
Cholsey Brook	Cholsey STW to Thames	RE4	1.9
Fawley Court Stream	Henley STW to Thames	RE5	1.4
Hughenden Stream	High Wycombe to Wye	RE2	1.0
Mill Brook	Blewbury to Bradford's Brook	RE2 (2006)	9.6
Pang	Hampstead Norries to Bradfield STW	RE1	11.9
Pang	Bradfield STW to Thames	RE1	7.2
Sul	Theale to Pangbourne STW	RE4	5.5
Sul	Pangbourne STW to Thames	RE4 (2006)	0.5
Thames	Thame to Goring STW	RE2	14.2
Thames	Goring STW to Whitchurch STW	RE2	8.5
Thames	Whitchurch STW to Kennet	RE2	12.6
Thames	Kennet to Loddon	RE2	7.9
Thames	Loddon to Fawley Court Stream	RE2	7.6
Wye	West Wycombe Park to High Wycombe STW	RE2	6.5
Wye	High Wycombe STW to Glory Mill Backwater	RE2	4.9
Wye	Glory Mill Backwater to Thames	RE2	4.3

* The River Quality Objectives without dates are targets which should already have been met. Those with dates require improvements in discharge quality, or other factors governing river quality, to ensure compliance by the given date.

EC Directives

- 4.14 There are several European Community Directives which apply to the aquatic environment.

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

- 4.15 The River Thames from Benson to Hurley has been designated as a cyprinid fishery under this directive. The River Pang is designated as a salmonid river from Stanford Dingley to its confluence with the Thames. The designated reaches are shown in Figure 21. All the designated reaches met the water quality standards given in the directive for each of the three years in the period 1992 - 1994.

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

- 4.16 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.
- 4.17 Mercury and cadmium are monitored routinely in the River Wye below the discharge from High Wycombe STW which receives a trade effluent containing both metals. The measured concentrations are assessed against environmental quality standards set in the directive. There have been no failures against these standards during the three year period 1992 to 1994.
- 4.18 The discharge to the River Thames from the Atomic Weapons Research Establishment at Aldermaston is consented for cadmium, copper, zinc, chromium, iron, nickel and lead, all of which are monitored routinely in the effluent and in the River Thames at Mapledurham Weir. There were no failures against the relevant environmental quality standards for these metals between 1992 and 1994.
- 4.19 Background environmental monitoring is also carried out on the River Thames at Caversham Weir for a wide range of metals, pesticides and organic solvents. There have been no failures at this sampling location against any of the relevant standards during the three year period 1992 to 1994.

The monitoring site locations are shown in Figure 21.

The EC Urban Waste Water Treatment Directives (91/271/EEC)

4.20 The Urban Waste Water Treatment Directive states requirements for the treatment of sewage according to the size of the discharge and the type and sensitivity of the receiving waters. Receiving waters which are sensitive to eutrophication problems are to be designated as sensitive areas (eutrophic) by the government. Phosphate removal at sewage treatment works discharging into these receiving waters is to be considered.

4.21 The whole of the River Thames in this catchment is designated as a sensitive area (eutrophic). The NRA is undertaking a study of the River Thames to determine phosphorus inputs to catchments, including agricultural inputs, before coming to a view on which inputs it would be most effective to reduce.

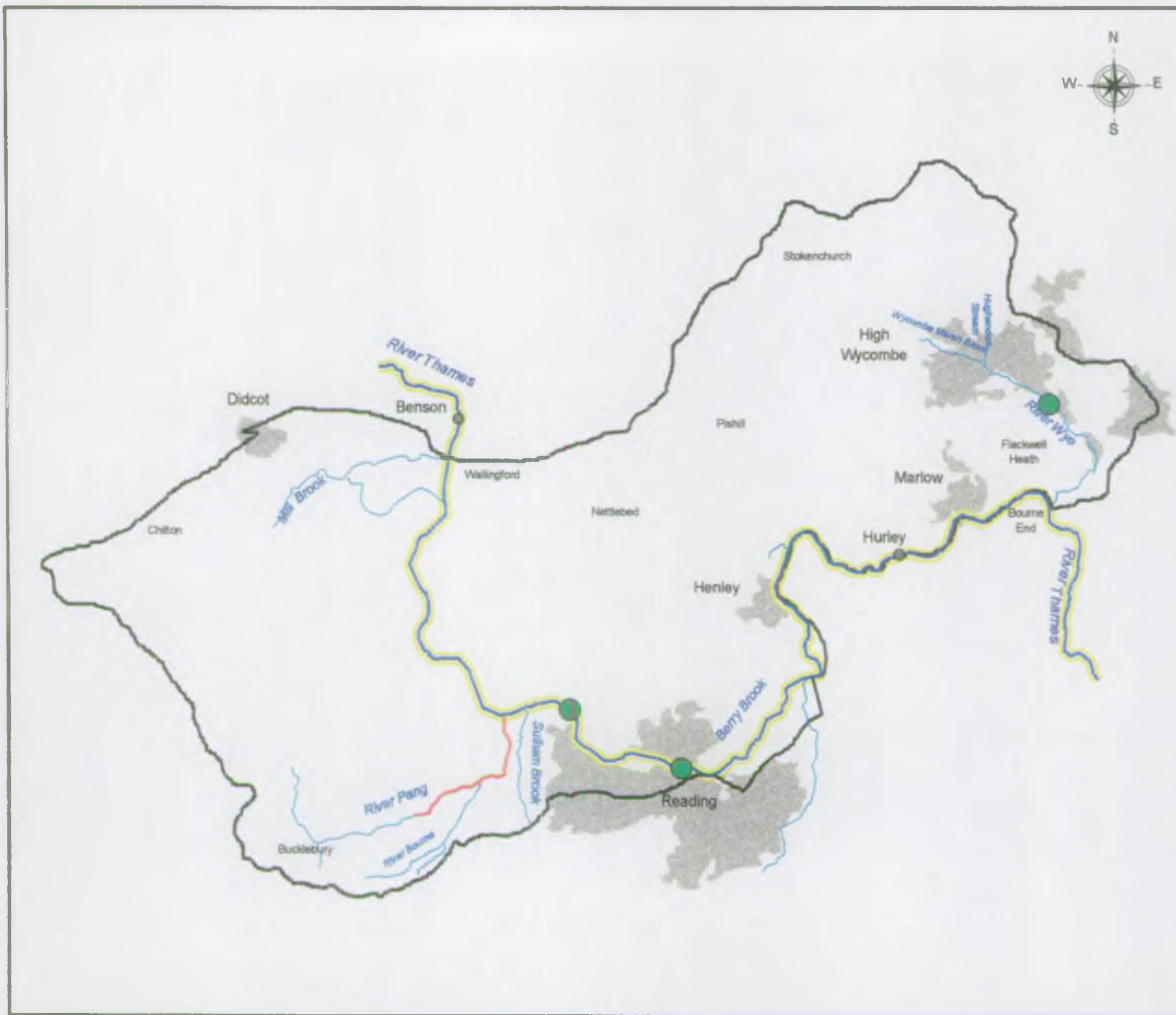
Not true.
Whether reducing will
have 4.22
an impact
on
eutrophic
state.

Intensive macrophyte surveys are being carried out on the River Wye above and below High Wycombe STW. These surveys, initially conducted over a 3 year period will help determine the suitability of designating the River Wye as a sensitive area under the UWWT directive. Early results indicate eutrophication problems below the STW, with increased cover of macrophytes.

4.23 Data from the SWORP studies (South West Oxfordshire Reservoir Proposal) are also being used to help study the trophic status of the River Thames in relation to the UWWTD.







The EC Nitrate Directive (91/676/EEC)

4.24 This directive is intended to reduce water pollution by nitrate from agricultural sources. This is done by designation of Nitrate Vulnerable Zones (NVZs). The proposed NVZs will be designated where surface waters intended for abstraction contain, or could contain, more than 50mg/l nitrate if protective action is not taken, where waters could become eutrophic if such action is not taken or where groundwaters could be affected.



Thames (Benson-Hurley), Pang & Wye
CMP Figure 21:

EC Directive Designations

-  CMP Boundary
-  Quality Assessed Rivers
- EC Designated Fish Reaches**
 -  Salmonid
 -  Cyprinid
 -  UWWTD Sensitive Area (Eutrophic)
-  Dangerous Substances Directive - Monitoring Sites



Biological Status

- 4.25 The health of a river is reflected in the variety and abundance of animal and plant life it supports. The NRA monitors the macro-invertebrate life in rivers and streams routinely at a network of biological sampling points. Aquatic macro-invertebrates are small animals visible by eye. A pollution incident can change the macro-invertebrate community present at a site for many months. Biological monitoring and assessment allows the interpretation of changes in the fauna and enables the detection of water quality changes that may be missed by chemical sampling.
- 4.26 The biological quality of a site is indicated by the number of different macro-invertebrate taxa present and their susceptibility to pollution. This is measured by using the Biological Monitoring Working Party (BMWP) Score System. In this area the most natural watercourses have scores of more than 100 whereas scores below 20 occur at the most polluted sites. Using BMWP alone can lead to problems in distinguishing the effects of pollution from natural factors such as changing sediments or flow rates. To overcome this, predicted scores under natural, unpolluted conditions can be generated using a computer program called RIVPACS (River Invertebrate Prediction and Classification Scheme). These scores are then compared to the observed scores to assist with interpretation of the results.
- 4.27 Figure 22 shows the biological river quality of the study area for 1995. Appendix D1 shows the BMWP score for each river reach together with an indication of whether the score achieved the RIVPACS predicted score.
- 4.28 BMWP scores for the River Thames (Benson-Hurley) are very close to the RIVPACS predicted scores and generally exceed them, indicating good faunal diversity.
- 4.29 The River Pang main stream also supports a rich faunal diversity with scores well over 100. The tributaries of the River Pang have suffered in the past from low flows limiting faunal diversity. In Sulham Brook particularly, the low flows compound water quality problems contributing to poor biological quality.
- 4.30 Biological results for the River Wye are consistently below predicted scores and lower than for other streams in the area. Regular pollution caused by urban run-off from High Wycombe has contributed to the poor fauna in this river.. The Hughenden Stream suffered from very low flows and drying up during the early 1990s drought and is currently recovering.
- 4.31 Cholsey Brook displays excellent faunal diversity in its upper reaches, far exceeding predicted scores. The scores then deteriorate dramatically below Cholsey STW falling to less than 30% of the predicted figure. Cholsey STW failed to meet its consent during 1994 which has obviously had a profound impact on the faunal diversity. In dry weather conditions the Cholsey Brook is practically non-existent above the STW, so that downstream the flow in the river is nearly all effluent.

- 4.32 In all, seven of the twenty reaches included in this CMP do not achieve their predicted scores. Of the smaller tributaries the reasons for poor biology are related to low flows while in the other reaches low flows are compounding the water quality problems caused by STW effluents and other diffuse or unidentified sources of pollution. The sites with poor biological communities and the possible causes are cited in Table 11.
- 4.33 Three sites on the River Thames are monitored as part of SWORP studies (South West Oxfordshire Reservoir Proposal) : Wallingford, Goring and Caversham. They have been monitored fortnightly since 1991. Results indicate the seasonality of algal communities, with marked differences in populations at different times of the year, but little difference between the three sites.

Table 11: Sites in the Catchment With Poor Biological Communities & Possible Causes

WATERCOURSE	BIOLOGY ISSUE	POSSIBLE CAUSE
Webbs Lane Stream	Poor biology	Low flows and treated discharge from old waste disposal site at Webbs Lane
Hughenden Stream	Low faunal diversity, improving since 1991	Drying up in drought years
Sul/Sulham Brook	Poor biology	Affected by low discharge upstream and Pangbourne STW downstream
Wye	Long term low faunal diversity	Suspected long term toxic pollution, run-off and High Wycombe STW effluent
Mill Brook	Poor biology	Affected by low flows, trading estate run-off and South Moreton STW
Bradford's Brook	Poor biology but showing long term improvement since 1990	Unidentified long term pollution, related to Barley Close surface water outfall
Cholsey Brook	Large drop in faunal diversity below Cholsey STW	Despite recent improvements the water quality remains poor downstream of Cholsey STW
Fawley Court Stream	Low faunal diversity, improving since 1991	Drying up in drought years

Bacteriological Status

- 4.34 Faecal coliform bacteria, which are normally resident in the guts of warm-blooded animals, are used as indicators of pollution in all types of waters. The presence of such bacteria also indicates the potential presence of pathogens. Faecal material may originate from point sources (eg. effluents from sewage treatment works) or diffuse sources (eg. agricultural land, urban run-off or misconnections of sewerage into surface water drains). Faecal bacteria can survive in water for varying lengths of time but do not multiply.
- 4.35 Levels of bacteria are of particular concern in terms of the health of people who come into contact with the water. The health implications of the bacteriological conditions in the catchment are the responsibility of the local authorities' Environmental Health Officers, and not the NRA.
- 4.36 NRA Thames Region has a rolling programme for bacteriological monitoring of surface waters. The following is a brief interpretation of the monitoring to date:
- 4.37 **River Thames (Benson-Hurley)**
The geometric mean levels of faecal coliforms from the River Thames were low (<1000/100ml) from all sites except that at Henley Bridge where the calculated 1117/100ml is considered moderate (1 000 - 10 000/100ml).
- Of the two tributaries sampled, Bradfords Brook had moderate faecal coliform levels, while Hamble Brook had faecal coliforms present at low levels.
- 4.38 **Pang/Sul Catchments**
The geometric mean levels of faecal coliforms from the River Pang were low (<1000/100ml) from all sites except that at the A430 roadbridge, Tidmarsh, where the calculated 1477/100ml is considered moderate (1 000 - 10 000/100ml).
- Of the two River Pang tributaries sampled, the Bourne (Berks) had moderate levels of faecal coliforms, while Bradfield South End STW elevates the coliform content of the Buscot Gulley from moderate to high levels (> 10 000/100ml).
- Pangbourne STW increased the geometric mean faecal coliform count from 221/100ml (at Bridge 322, Sulham) to 15 747/100ml at Saltney Mead, Pangbourne.
- 4.39 **Wye Catchment**
The River Wye upstream of High Wycombe STW, Wycombe Marsh Brook and Hughenden Stream all had faecal coliforms present at low levels. High Wycombe STW, was responsible for the moderate faecal bacterial counts over the entire downstream length of the River Wye.

Groundwater Quality

- 4.40 The NRA has a duty under the Water Resources Act 1991 to monitor and protect the quality of groundwater. To assist in this duty the NRA has published a document entitled 'Policy and Practice for the Protection of Groundwater' (PPPG). The non-statutory policies described in the document are used as a framework for decision-making on groundwater issues, particularly those relating to landfill activity, current and former industrial sites, use of soakaways (including road and rail drainage), effluent discharges and agricultural activity. Groundwater in this catchment is sensitive due to the presence of outcrop aquifers across most of the area. There are also a number of groundwater abstractions for public water supply which require protection.
- 4.41 A Regional Appendix is available from the NRA which shows how the policies relate to general issues in Thames Region.
- 4.42 As part of the PPPG different aquifers are categorised. The NRA is delineating Source Protection Zones within which certain activities could present an unacceptable risk to supply boreholes. The NRA seeks to provide additional protection within these zones, which have been defined for a number of abstractions including two major public water supply abstractions from the chalk aquifer around High Wycombe.
- 4.43 The NRA is in the process of producing groundwater vulnerability maps for the UK. Groundwater vulnerability sheets 38 and 39 (1:100,000 scale) cover this catchment and indicate areas where groundwater is particularly vulnerable to pollution infiltration from the land surface. These maps will be made available to planning authorities, farmers etc. to assist in negotiations with the NRA over potentially polluting activity.
- 4.44 Within the Pang sub-catchment numerous swallow holes exist which can provide a pathway for pollutants to enter groundwater and may at times cause surface water pollution. There is much supposition concerning the 'Blue Pool' at Kimberhead, but the only certainty is that it is manifested after fairly prolonged and very heavy rainfall. A colour test carried out some years ago implicated a swallow hole three to four kilometres upstream and indicated the time of travel to be seventeen hours. Although steps were taken to isolate that source, problems still exist. The intensive programme of farm pollution prevention visits now under way in the Pang Valley may throw some light on further potential sources.
- 4.45 Industrial activities, such as gas and engineering works, may have resulted in the contamination of land. Such sites may pose a risk to water quality during periods of redevelopment. The use of soakaways for the disposal of surface water run-off, including that from roads and car parks, can contribute to the degradation of groundwater quality, for example when de-icers, herbicides or incidental spillages become washed into the ground. There is evidence of some groundwater contamination at High Wycombe, in common with most other urban/industrial areas, and to a lesser extent at Marlow and Henley on Thames.

- 4.46 There are a number of areas where historical activities, such as the use of solvents, have resulted in groundwater contamination. Previous solvent disposal at an old waste disposal site at Harwell is believed to have led to identified groundwater contamination over a wide area to the south of Didcot. UKAEA have undertaken considerable investigation and research into the problem and the NRA in conjunction with the WRA continue to monitor the situation. A containment scheme which includes a treatment plant licensed by the WRA is in place with the intention of preventing groundwater contamination, following concerns expressed by the NRA.
- 4.47 No statutory water quality objectives are envisaged for groundwater in the near future. However, a network of groundwater monitoring sites is currently being established which enables the NRA to comply with its duty to monitor groundwater quality. There are currently 12 sites in this catchment and most of the sampling boreholes abstract from the chalk aquifer. The programme is under review, pending approval for a national monitoring scheme.
- 4.48 A NVZ has been proposed to protect the groundwater abstraction at Twyford. The proposed zone incorporates Shiplake and extends towards Stoke Row. Proposals are currently at the consultation stage.

Pollution

- 4.49 There are three main types of surface and/or groundwater pollution: accidental or deliberate intermittent discharges from point sources, unconsented intermittent or constant point source discharges, and other diffuse inputs.
- 4.50 The main source of accidental or deliberate intermittent discharges in rural catchments is often agricultural. The cause may be, for example, washing down milking parlours or cattle stands, or leakage from silage clamps or slurry stores. The pollutant is generally organic in nature with associated high BOD and ammonia levels and may cause significant fish kills, particularly where the discharge is to a small watercourse with limited dilution capacity. Pollution incidents may also occur as a result of spillages from commercial and industrial sources, for example oil or chemical stores, or due to failure at a public or private sewage treatment works. Other major potential sources are traffic accidents involving road or rail transport.

- 4.51 Most public sewage treatment works have storm overflows to allow drainage outflows to bypass the works following heavy rainfall events. A storm water storage facility is often included at the sewage treatment works to hold the initial flushing out flow. Nevertheless, stormwater overflows can significantly increase the pollutant load to surface waters. Whilst the NRA has placed discharge consents on most storm overflows there are still a number which do not have conditions attached to the consent. It is the NRA's intention to place conditions on these in due course.
- 4.52 Other pollution sources which may or may not operate under a discharge consent are discharges from landfill sites and quarries. The NRA is a statutory consultee on all planning and waste management licence applications for such developments and has a duty to ensure that new sites do not impact upon the aquatic environment. Most old sites had little or no control on pollutant movement and can potentially cause pollution problems to both groundwater and surface water resources.
- 4.53 Diffuse pollutant sources are often related to agricultural practices. High nitrate concentrations are a particular concern in many catchments and causes include fertiliser applications and ploughing of fallow land, as well as effluent from sewage treatment works and riverine organic inputs. The main sources of herbicide input are often not agricultural but due to weed control along roadsides, railway lines, etc. Pesticide and herbicide concentrations, along with nitrate, are often the main concerns of water companies when trying to meet the EC Drinking Water Directive (75/440/EEC).

Pollution Incidents

- 4.54 Nationally, the number of reported pollution incidents has grown over recent years. This increase appears to be attributable to a range of factors including better communication facilities (eg. setting up and publicising of 'Pollution Hotlines'), publicising the NRA and its functions, and greater environmental awareness amongst the general public, together with an actual rise in the number of pollution incidents that are occurring.
- 4.55 HMIP does not classify reported pollution incidents in the same way as the NRA because their responsibilities are different. They have ISO9001 procedures which basically require HMIP to investigate incidents to ensure operators stop them from continuing or reoccurring. HMIP inform other organisations such as the NRA, HSE and emergency services where appropriate. The definitions HMIP use in these incidences are given in are given in Appendix D5. There have been no pollution incidents (under the NRA classification scheme) relating to the three processes within the catchment since they have been authorised by HMIP under EPA90.

- 4.56 The NRA divides pollution incidents into four classes. These are: major, significant, minor and unsubstantiated, depending on their severity. During 1994, 163 pollution incidents were reported within the catchment. Of these, 75 were actual cases of pollution and all but 5 were categorised as minor incidents. A breakdown of the different types of reported pollution incidents from 1991 to 1994 is shown in Table 12.

Table 12: Reported Pollution Incidents by Type and Category (1991-1994)

Pollution Type	1991				1992				1993				1994			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Oil	-	-	46	23	-	-	32	7	-	-	33	18	-	2	40	11
Chemical	-	1	1	8	-	-	4	8	-	-	5	7	1	-	3	17
Sewage	-	-	9	6	-	-	6	16	-	-	13	6	-	2	5	10
Natural	-	-	2	9	-	-	-	26	-	-	-	12	-	-	4	18
Agricultural	-	-	1	1	-	-	2	-	-	-	1	2	-	-	1	3
General	-	-	16	8	-	-	9	9	-	-	19	9	-	-	16	14
Urban Runoff	-	-	5	-	-	-	1	1	-	-	2	1	-	-	-	2
Unknown	-	2	11	22	-	-	7	15	-	-	6	8	-	-	1	13
Total	-	3	100	77	-	-	61	82	-	-	79	63	1	4	70	88

Note: Category 1, 2 and 3 incidents are those that have been substantiated. Together with unsubstantiated incidents these make up the total reported for each year.

- 4.57 A category 1 incident occurred on the River Wye in early December 1994 when cyanide was discharged to the river through High Wycombe STW. The effect on the river was devastating, leaving it almost devoid of fish. Although the immediate effect was devastating and the public and press interest overwhelming, little damage was done to the invertebrates and the river was able to recover and be restocked quite quickly. On the 20th November 1995, Premier Plating were prosecuted by both TWUL and the NRA in connection with the discharge. The company pleaded guilty and were fined £7,500 by Wycombe magistrates. Quite substantial civil claims may follow. In order to prevent this type of pollution, the NRA is working with the Metal Finishing Association to produce guidelines for preventing pollution from the plating and metal finishing process.
- 4.58 Appendix D6 gives details of prosecutions and fines related to pollution incidents in the area of this CMP over the past 5 years.

Pollution Prevention

- 4.59 Many pollution incidents occur as a result of ignorance and in the mistaken belief that any liquid which passes to a drain goes to a sewage treatment works. This is not generally the case, especially in the West Area of Thames Region, where most drainage systems run directly to watercourses or soakaways (groundwater).
- 4.60 Education is a vital element in pollution prevention through all sectors of the community. A programme of pollution prevention visits exists which targets areas where occasional incidents occur. Within the catchment area the trading estates cited in Table 13 have been, or will be visited and recommendations for remedial work will be made where necessary.

Table 13: An Example of a Programme of Pollution Prevention Visits (93-96)
(targeting areas where occasional incidents occur)

TOWN	AREA	DATE OF VISIT
Wallingford	Hithercroft	7/93
Reading	Cardiff Road	10/93
Reading	Battle Farm	4/94
High Wycombe	Binders Yard	11/94
Henley-on-Thames	Newtown	12/94
High Wycombe	Cressex	95/96

- 4.61 In rural areas the risk of pollution from agricultural premises is always present. The present pollution prevention programme covers the Pang sub catchment where each farm will be visited and all facilities checked.
- 4.62 Over and above the programmed work, visits to offer advice are made to any premises on request.
- 4.63 A number of initiatives have been and are being taken to reduce pollution incidents by working with industrialists and others.
- 4.64 (a) The Oxfordshire Business Environment Group has over two hundred members who are keen to protect the environment. The NRA is one of the sponsors of their waste minimisation club and has been active in promoting the concept of BS7750.
- (b) The NRA is working with the Oxfordshire, Buckinghamshire and Berkshire Fire Services to contain spillages more effectively at incidents and has provided a wide range of equipment to each fire brigade to facilitate this.

(c) The use of pesticides on or near water can cause pollution. NRA pollution prevention staff have been specially trained to offer advice and regulate use near waterways.

(d) Oil pollution is prominent in the incident statistics. To address this the NRA will shortly be promoting oil recycling and visiting marinas and other installations.

(e) Liaison with local authorities has been successful in the pre-notification to the NRA of demolition sites who can subsequently carry out pollution prevention inspections.

(f) To help put the NRA message across consistently a number of pollution prevention guidelines have been produced, tailored to various sectors of industry and commerce. They were developed in Thames Region and have been adopted nationally as common policy. They have been used as the basis for mail shots within the area. Target sectors include:

- i) Transport and haulage companies
- ii) Bus and coach operators
- iii) Builders and contractors
- iv) Plant hire firms
- v) Retail foodstores
- vi) Schools
- vii) Councils

(g) Pollution prevention staff take every opportunity to meet interested groups and organisations. They have given talks to a wide cross-section of the community.

4.65 As part of the EPA90 authorisations issued for the three processes in the catchment, HMIP has ensured that all practicable measures have been taken to prevent inadvertent releases to watercourses and groundwaters.

WATER RESOURCES

Introduction

- 4.66 In managing water resources the NRA seeks to achieve a sustainable balance between the needs of the environment and of abstractors. In carrying out water resources management the NRA has general duties to further the conservation and enhancement of the natural environment and to have particular regard for the statutory obligations of the water undertakers.

Catchment Perspective

Abstractions and Low Flows

- 4.67 The NRA has, nationally, identified 40 rivers as suffering from low flows caused by over-abstraction. The Authority has developed a standard methodology for assessing the severity of low flow conditions resulting from excessive abstraction. This methodology has been applied to both the River Pang and the River Wye.

River Pang

- 4.68 A large proportion of groundwater which would otherwise have fed the upper reaches of the River Pang has for many years been abstracted from boreholes at Compton for public water supply. As a result the upper reaches of the River Pang dried up for longer periods than would otherwise have been expected and the middle and lower reaches often became shallow and sluggish. Negotiations with Thames Water Utilities Ltd (TWUL) in 1990-93 led to a reduction in abstraction at Compton to 5Ml/day. As a result groundwater levels in the upper Pang catchment began to rise and this combined with substantial amounts of rainfall saw a return of flows to the upper reaches of the river. Throughout 1993 and 1994 the source of the river remained near Hampstead Norreys, some 6 kilometres further upstream than for most of the previous 10 years. The NRA has already funded some enhancement works along the river including in-channel modifications and brown trout restocking. A three year programme of environmental monitoring has been initiated which will provide valuable data about the recovery of the River Pang.

River Wye

- 4.69 Following recognition by the NRA, and others, that flows in the River Wye may be adversely affected by authorised abstraction for public supply and other uses, preliminary investigations have been undertaken by the NRA. This work indicated that further, more detailed, studies are required to gain additional information on the causes and severity of the problem, and to assess possible remedial measures. The reach of river to be investigated lies upstream of the STW; downstream of the STW the effluent return supports river flows.

Water Resources Management

- 4.70 Water resources for meeting demand for public water supply come primarily from groundwater abstractions. Water is supplied to centres of population such as Reading, Henley and High Wycombe. Abstractions from Gatehampton supply Didcot and also upstream to Oxford, while sources in the Wye catchment supply Aylesbury to the north and Slough and Windsor to the east (see Figure 13).
- 4.71 The level of demand for water may be influenced by a number of factors, such as increasing water use in the home, population growth, local development pressures and economic trends, which may affect commercial water usage.
- 4.72 '*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. The report shows that existing resources can sustain planned levels of local development in the catchment as identified in existing local and county council structure plans.
- 4.73 Managing growth in demand for water is a key element of these strategies. The NRA has recently published '*Saving Water - the NRA's Approach to Water Conservation and Demand Management*' (1995) which reviews the opportunities for managing demand. Managing leakage and encouraging more efficient use of water at work and at home can affect growth in demand for water significantly. It may be possible to delay the need for major new strategic water resources and, perhaps, avoid their development altogether for the foreseeable future. However, the NRA and TWUL must work together to establish the practicalities and economic extent of leakage control. TWUL have stated that they intend to reduce leakage by 50% over the coming years. Depending on the outcome of this, some local development may still be required.
- 4.74 A number of local water resource options have also been identified should growth in demand for water continue in this area. These include the further development of Thames-side groundwater resources similar in principle to Gatehampton although on a smaller scale. Potential sites have been investigated at Reading, Remenham, Harpsden and West Marlow.

- 4.75 Should the growth in demand for water continue across the region it may contribute to the need to develop larger strategic water resources within the Thames catchment in the longer term. *"Future Water Resources in the Thames Region"* identifies a number of strategic options which may be developed in this respect, two of which are:
- the transfer of water from the River Severn to the River Thames;
 - the proposed reservoir in south west Oxfordshire.

? The transfer of water from the River Severn to the River Thames could have potentially grave ecological consequences if the water is of varying mineral content, BOD and pH.

- 4.76 The local planning authorities within this catchment recognise the link between development pressures, particularly housing development and water resources. All have policies which refer to development being permitted only where water resources exist or can be provided without adversely affecting existing users or the water environment. The consultation draft of the Oxfordshire County Council Structure Plan (August 1995) notes that, before further development of water resources infrastructure is considered, the council wishes to be satisfied that measures to manage demand, including leakage control, are implemented.

PHYSICAL FEATURES

- 4.77 Physical features are those characteristics of watercourses which can be expressed in physical terms and do not relate to either quantity or quality of water. It includes features such as channel morphology, water movements etc. For the purposes of this report, the physical features category also includes any relevant land or water management practices such as flood defence, environmental enhancement etc.

Flood Defence

- 4.78 The NRA have developed a system for assessing the level of protection an area should be given against flooding known as the 'Standards of Service for Urban and Rural Flood Defence' as discussed in Section 3 of this Report. Whilst it is accepted that these Standards of Service are a useful tool for management there are a number of problems in applying them:

- baseline data have not been collected in most cases and will require resources and time to collate;
- a length of river may not be receiving the standard of service commensurate with its land-use band but the cost of works to ensure that the target is met may exceed the benefit;
- land use changes over time and, therefore, the standards of service targets may become out of date and may require regular updating;
- the standards only apply to certain reaches and the approach may not be consistent with a total river or total catchment approach.

- 4.79 As mentioned in Section 3, it is better to prevent flooding than to solve problems later. The Thames Non-Tidal Floodplain Policy precludes most development in areas which have more than a 1% chance of flooding in any one year in order to protect the catchment's flood routes and storage areas. Development which is allowed in these areas must meet the following criteria:

- flood flows must not be impeded;
- the storage capacities associated with floodplains must not be reduced;
- the number of people or properties at risk from flooding must not be increased;
- land required for maintenance of, or access to, watercourses must not be obstructed;
- adverse environmental impacts should be minimised and any unavoidable residual impact balanced by environmental enhancements.

There are a number of local flooding issues and some of the more notable areas are detailed in Section 3. The NRA is working towards alleviating these problems through capital works as it is recognised that maintenance does not provide a reasonable solution.

- 4.80 The NRA has adopted the flood warning target that the police will be informed four hours in advance of an event in rural areas and two hours in urban areas. In September 1996 the Environment Agency will take over from the Police as the lead agency for the dissemination of flood warnings.

Riverine Environment

Introduction

- 4.81 The quality of the physical river environment is important in terms of the habitats and species it can support and has relevance for a number of NRA functions, including conservation, fisheries, landscape and recreation. Survey data can be used to monitor changes in the status of the river environment. No overall set of standards/targets currently exist for this area of concern and, at present, specific surveys are undertaken by individual functions, eg. river corridor surveys, geomorphological field surveys and fisheries surveys. However, the NRA is currently undertaking research to formulate a general environmental surveying and classification system for river corridors SERCON (System for Evaluating Rivers for Conservation).
- 4.82 The lack of comprehensive baseline data on the status of the river environment precludes a complete assessment of status at this stage. However, interpretation of data collected to date can provide an indication of the areas of value, as well as identifying particular concerns.

Ecology

- 4.83 River corridor surveys (i.e. ecological surveys of the river channel and adjacent marginal habitat) of the River Pang and the River Wye have been completed. There are a number of water-dependent sites in the CMP area of considerable conservation value which may be vulnerable to damage by changes in water levels, although some are adjacent to the River Thames where river regulation which is determined by lock and weir operations ensures that the water levels are maintained at a broadly constant level. The WLMP process should define acceptable water-level management regimes for the three SSSIs in the CMP area for which these plans are to be produced.

Fisheries

- 4.84 The NRA has developed targets for fisheries based on the amount of fish (biomass) found in a certain area. Two targets have been set; one for EC designated salmonid waters, the other for EC designated cyprinid waters. Biomass is sampled during routine fisheries surveys which are undertaken on a rolling programme basis throughout the Thames catchment.
- 4.85 The whole of the River Thames in this area is designated an EC cyprinid fishery. Existing knowledge on the status of fish populations in the River Thames within this area has previously been limited due to a lack of suitable methods for surveying fish populations in rivers of this size.
- 4.86 The River Pang from Stanford Dingley to its confluence with the River Thames is designated as an EC Salmonid fishery. In recent years low flows in the upper reaches have led to a substantial reduction of the fish population. Downstream from Stanford Dingley moderate wild brown trout populations exist which are augmented by stocking activities of angling clubs. The NRA has stocked 3,000 10 - 15cm brown trout whose progress is being monitored. Important grayling and coarse fish populations exist in the lower reaches of this river.
- 4.87 The River Wye has moderate to poor fish populations due to a number of factors, including low river flows in the headwaters, poor habitat quality and sporadic but severe pollution incidents. Following the most recent incident that virtually destroyed fish populations over a 20 km reach of the river, the NRA restocked with over 4,500 fish including brown trout, chub, gudgeon and stickleback. The Hughenden stream now supports an excellent stock of brown trout following reinstatement work by the NRA after this tributary dried up for a number of years.
- 4.88 The River Thames in this area forms an important conduit for Atlantic Salmon to enter the Rivers Wye, Loddon, Kennet and Pang to access suitable spawning habitat. Fish passes have been constructed on the majority of weirs and river control structures in this part of the River Thames. The Rivers Pang and Wye have some potential to support a salmon population and recently the River Pang was used by the Thames Salmon Rehabilitation Scheme as a nursery area.

Landscape

- 4.89 No landscape assessment of the entire River Thames (Benson to Hurley), Pang and Wye has been undertaken, although a landscape assessment of the River Pang was carried out in 1993 as part of the ALF scheme. The report looked at the problem of low flows and enhancement opportunities were identified.

Geomorphology

- 4.90 Rivers naturally change their course and flow over time, but with human interference, (eg. channel straightening and weirs) the flow regime is altered which leads to different erosion and sedimentation patterns. The study of these changes is known as geomorphology.
- 4.91 In 1993 a bank erosion survey of the River Thames was carried out. The data derived from this are contained in a map atlas and on a database, providing information on length, type and condition of bank protection. In general, the bank protection along this section of the River Thames is minimal with long stretches remaining completely unprotected. It has been recommended that in the near future, and as a long term project, a geomorphological survey of the Rivers Pang and Wye should be undertaken.
- 4.92 In morphological terms the River Wye is unusual in that it has a relatively steep slope for this region and therefore that energy was available to drive water wheels. However, the relatively high energy means there is potential for erosion, thereby presenting problems for the NRA or external developers. New structures, bank protection and channel works can cause significant downstream erosion. Enhancement works must be designed carefully to ensure that, for example, introduced bed material does not wash out in high flows.
- 4.93 The River Pang is a lower energy stream with beds and banks made up of relatively coarse material. Related to the problem of low flow, there have been discussions and local attempts to narrow the channel. Local structures placed in river channels need to be designed carefully in order to ensure their sustainability and to avoid localised erosion. The established pool-riffle sequence is sensitive to channel works (eg. dredging of the hard bed) and there are instances of long reaches which have in effect become silt traps.

SECTION 5

CATCHMENT ISSUES

In the following section we describe issues that have arisen through investigation of the catchment and through internal and informal external liaison. In identifying the catchment issues, the many key points and areas of concern have been consolidated into a small number of integrated categories. We suggest ways of dealing with these issues and look for your comment on the best way forward. We also identify the areas where external support and action is required and give prominence to the communication process, with LAs and others, by which several of the issues could be resolved.

5 CATCHMENT ISSUES AND PROPOSALS FOR ACTION

INTRODUCTION

5.1 This section identifies issues that have arisen through the catchment review process and as a result of internal and informal external liaison. Proposed actions are suggested as ways of tackling these issues. As some of the actions suggested are outside the responsibility of the NRA, other organisations with appropriate interests are identified.

5.2 In identifying the catchment issues, the many key points and areas of concern have been consolidated into a small number of integrated categories.

5.3 At this stage the issues and options for action are not presented in any order of priority.

Issue 1: Alleviation of low flows.

Issue 2: Future water resources: meeting demand for water.

Issue 3: River Wye improvements.

Issue 4: Eutrophication of the River Thames and River Wye.

Issue 5: Sewage treatment works improvements (TWUL Asset Management Plan).

Issue 6: Pollution of Vastern Ditch.

Issue 7: Groundwater ingress into sewers at Compton and Hambleden STWs.

Issue 8: Waste disposal sites and groundwater pollution.

Issue 9: In-Channel islands on the River Thames (and the problem of erosion)

Issue 10: Implementation of the Recreation Strategy for the Thames.

Issue 11: Caversham lakes and the third Thames crossing.

Issue 12: Drainage strategy for High Wycombe.

Issue 13: Flooding to persons and property.

ISSUE 1: ALLEVIATION OF LOW FLOWS

Overview

Nationally the NRA has identified forty rivers suffering from low flows caused by over-abstraction. Of these forty, five are in the Thames region, including the River Pang. A second phase of assessment using the standard NRA methodology has identified that the River Wye merits further investigation.

The River Pang

Negotiations with TWUL resulted in a reduction in abstraction at Compton Pumping Station from 13.5Ml/day to 5Ml/day. Flows on the River Pang have been restored and during the last two years the source of the river has been some six kilometres further upstream than for most of the time during the previous ten years. The only outstanding issue on the River Pang is for the NRA and TWUL to agree a permanent solution.

The River Wye

Detailed studies to assess the causes and severity of the problem on the River Wye and assess possible remedial measures are required. To assist in the studies, and in monitoring the effectiveness of any remedial measures implemented, additional data on river flows and groundwater level will be required. To this end the design of two river flow measurement stations and eight groundwater observation boreholes has been completed. It is planned that the construction of the gauging stations and boreholes will be completed by the end of 1996.

Strategies and Proposals for Action

- Construct two river flow gauging stations and eight groundwater observation boreholes in the River Wye catchment in 1996.
- Commence detailed investigation into the causes of and possible solutions to the problem of low flows in the upper reaches of the River Wye. Study to commence in 1996.
- Undertake assessment of the environmental and economic benefits of potential options for alleviation.
- Promote a recommended scheme for alleviation - if the studies undertaken demonstrate that a scheme to provide the desirable increase in flow can be justified in environmental and economic terms.

Implementation

The NRA will continue to keep the public informed of plans and progress through the issue of newsletters, public meetings and the local media.

Close liaison throughout the study period will be required with the main abstraction licence holders, District, Local and Parish Councils, and Conservation and Environmental groups.

ISSUE 2: FUTURE WATER RESOURCES: MEETING DEMAND FOR WATER

Overview

'Future Water Resources in the Thames Region: A Strategy for Sustainable Management,' outlines the NRA's view of water resources in the region in the next thirty years. Managing growth in demand for water and raising awareness of water use efficiency is critical to the sustainable management of the region's water resources. If growth in demand cannot be managed in the longer term new resources may be required.

Local Resources

One of the options identified in the strategy, should additional local resources be required, is the development of riverside groundwater abstractions in the middle Thames. These abstractions would operate in a similar principle to the Gatehampton abstraction but on a smaller scale. With appropriate licence constraints they would not result in undesirable environmental impacts. A number of possible sites are being investigated at Remenham, West Marlow, Harpsden and Reading.

On a regional scale, should new strategic water resources be required, a reservoir in south-west Oxfordshire and a Severn-Thames transfer have been identified as possible options. These are dealt with in other CMPs.

Strategies and Proposals for Action

- Ensure that the most efficient use is made of resources by all water supply companies in the Thames region.
- Investigate the scope for introducing water efficiency measures through new developments. The NRA will work closely with the local planning authorities to give timely guidance.
- Continue investigation of local water resource options, where additional local resources being required and assess potential environmental impacts.
- Assess the impact of strategic water resource options for river basin management.

Implementation

The NRA plans to continue to inform the general public and raise awareness of water issues and the opportunities for water conservation and efficiency, and the benefits they can provide economically and environmentally. Close liaison with TWUL will continue in order to monitor and review water resource management within the area.

ISSUE 3: RIVER WYE IMPROVEMENTS

Overview

The River Wye in High Wycombe is highly urbanised. Historically, most of the heavy industry, including a number of paper mills, was located along the river and it was heavily polluted by discharged effluents. However, gradually most of the paper mills have closed down and development has moved away from heavy industry towards retail and housing. As a result, the quality of the river is improving. Despite this improvement pollution incidents and habitat quality are still major factors limiting faunal and floral diversity in the River Wye. An additional factor is that the complex culvert system beneath the town makes it very difficult to trace pollution events when they do occur.

High levels of polychlorinated biphenyls (PCBs) and fin skeletal deformations have been found in pike and trout taken from the River Wye. Detailed investigations into PCB, heavy metal and pesticide concentrations in fish within this reach are needed in order to determine levels of pollution.

This river has historically supported a self sustaining salmon population. The provision of access for salmon and other indigenous species to the upper reaches of the River Wye, through the installation of fish passes, is desirable and should be pursued at every opportunity. For example a fish pass was recently constructed on the River Wye at Soho Mill, near Bourne End, as planning gain.

Some sections of the watercourse have been highly managed. In 1985, the channel of the River Wye through Kingsmead Recreation Ground was concreted, resulting in the loss of instream habitat diversity. The NRA are currently looking to carry out enhancements to this section of river, in conjunction with Wycombe District Council who initiated several improvement schemes following their River Wye Study (completed 1991). Hydraulic modelling is being undertaken to determine the possible flooding implications of the proposed enhancement works. Potential for enhancement also exists elsewhere. Other improvements planned include various landscaping schemes, improvements to bridges and the Funges Farm scheme which is intended to create a nature conservation area beside the backstream of the River Wye, just south of High Wycombe centre.

During the 1970s a flood relief scheme was undertaken on the River Wye but there is a lack of up-to-date, detailed flood maps and associated information for the river. This will be resolved as Section 105 surveys are undertaken in accordance with the Memorandum of Understanding on Development and Flood Risk signed jointly by the NRA and local authorities.

Strategies and Proposals for Action

- Continue regular river maintenance work, such as weedcutting and the removal of blockages, so as to reduce flood impact.

- Determine where enhancement schemes would be the most beneficial in providing suitable, natural in-stream and bankside habitat along the watercourse and pursue enhancements as an integral part of urban redevelopment proposals.
- Investigate levels and sources of pollution in the river in order to enhance fish populations from the current low levels.
- Exercise stringent pollution prevention to ensure that the in-stream habitat can continue to support a salmonid fishery.
- Provide appropriate fish passes at every opportunity on an opportunistic basis.
- Consider designation of the upper reaches of the River Wye as a salmonid fishery under the EC Fish directive.
- Carry out S105 floodplain surveys.

Implementation

There will be continued liaison between the NRA and TWUL to ensure that water quality does not deteriorate and with a view to making improvements.

Riparian owners and relevant authorities will be consulted and involved, as appropriate in any enhancement schemes and made aware of fish pass opportunities.

ISSUE 4: EUTROPHICATION OF THE RIVER THAMES AND RIVER WYE

Overview

Under the Urban Wastewater Treatment Directive (91/271/EEC), the River Thames has been designated as sensitive (eutrophic) and is being monitored. The Directive instructs that phosphate removal at STWs discharging to designated waters is to be considered, but that if this has no impact on eutrophication then phosphate removal is unnecessary.

In addition, macrophyte surveys have been conducted in the River Wye, upstream and downstream of High Wycombe STW, in relation to the UWWTD. Preliminary results show that the STW discharge is causing eutrophication as far downstream as the confluence with the River Thames.

Strategies and Proposals for Action

- Continue monitoring for nitrate and phosphate.
- *macrophytes* Continue monitoring discharges including routine monitoring of macroinvertebrates and bacteriological and algal sampling. Monitoring will provide information on the biological status of watercourses in the catchment as well as allowing assessment of the impact of various discharges to watercourses.
- Implement the solutions identified.

Implementation

The DoE are responsible for the designation and determining what needs to be done.

ISSUE 5: SEWAGE TREATMENT WORK IMPROVEMENTS, (TWUL Asset Management Plan)

Overview

6 Major capital investment is planned by TWUL for improvements to STWs. The NRA is guiding TWUL on the prioritisation of these improvements and has indicated the need for investment at several STWs in this catchment, under the Asset Management Planning process (AMP2). The STWs concerned are: Benson, Blewbury, South Moreton, Bradfield South End, Pangbourne and Compton.

Strategies and Proposals for Action

- ??
- ?
- Where further investigation is warranted, computer modelling will be used to predict possible future effects of discharges on individual reaches.
 - Investigate the setting of RQOs to reflect possible changes due to alterations in the quality of discharges within consent limits, as highlighted by computer modelling.
 - ✓ ● Monitor the impact of the improvements on the rivers.
 - ✓ ● Continue discussions and liaison with TWUL to ensure appropriate and necessary improvements post AMP2.

Implementation

The NRA will liaise closely with TWUL and seek to ensure that agreed investment timescales are met.

ISSUE 6: POLLUTION OF THE VASTERN DITCH

Overview

The Vastern Ditch in Reading has experienced long term, sporadic (mainly oil related) pollution incidents. Reading Borough Council, acting as agents for TWUL, have been clearing the ditch out at regular intervals and tankering the oil away. Following further investigations by TWUL it was discovered that the Vastern Ditch was, in fact, a culverted watercourse and not a surface water sewer as originally thought and as such was the responsibility of the NRA. The NRA's pollution control staff are currently looking into the problem.

The NRA have commissioned CCTV surveys of the culverted section of the ditch to establish where the oil is coming from. Pollution prevention surveys of the adjacent industrial sites have also been carried out.

Strategies and Proposals for Action

- Investigate and implement strategies for reducing pollution in the ditch including:
 - pollution prevention visits to properties within the Vastern Ditch catchment,
 - reinstatement of the existing wooden baffles in the open section of the ditch,
 - widening the existing river channel to slow the flow and allow better oil collection and removal by booms and tankers respectively,
 - removing the contaminated silt and mud from the culvert,
 - general cleaning of the culvert, and
 - repairing or installing manholes at strategic points.
- Encourage reopening of the Vastern Ditch to improve local amenity and ease pollution control.

Implementation

The NRA will convene a working group to establish a long term solution. Reading Borough Council, Newbury District Council (who are now TWUL management agents in the area) and TWUL are among those to be invited to form the working group.

ISSUE 7: GROUNDWATER INGRESS INTO SEWERS AT COMPTON AND HAMBLEDEN STWS

Overview

Historically, Compton STW discharged to soakaway. With the reduction of abstraction from Compton Pumping Station as part of the ALF scheme, and with rising groundwater levels, infiltration has occurred to the foul sewer causing hydraulic overloading of the STW. The works consequently started discharging effluent to the River Pang. A temporary consent was issued to cover this discharge but it has lapsed and renewal is currently being negotiated. Extensive sewer sealing works have been undertaken and appear to be having some effect on the volume arriving at the works but recent dry weather must also be helping in this respect. The real efficacy of the sewer sealing cannot be judged until after a period of prolonged heavy rainfall. The works is to be rebuilt as a part of the TWUL AMP2 investment programme.

Leaking sewers and natural rises in groundwater levels at Hambleden STW have resulted in the incursion of groundwater to the foul sewers, leading to the flooding of Mill End Pumping Station. This dilute sewage is then pumped up to Hambleden STW which is unable to treat the dilute effluent effectively and, as a consequence, the works have been failing their discharge consent. TWUL was prosecuted on 12th December 1994 in respect of these failures and was fined £2,500. Action has been taken to reduce the amount of groundwater ingress through both the public and some private sewerage systems. TWUL are undertaking major refurbishment of the works.

Strategies and Proposals for Action

- Ensure that action is taken to seal the relevant sewers.
- Consider field investigations and pumping trials in conjunction with TWUL.
- Ensure that the consent standards set for the Compton discharge will protect the RE class in the River Pang downstream of the discharge point.

Implementation

Maintain close liaison between the NRA and TWUL to ensure that the situation on both rivers is kept in check and does not degenerate.

ISSUE 8: WASTE DISPOSAL SITES AND GROUNDWATER POLLUTION

Overview

It is believed that activities at UKAEA Harwell (located to the south of Didcot) have resulted in a plume of solvent contamination in the chalk groundwater to the south of Didcot. The NRA continues to monitor groundwater quality.

There are a number of old waste disposal sites within the catchment which are giving the NRA cause for concern.

Redevelopment of a number of old waste disposal sites in the valley gravels in the Marlow area is of concern due to the potential contamination of groundwater arising from construction activity.

Contamination of groundwater from the High Heavens waste disposal site to the north of Marlow has occurred in the past and the NRA are currently monitoring the situation.

Strategies and Proposals for Action

- Instigate remedial work, including treatment of contaminated groundwater.
- Continue monitoring and assessment of Ewelme landfill.
- Establish a monitoring programme, and protection measures as necessary to protect groundwater quality.

Implementation

Liaise with local authorities, TWUL and local industry to protect groundwater.

ISSUE 9: IN-CHANNEL ISLANDS ON THE RIVER THAMES (& the problem of erosion)

Overview

The in-channel islands formed along the River Thames can provide valuable wildlife habitats, particularly for nesting birds, as well as representing significant river landscape features. These islands are gradually being eroded, largely through natural processes. Unless action is taken to protect these islands or allow others to form elsewhere, they will eventually be lost entirely.

There are a large number of swans on the River Thames around Caversham Bridge which use the in-channel islands as roosting sites. The islands have become de-vegetated and are eroding. Reading Borough Council, in conjunction with the NRA, are investigating the possibility of temporarily preventing access to one of the islands for swans (and allowing their access to another) to allow vegetation to recover and to facilitate works to enlarge and protect the island from further erosion.

Strategies and Proposals for Action

- Investigate the setting up of a programme to let river users know about the harm speeding and boat wash can cause.
- Produce a leaflet for all river users on the importance of bankside/in-channel island protection.
- In collaboration with landowners, consider environmentally sensitive restoration of selected islands in the River Thames and investigate the priorities for action.

Implementation

Set up a working group between the NRA, local authorities and other interested bodies with a remit to recommend actions during 1997 for implementation shortly afterwards.

ISSUE 10: IMPLEMENTATION OF THE RECREATION STRATEGY FOR THE THAMES

Overview

This strategy was published by the NRA in 1995. The acceptance and implementation of the strategy, both internally and externally, is of major importance to the management of recreation and navigation on the Thames. Internally the NRA is incorporating the recommendations and actions identified as part of future work programmes. Many of these are extensions of work which has already begun. Externally, liaison with bodies such as the Sports Council, Local Authorities, governing bodies of sport and those representing river users is essential.

Key Issues

The recreation strategy identifies numerous issues, most of which are applicable to the whole of the river.

A Conflict on the Thames

Conflict between Recreation and Conservation

The landscape character of the Thames is unique and in this catchment there are several areas of significant landscape or ecological value (AONBs, SSSIs, etc). It is important that the recreational use of the river is compatible with the landscape and that, where possible, neither is promoted to the detriment of the other.

For the NRA's own sites along the River Thames it is proposed that multifunctional management plans are produced for each lock and weir site within the catchment. This will address all interests and should resolve conflicts.

Action

- Continue the production of multi-functional management plans for each lock and weir site within the catchment.

Conflict between different Recreational Activities

As one of the busiest waterways in the country the River Thames has its fair share of conflict between incompatible activities - angling and cruising; cycling and walking; canoeing and rowing; etc. The area between Benson and Hurley is no exception, with concentrations of activity around the villages and towns (Reading and Henley especially). The recreation strategy identifies potential conflicts and recommends ways to resolve them, largely through the education of users.

Action

- Review the effectiveness of River User Groups and encourage better attendance and improved dialogue between river users.
- Redevelop the user code for the River Thames and distribute it to both clubs and casual users. (In progress)
- Educate and influence the casual sportsmen using the river.

B Improved Access and Facilities on Recreation

Poor access and lack of facilities is a problem along the full length of the River Thames.

Moorings

There is a demand for additional permanent and overnight moorings. The recreation strategy recommends that the development of additional permanent mooring sites in the main river channel be resisted but that the provision of low cost and free visitor moorings, with adequate facilities, be encouraged in towns and villages and along the river.

Action

- Protect existing riverside facilities and services for boaters and promote the provision of additional services, especially fuel supply points.
- Review the banks of the River Thames and identify potential sites for off-river mooring which will not adversely affect sites of conservation value.
- Review redundant stages and moorings, remove those which are derelict and re-establish use of those which have suitable potential.
- Consider the provision of well equipped visitor moorings in towns, villages and rural areas. Investigate ways in which to provide information on visitor moorings.

Slipways

Although there are several slipways giving access to the river in this catchment, there are few which have adequate parking or are in good condition. Existing slipways should be reviewed and upgraded where appropriate and information on their locations made more readily available to the general public. New slipways will only be encouraged in areas where they will not damage the natural environment.

Action

- Continue to refurbish old slipways and develop new ones.

Land Access

The availability of access to the River Thames for recreation varies significantly between rural and urban areas. In rural areas where there are relatively few bridging points access is difficult and information on where it does exist is not readily available. The use of the River Thames and its banks for informal recreation is encouraged, especially in focal areas which are more environmentally robust.

Action

- Carry out a review of all access routes to the River Thames, both pedestrian and vehicular, including public transport, suggesting enhancements where appropriate.
- Produce maps showing footpath etc. access to the riverside for main rivers in the catchment.

Information

One of the most frequent comments from visitors to the River Thames is that there is a lack of information - leaflets, guide books, databases. There have been several recent initiatives to address this problem but there are still significant opportunities to improve the availability of information and its distribution.

Action

- Produce and disseminate local information sheets etc. which educate people about the River Thames. This will include leaflets, information panels and exhibitions.
- Create a database of Thames information which will be updated as part of strategy monitoring.

Summary

These issues and proposals for action are a selection taken from the Recreation Strategy. It includes many other policies and actions which are pertinent to this catchment. An integral part of implementing the CMP action plan will be the adoption and implementation of the Recreation Strategy. Its philosophy needs to become part of the everyday thinking and operations of all those concerned with using and managing a multi-functional river and catchment.

ISSUE 11: CAVERSHAM LAKES AND THE THIRD THAMES CROSSING

Overview

Just east of Caversham sand and gravel has been extracted from a large area. This has been left as a series of lakes which are used for sailing, water skiing, a marina and some nature conservation. A relatively small area remains to be dug for gravel by Redlands Aggregates Ltd.

Redlands Properties Ltd in the early 1990s proposed to develop part of the Caversham Lakes area for housing and commercial purposes. Two models of the scheme were produced to enable the effects of the development on the floodplain around Reading to be assessed. The NRA funded development of a physical model and the developer's consultants produced a mathematical model of the proposals. The proposal was withdrawn but it is possible that other schemes will be put forward in the future.

Berkshire County Council has proposed a new road bridge crossing the River Thames. Both Oxfordshire County Council and South Oxfordshire District Council are firmly against it and the proposal does not form part of OCCs Structure Plan or SODCs Local Plan.

Strategies and Proposals for Action

- Assess the value of providing a floodplain management plan for Sonning and Caversham reaches.
- Continue liaison with local authorities and developers to ensure that solutions and options take due account of the water environment and offer an opportunity to improve the standard of flood defence to Reading and Caversham without worsening it elsewhere.

Implementation

Review current status with Berkshire and Oxfordshire County Council Minerals and Transportation Planners.

Agree requirements for water environment i.e. flood defence, nature conservation etc.

ISSUE 12: DRAINAGE STRATEGY FOR HIGH WYCOMBE

Overview

The groundwater in the chalk aquifer around High Wycombe is sensitive to pollution. There is a need for a drainage strategy to address future development in High Wycombe, in an attempt to attenuate peak flows to the River Wye. A multi-functional working group has been set up within the NRA to investigate methods of source control region-wide, and will be giving advice on the action necessary to make progress on this matter.

Source protection zones have been defined for two major public water supply abstractions from the chalk aquifer in High Wycombe. These zones are used in conjunction with the NRA's Policy and Practice for the Protection of Groundwater, to protect groundwater quality.

Strategies and Proposals for Action

- Assess what effect a drainage strategy could have.
- Continue stringent pollution prevention measures.
- Investigate all possible methods of source control, in both the short and the long term.
- Ensure that the multi-functional working group established to look at source control addresses the issue.

Implementation

A multi-functional working group has already been set up within the NRA. Close liaison with the local authority will be necessary to ensure the working group promotes the best strategy for this area.

ISSUE 13: FLOODING TO PERSONS AND PROPERTY

Overview

It is recognised that flooding occurs affecting persons and property, in some cases more severely than others. There are a number of high risk sites identified previously, as well as much agricultural land and other areas liable to flood.

Strategies and Proposals for Action

- Continue routine maintenance on rivers to reduce the incidence of flooding within NRA Standards of Service requirements.
- Carry out capital improvements where shown to be sufficiently beneficial.
- To continue to provide an emergency response service in conjunction with local authorities.
- To continue to provide and improve flood warning.
- To gain a better understanding of flood mechanisms through Section 105 surveys and Circular 30/92.
- Promote effective development control to reduce flooding problems at source.

Implementation

Liaison between NRA and local authorities will continue. The NRA flood defence department are striving to become more effective and efficient in river maintenance and provision of capital works concerning rivers.

SECTION 6

NEXT STEPS

This section explains how the Consultation Report has been produced, what will happen to it next and how people can make comments upon it.

THE NEXT STEPS

This document has been produced through a process of internal discussion, informal liaison with a wide range of organisations (see Appendix C) and a desk study of readily available reports produced by organisations such as local authorities.

The next step is to consult formally with organisations, groups and individuals interested in the future of the catchment's water environment. Consultation will enable the NRA to:

- i) clarify the extent and distribution of current uses and natural resources of the catchment;
- ii) assess the relative importance of catchment uses and natural resources;
- iii) identify the wide range of likely, possible and potential future catchment uses and natural resources;
- iv) expose catchment-specific issues to a wide audience and establish whether there are any additional issues that need to be considered;
- v) ensure that decisions on the future management of the catchment are based on accurate information and the fullest range of views from interested parties.

In commenting on this plan it is hoped that both points of detail and strategic issues will be tackled. In particular the following questions should be answered:

- i) have the current and future uses and natural resources of the catchment been identified correctly?
- ii) have the issues been addressed fairly, what opinions do you have on them and do you agree with the actions we propose?
- iii) have any issues been overlooked?
- iv) how should evaluation of the issues and the development of strategies and action plans be progressed?

During the consultation period comments can be submitted in writing to:

Tania Woodward
Catchment Management Officer
National Rivers Authority
Thames Region - West Area
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD

Jamal A Hamid, Catchment Manager can also be contacted on (01734) 533304.
All comments must be with us by 14th June 1996.

The consultation phase incorporates a number of separate but linked activities.
These include:

- a) distribution of the full plan and/or a summary leaflet to key organisations, groups and individuals;
- b) a display for use in libraries and other public areas;
- c) public meetings as appropriate; and
- d) news, radio and television releases.

At the end of the consultation phase, the results of the process will be considered in detail before producing a definitive Action Plan. This Action Plan will define both a strategy for the future management of the catchment and a series of planned activities for the NRA and others to implement in order to deliver the strategy.

In collaboration with the organisations that are jointly responsible, the NRA will aim to pursue and implement the activities outlined in the Action Plan. It is the NRA's intention that the Plan should influence the policies and action of planning authorities and developers as well as assisting in the day-to-day management of the catchment. An annual review will be undertaken to monitor and report progress.

The information and views that you provide are a very important step in the overall process. It is hoped that you will respond constructively to this initiative so that a shared vision for the River Thames (Benson to Hurley) Pang and Wye catchment can be developed.

APPENDICES

APPENDIX A:

NRA Aims and Strategies and Other Organisation's Responsibilities

APPENDIX A: NRA AIMS AND STRATEGIES AND OTHER ORGANISATIONS RESPONSIBILITIES

NATIONAL RIVERS AUTHORITY (NRA)

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 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 dischargers pay the costs of the consequences of their discharges and, as far as possible, recover the costs of improvements to the water environment from those who benefit.
- To improve public understanding of the water environment and the NRA's work.

Water Resources

- A.1 It is the NRA's responsibility to assess, plan and conserve water resources. The Water Resources Act 1991 describes the duty of the NRA to ensure that measures are taken towards the 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 to secure the 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.

- A.2 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.
- A.3 To secure proper management of water resources the NRA operates a hydrometric network of rainfall and river flow gauging stations. These provide not only data for water resource assessment but also for flood prediction, impact of effluent discharges, fisheries management, conservation and recreational uses.
- A.4 The NRA's strategic objectives regarding water resources are:
- to plan for the sustainable development of water resources, developing criteria to assess the reasonable needs of abstractors and of the environment;
 - to collect, validate, store and provide hydrometric data and water environment data in order to assess water resources;
 - to apply a nationally consistent approach to abstraction licensing, including licence determination, charging, policy 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

- A.5 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.
- A.6 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.

- A.7 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 monitored routinely and failure to satisfy consent conditions may lead to legal action being taken.
- A.8 The NRA makes an immediate response to all reports of pollution. During a pollution incident investigative actions are taken to identify the source, stop the discharge, minimise its adverse effects and ensure that remedial work, where appropriate, is completed. Legal action is considered in cases of serious and/or repeated incidents.
- A.9 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.
- A.10 The NRA's strategic objectives regarding water quality are:
- to maintain waters that are already of high quality;
 - to improve waters of poorer quality;
 - to ensure that all waters are of an appropriate quality for their agreed uses;
 - to prosecute polluters and recover the costs of restoration from them;
 - to devise charging regimes that allocate the costs of maintaining and improving water quality fairly and provide an incentive to reduce pollution.

Conservation

- A.11 The purpose of the conservation activities of the NRA is to:
- conserve and enhance the wildlife, landscapes and archaeological features associated with inland and coastal waters; and,
 - promote the conservation of aquatic flora and fauna.
- A.12 The NRA's statutory duties under the 1991 Water Resources Act are to 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 proposed developments would have. This is achieved by 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.

A.13 The NRA's strategic objectives in relation to conservation are:

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

Recreation

A.14 The NRA has statutory duties to:

- ensure that water and land under the NRA's control (ie. as landowner, etc.) are made available for recreational purposes, and that the needs in this context of persons who are chronically sick or disabled are taken into account;
- promote the use of all inland and coastal waters and associated land for recreational purposes.

A.15 Recreation includes the provision of 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.

A.16 These duties are identified in the Water Resources Act 1991 and in a code of practice which gives guidance on the kinds of provision required and the need to consider collaborative management with other bodies.

A.17 In addition to these recreation and amenity considerations the NRA, where it is the authority, has responsibilities relating to the maintenance and improvement of waterways for navigation.

A.18 The NRA's strategic objectives regarding recreation are:

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

Fisheries

- A.19 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.
- A.20 An essential feature of the 1991 Act is the statutory duty placed on the NRA to 'maintain, improve and develop fisheries'. The term 'fisheries' encompasses both the recreational fishery and the fishery as an environmental resource. However the Act extends further to cover effectively all inland waters which have the capacity to support fish, other than fish farms; the latter are regulated by the Ministry of Agriculture, Fisheries and Food. Recreational fisheries include waters such as rivers, streams, canals, lakes, ponds and reservoirs.
- A.21 In order 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 also important activities.
- A.22 The costs of the fisheries service are met, in part, by funds raised from rod licence sales.
- A.23 The strategic objectives of the NRA Fisheries function are:
- to protect and conserve salmon, trout, freshwater fish, eels and, where appropriate, coastal fisheries;
 - to regulate fisheries through the enforcement of a consistent series of licences, orders, byelaws and consents;
 - to monitor the fisheries status of rivers and inland estuaries and, where appropriate, coastal waters;
 - to formulate policies to maintain, improve and develop fisheries, and to restore and rehabilitate damaged fisheries;
 - to provide an efficient and effective fisheries service which is responsive to the needs of its customers and is based on a sound charging system.

Flood Defence

A.24 The NRA has powers to:

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

A.25 Certain watercourses are designated as 'main river'. On main rivers the NRA has 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 is the primary body involved in flood defence matters but on "ordinary watercourses" district or borough councils are the first point of contact. For flooding from sewers responsibility rests with either the district or borough council or TWUL.

A.26 The standard of flood protection can be measured in terms of the frequency (eg. 1 in 50 years), on average, up to which it will prove effective. The standards considered appropriate vary according to the land use to be protected and the economics of providing the service.

A.27 These activities are undertaken under the Water Resources Act 1991 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.

A.28 The NRA's strategic objectives in relation to flood defence are:

- to develop and implement the 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 the development of information technology and the 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 on flood plains and contribute to the development of catchment management plans. To identify opportunities for the enhancement of environmental,

conservation, recreational and amenity facilities when undertaking flood defence works.

Navigation

A.29 The NRA's future strategy for navigation is to take a lead in working with other navigation authorities to bring about a more consistent approach to the administration of navigation in inland waters than currently exists in England and Wales, 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.

A.30 The NRA's strategic objectives in relation to navigation are:

- to contribute to the development of an overall navigation strategy for England and Wales;
- to regulate NRA navigation through the enforcement of a consistent series of licences, orders, byelaws and statutes;
- to maintain and improve NRA navigation fairway, facilities and standards;
- to recover from users the costs of providing specific navigation facilities and a reasonable proportion of the costs of maintaining the navigation.

A.31 NAVIGATION LEVELS OF SERVICE

- (a) Maintenance of the fairway between locks to permit the navigation of vessels of varying dimensions from Teddington to Cricklade.
- (b) Maintenance of the existing locks for navigation throughout the year except during periods of necessary maintenance.
- (c) Control of water levels for navigation, except in extreme river conditions, within prescribed ranges.
- (d) Provision of facilities for water supply, sewage disposal and dry refuse disposal at prescribed sites.
- (e) Provision of staff to assist river users pass vessels through locks during advertised hours and at other times when extraordinary traffic conditions are predicted.
- (f) Inspection of all launches let or plying for hire once every year together with the inspection of a percentage of newly registered launches.
- (g) Supervision of all major river events which impinge on normal navigation.

- (h) Maintenance, and where possible augmentations of the provision of free 24 hour visitor mooring sites.

Land Use Planning

- A.32 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. Promotion of source control techniques by local authorities would assist in this process.
- A.33 A close working relationship is required with county, district and borough councils on mineral workings, waste disposal issues, infrastructure works, works within river corridors or floodplains, and any activities likely to pollute surface waters or groundwaters or increase the demand for water resources or adversely affect the conservation and amenity value of the water environment.
- A.34 Guidance notes for local planning authorities on the methods of protecting the water environment through development plans have been produced (September 1993), and these are being promoted in conjunction with the initiative to prepare CMPs.

Summary

- A.35 Further information on the work of the NRA can be found in a series of NRA strategy documents covering 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 the NRA's head office in Bristol.

The Environment Agency

- A.36 The Agency will take over from the NRA, HMIP and the WRAs, as well as some parts of other statutory bodies, on 1st April 1996.

The main aims of the Environment Agency are:

- (i) to provide effective environmental protection, management and enhancement, particularly in ways which take account of impacts on all aspects of the environment;
- (ii) to impose the minimum burden on industry and others consistent with the above, e.g. by developing single points of contact through which industry and others can deal with the Agency;
- (iii) to operate to high professional standards, based on the best possible information and analysis of the environment and of processes which affect it;
- (iv) to organise its activities in ways which reflect good environmental practice and provide value for money for those who pay its charges and for taxpayers as a whole;
- (v) to provide clear and readily available advice and information on its work;
- (vi) to develop a close and responsive relationship with the public, local communities and regulated organisations.

Other Organisations

Water and Sewerage Undertakers

- A.37 These private companies are responsible for providing water supplies for domestic and industrial use and the management of sewage treatment works. Thames Water Utilities Limited is the main water utility company in the catchment.

Her Majesty's Inspectorate of Pollution (HMIP)

- A.38 Within the Thames Region, HMIP is responsible for regulating about two hundred of the most complex and potentially polluting types of process under the regime of Integrated Pollution Control. This is a preventative philosophy which requires operators to use the Best Available Techniques Not Entailing Excessive Costs to prevent, or minimise and render harmless, the release of harmful substances to the environment. In addition the Best Practicable Environmental Option should be used where the releases from the process are to more than one of the environmental media, namely air, water and land, to minimise the overall effect on the environment. Thus HMIP controls the releases to the water environment from a

number of particular, designated industrial processes whilst discharges from sewage treatment works and other discharges to water are regulated by the NRA.

Drinking Water Inspectorate (DWI)

- A.39 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 (75/440/EEC).

Office of Water Services (OFWAT)

- A.40 This is 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.

District and Borough Councils

- A.41 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.
- A.42 Watercourses which have not been statutorily designated as "main river" on maps held by the NRA and the 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 within the control of the relevant district or borough council.

Waste Regulation Authorities (WRAs)

- A.43 These authorities are responsible for regulating the waste disposal industry through the Environmental Protection Act 1990 and other legislation. Their remit includes controlling the storage, transport, reclamation or final disposal of all controlled waste in order to prevent pollution of the environment.

British Waterways (BW)

- A.44 Created by the Transport Act 1962, BW is the largest navigation authority in the country. Navigation on the Oxford Canal falls under the jurisdiction of BW.

APPENDIX B:

Consultation List

APPENDIX B: CONSULTATION LIST

Authorities, environmental organisations and groups consulted include:-

Agricultural Development and Advisory	Kintbury Wildlife Group
Association of Chambers of Commerce	KOMPASS
Berkshire County Council	London Waste Regulation Authority
British Aggregates & Construction Materials Industry	Ministry of Agriculture, Fisheries & Food
British Canoe Union	Ministry of Defence
British Coal	National Farmers Union
British Gas	National Federation of Anglers
British Horse Society	National Trust
British Rail Property Board	Newbury District Council
British Telecom PLC	Oxford Brookes University
British Trout Association	Oxfordshire County Council
British Trust for Conservation Volunteers	Oxford University
British Waterways	Pang Valley Countryside Project
Buckinghamshire County Council	Railtrack
Buckinghamshire College of Higher Education	Ramblers Association
Business Environmental Forums/Groups	Reading Borough Council
Chiltern District Council	Reading & District Anglers Association
Clean Rivers Trust	Reading Geological Society
Cleaner Kennet Campaign	Reading Urban Wildlife Group
Confederation of British Industry	Reading Waterways Forum
Cotswolds Fly Fishery	River Thames Society
Council for Protection of Rural England	Royal Society for Nature Conservation
Country Landowners Association	Royal Society for the Protection of Birds
Countryside Commission	Rural Action Team
Crown Estate Commissioners	Sand & Gravel Association
Cyclists Touring Club	SERPLAN
Department of the Environment	South Buckinghamshire District Council
Electricity Companies	South Oxfordshire District Council
English Heritage	Sports Council
English Nature	Thames Salmon Trust
English Tourist Board	Thames Valley Mammal Group
ETSU	Thames Water Utilities Ltd
Farming & Wildlife Advisory Group	The Salmon & Trout Association
Forestry Enterprise	Upper Thames Fisheries Consultative Committee
Friends of the Earth	University of Buckingham
Friends of the Lower Kennet	University of Reading
Groundwork Trust	Vale of White Horse District Council
Her Majesty's Inspectorate of Pollution	Water Services Association
House Builders Federation	Wildlife Trust (BBONT)
Hungerford Fishery	Wiltshire & Berkshire Canal Amenity Group
Hurley Preservation Society	Winterbourne Stream Action Group
Inland Waterways Association	Wokingham District Council

Wycombe District Council
Wycombe Urban Wildlife Group

Berkshire CC
Berkshire Association of Local Councils

Buckinghamshire CC
Amersham TC, Beaconsfield TC, Bradenham
PC, Chepping Wycombe PC, Coleshill PC,
Downley PC, Fawley PC, Great Marlow PC,
Hambleden PC, Hazelmere PC, Hughenden
PC, Ibstone PC, Lacey Green PC, Lane End
PC, Little Marlow PC, Little Missenden PC,
Marlow TC, Medmenham PC, Penn PC,
Radnage PC, Stokenchurch PC, West
Wycombe PC, Wooburn PC.

Oxfordshire CC
Aston Rowant PC, Aston Tirrold PC, Aston
Uphorpe PC, Bix & Assendon PC, Blewbury
PC, Brightwell-cum-Scotwell PC,
Checklendon PC, Chilton PC, Chinnor PC,
Cholsey PC, Crowmarsh PC, Didcot TC, East
Hagbourne PC, East Hendred PC, Ewelme
PC, Eye & Dunsden PC, Goring Heath PC,
Goring PC, Harpsden PC, Harwell PC,
Henley-on-Thames TC, Highmoor PC, Ipsden
PC, Kidmore End PC, Mapledurham PC,
Moulsford PC, Nettlebed PC, North Moreton
PC, Nuffield PC, Pishill with Stonor PC,
Rotherfield Peppard PC, Shiplake PC,
Sonning Common PC, South Moreton PC,
South Stoke PC, Stoke Row PC, Swyncombe
PC, Upton PC, Wallingford TC, Watlington
PC, West Hagbourne PC, Whitchurch-on-
Thames PC, Woodcote PC.

APPENDIX C:

Results of Informal Liaison and Consultation

APPENDIX C: RESULTS OF INFORMAL LIAISON AND CONSULTATION

- C.1 During October 1995 all county, district and parish councils in the catchment were contacted, together with over 100 other organisations who have an interest in their local water environment. Other organisations contacted included government departments and statutory bodies, conservation, amenity and other interest groups, industries and other businesses located in the catchment, landowners and angling organisations.
- C.2 The purpose of this period of informal liaison was to secure relevant information and appreciation of the issues related to the water environment from as wide a range of local people, interest groups and statutory bodies as possible. This informal liaison exercise was not intended to be a substitute for the planned period of formal consultation. It has enabled the NRA, however, to review a wide range of interests in the water environment before identifying the key issues to be addressed.
- C.3 By the 15th December a total of thirty nine responses had been received, either by letter or by telephone. The following responses were noted:

Consultee Type	Number of Consultees	Number of Responses	Response Rate (%)
Central government departments	13	4	31
County and district councils	16	8	50
Parish councils	65	9	14
Public bodies and utilities	24	5	20
Industry, commerce, agriculture, environmental and other interest groups	48	5	10
Local groups / clubs	22	2	9
Total	188	33	18

- C.4 In addition, four parish councils and two local groups responded, having received consultation papers from another consultee.
- C.5 The rest of this appendix provides a summary of the key issues (current and future), comments and concerns raised during this informal consultation exercise. Not all correspondence received is mentioned individually. However, all comments received have been considered fully in the preparation of this Consultation Report:

C.6 ECOLOGY

- Crowmarsh Parish Council registered concern about the future of the proposed Crowmarsh Parish Council Nature Reserve.
- Pang Valley Countryside Project identified the following key issues:
 - conservation of areas of nature conservation value;
 - involvement of the local community in deciding what work should be done (farmers and parishes);
 - creation of buffer zones for the river;
 - management of derelict woodland;
 - need for continued education of students of all ages to raise awareness of water issues within a valley such as Pang Valley.
- English Nature identified the following key issues:
 - retention, restoration and extension of waterside habitats, eg. water meadows;
 - sympathetic river/watercourse management for wildlife;
 - maintenance/improvement of water quality to benefit aquatic/riparian wildlife;
 - control and limitation of water abstraction that may impact upon wetland sites;
 - control and limitation of the potential effects of development pressure on river and waterside habitats.

C.7 FISHERIES

- Pang Flyfishers have expressed concern at the appearance of coarse fish in the river above the M4 bridge, particularly the appearance of perch and rudd. It is understood that these originated from a small pit adjacent to the river near Tutt's Clump, which was stocked with such species. They suggest that:
 - such stocking should not be permitted in waters within the catchment of a purely game fish habitat

- there should be no further mineral extraction in the area which leads to the creation of suitable habitats for coarse fish.
- The Thames Salmon Trust feels that the condition of the River Pang for salmon spawning in the distant future is an issue which should be addressed.

C.8 LANDSCAPE AND ARCHAEOLOGY

Respondents suggested a number of key issues:

- Appropriate buildings can enhance run down stretches of the River Thames. (The River Thames Society)
- Existing water meadows and conservation areas should continue to be treated with sensitivity. (The River Thames Society)
- Whatever approach is taken to the water environment, it should not be to the detriment of the landscape quality of the area. This is particularly important in this catchment as the greater part of the catchment area is in either the North Wessex Downs or the Chilterns AONB. An example given is that beech woods should be protected (and if possible enhanced) as they are a predominant feature of the Chiltern Hills in Oxfordshire. (Planning, Oxfordshire County Council)
- In addition, English Heritage's concerns relate to sites and features associated with the water environment, including:
 - archaeological sites adjacent to rivers and other watercourses;
 - sites where waterlogging results in a higher degree of archaeological preservation;
 - historic buildings and other structures associated with the past use of the water environment (such as mills, canals, etc.);
 - features associated with past management and use of the water environment (such as leats, fishponds, etc.);
- Pang Valley Countryside Project identified the following key issues:
 - conservation of areas of nature conservation value;
 - conservation and ongoing management of key landscape features such as pollarded willows;
 - involvement of the local community in deciding what work should be

done (farmers and parishes);

- creation of buffer zones for the river;
- management of derelict woodland;
- need for continued education of students of all ages to raise awareness of water issues within a valley such as Pang Valley.

C.9 RECREATION

Respondents have indicated that the CMP should address the following points:

- All existing footpaths and tow-paths should be maintained to a good standard and protected. (The River Thames Society)
- There is concern at the increasing clash of interests, especially on towpaths, between anglers with extra-long protruding rods, cyclists, walkers and joggers. Guidelines need to be laid down. (The River Thames Society)
- Provision should be made for more slipways along the River Thames for small craft such as canoeists. (The River Thames Society)
- Two rights of way of special importance are the Ridgeway, and the River Thames long distance paths. The Thames path provides an almost continuous link along the riverside in Oxfordshire. The county council is keen to protect and enhance the existing rights of way network and to promote access to the countryside generally. (Oxfordshire County Council)
- The river at Wallingford is used mainly for leisure activities such as boating, angling and walking. These uses should continue and increase over the next 10 years. (Town Council of Wallingford)
- The CMP should include associated land based recreation in the form of footpaths, towpaths and cycle paths. (Berkshire County Council)
- There is insufficient water space available to canoeists in Britain, especially on upland rivers and the smaller lowland rivers. The CMP provides an opportunity to make progress towards a situation where canoeists achieve a reasonable and equitable share of the limited waterway resources. Policies should therefore be included, whereby the NRA will:
 - actively encourage the making of agreements to enable canoeing to take place on physically canoeable waterways, and
 - act to bring together parties to potential agreements and if required, act as an honest broker. (British Canoe Union)

- When planning waterside facilities it is important to provide launching sites. As most canoeists arrive by car and minibus parking facilities with trailer provision need to be made so that these vehicles can park without causing an obstruction. (British Canoe Union)
- At locks and weirs or at any uncanoeable stretch of the river, there needs to be a portage route starting and finishing at suitable landing and launching points. (British Canoe Union)
- The British Canoe Union are keen to make suggestions on the design of facilities and particularly on the design of weirs, as these can provide an opportunity to create a white water canoeing facility through design modifications.
- English Nature would like to see a protective policy for side channels as they are often used for additional mooring, especially during busier seasons, to the detriment of the natural habitat. It is in the side channels that bankside vegetation has the opportunity to grow without the competition of continual moorings.
- Use of gravel pits for water sports can put considerable pressure on the conservation interest of a site, particularly if unauthorised. Careful decisions must be made to determine which sites are to be promoted for quiet recreation and which for more active sports. (English Nature)

C.10 WATER RESOURCES (Including Abstraction)

- Berkshire County Council comments that the issue of low flows in the River Pang has been satisfactorily addressed by the NRA, and is therefore no longer an issue.
- For the future the village of Blewbury, via the Blewbury Village Society Environment Group and its links with the parish council, seeks to:
 - (a) work closely with the NRA in monitoring the groundwater catchment of Blewbury springs and to seek agreed criteria for early warning to avoid drawdown leading to dewatering of the watercourse by over-abstraction; and,
 - (b) work together with the NRA and others to restore the Cleve and enhance the springs and streams which are the paramount feature of the village of Blewbury.
- The Oxfordshire structure plan consultation draft contains four options for future development on which the county council is currently seeking views. Depending on the strategy finally adopted in the structure plan, Didcot may need to accommodate up to 3,000 new dwellings in the period 2001 to 2011. If a dispersal to smaller towns strategy was adopted towns like Henley and

Wallingford might also have to accommodate approximately 1,000 dwellings each. The implications of these approaches on water resources in the catchment area need to be assessed.

- It is vital for the health of the river to maintain the reduction in abstraction from the Compton groundwater source. Wherever possible there should be further reductions in the future. (Pang Flyfishers)
- The catchment has significant groundwater importance to Thames Water who would like emphasis placed on the importance of groundwater protection. They are particularly concerned with contamination at the following sites:
 - Gatehampton, Compton, Sheeplands and Medmenham - nitrate.
 - Bourne End and Playhatch - pesticides.
 - Mill End - solvents.
 - Blewbury - carbon tetrachloride.
- Abstraction from spring sites causes deterioration in or destruction of the flush vegetation associated with the spring as well as reducing the extent and duration of water flow in the very characteristic seasonal bourns of this zone. It is therefore vital that abstraction is controlled and monitored to prevent its associated detrimental effects on the flora and fauna, which in turn, affect the appearance of local landscape. (English Nature)

C.11 WATER QUALITY (Including Effluent Disposal)

Pang Valley Countryside Project feels that the maintenance of high water quality is a key issue. Other consultees have made comments which are more area or site specific:

- Pang Flyfishers have suffered from major problems with water discolouration in 1995, resulting in a number of calls to the NRA pollution control office. This is understood to be due to encroachment of cattle in upstream reaches where large silt beds were disturbed. Fencing of such areas would do much to solve this problem.
- Blewbury Parish Council have commented that during recent years there have been problems with sewage overflowing in the Ladygrove Mobile Home Park and nearby ditches during times of flooding. There have also been backflow problems in some houses after heavy rain or sudden thunderstorms. The Didcot sewerage project was due to start this year but has now been put back to 1998. The planned improvement work on the sewerage system in Blewbury is dependent upon this project and there is therefore concern at this delay in construction.

- Pang Flyfishers are concerned at the level of pollution in the River Pang. They understand that much of this emanates from the 'Blue Pool' at Kimberhead and is due to pollution of groundwater by leakage from domestic cess-pit units.
- South Moreton Parish Council suggest that something should be done about the amount of slurry spread onto fields near Mill Brook.
- Chilton Parish Council identify an unlined builders waste landfill site in direct seasonal contact with the water table which has a proven record of solvent contamination.
- Berkshire County Council suggest that nitrate-rich runoff should be addressed by the CMP.

C.12 INDUSTRY AND AGRICULTURE

- The proposed industrial / business park development at AEA puts pressure on an important groundwater recharge catchment. (Chilton Parish Council).
- MAFF highlighted areas of land in the catchment which are subject to designations which have an impact on the management of the agricultural land. These include some of the Ministry of Agriculture, Fisheries and Food schemes which are part of the EC assisted environmental schemes they relate to:
 - Nitrate Vulnerable Zones (NVZs) - the action programme will become compulsory in these zones between 1995 and 1999.
 - Countryside Access Scheme.
 - Farm and Conservation Grant Scheme.
 - Farm Woodland Premium Scheme.
 - Habitat Scheme - 5 year set aside.
 - Organic Aid Scheme

C.13 BUILT DEVELOPMENT

- Chilton Parish Council identified a proposed increase in the urbanisation of the groundwater catchment in Chilton parish. The old prefab site will be redeveloped with 275 houses. The parish is in the catchment for public drinking water supplies at four borehole complexes - Blewbury, Upton, West Hagbourne and probably Compton.

- Within Berkshire a significant development in the catchment is the proposed third Thames bridge at Reading.
- Oxfordshire County structure plan was approved in 1992. The structure plan is now being reviewed and the 'Oxfordshire Structure Plan 2011 consultation draft' was the subject of consultation until the end of October 1995. The consultation draft contains four options for future development on which the county council is seeking views:
 - country towns - continuation of current strategy;
 - new settlement at Upper Heyford;
 - rail corridors;
 - dispersal to smaller towns

So far as this relates to the catchment area Didcot would have to accommodate significant new development between now and 2011 if any of the options was to be pursued. Option 3 could result in new development in a number of towns and villages along the Thames Valley downstream of Wallingford; Option 4 could mean more development at Wallingford and Henley. However, the county council does not have a preference for any option or mix of options at this stage - the preferred strategy will be developed for the deposit plan next year.

C.14 FLOOD DEFENCE

The majority of comments in this section relate to development in the floodplain. The following concerns were raised:

- Medmenham Parish Council has observed that NRA advice relating to development in the floodplain is often ignored by the planning authority. They believe that this is due to:
 - legislation which does not require the planning authority to heed the NRA advice;
 - the planning authority being located many miles from the river and staffed by councillors and others who live in urban areas far from the problems of flooding;
 - the reluctance of the NRA to advise firmly against floodplain development due, possibly, to shortage of staff time to examine and progress applications which are brought to their notice.
- Wallingford Town Council and The River Thames Society expressed support

for the protection of the floodplain from development.

- Marlow Town Council and the Committee of Riverside Parishes feel that the CMP should clarify NRA policy on the control of development in the floodplains of both the River Thames and of minor rivers. It is currently perceived that NRA policy to allow development in areas liable to flood on minor rivers is not dealt with in the same way as similar proposals on the major rivers. It is felt that development on minor rivers is not treated as seriously as that on major rivers.

Due to the reduction in water abstraction by Thames Water Utilities Ltd in the Upper Pang region in the Compton boreholes, in combination with the recent climatic changes, the groundwater table has risen to heights that have not been experienced for many years, with implications for flooding. Newbury Council, in carrying out the land drainage function for ordinary watercourses, have experienced difficulty in convincing land owners that they have a responsibility to maintain ordinary watercourses, regardless of whether they are carriers of water during every season. They suggest that a programme of education is needed to point out to owners their obligations under statute.

Policies for flood defence can either considerably enhance the quality of habitat in the catchment or significantly worsen it, depending on the degree of flooding allowed on meadow land. English Nature suggest that a future environmental objective to be included in CMPs could be to investigate the feasibility of alternative methods of flood control.

C.15 NAVIGATION

The Inland Waterways Association raised the following issues:

- funding for the maintenance of levels in the Thames is needed, in order that the Thames should remain suitable for navigation;
- some major locks need refurbishment.

C.16 MINERALS AND WASTE

Oxfordshire County Council suggest a number of issues which should be addressed by the CMP:

- although there do not appear to be any major landfills in the catchment area (within Oxfordshire), the importance of engineering landfills so that potentially contaminating leachates are contained and the quality of groundwater is safeguarded should be addressed in the CMP.

C.17 ENERGY

ETSU's main interest would be to ensure that opportunities for small scale hydro-electric generation are considered in catchment planning. While they are not aware at this stage of any definite plans for new hydropower development in the catchment, the low head resource available at the weirs along the Thames in particular may offer possibilities for future development. The CMP should ensure that development of low head hydropower is not unduly restricted within the catchment.

APPENDIX D:

Supporting Data and Standards

**APPENDIX D1: BMWP RESULTS AND ACHIEVEMENT OF RIVPACS
PREDICTIONS IN 1995**

SITE	LOCATION	BMWP	ACHIEVED
Thames PTHR.0103	At South Stoke	139	Y
Thames PTHR.0120	Above Goring Weir	157	Y
Thames PTHR.0115	At Whitchurch Weir	156	Y
Thames PTHR.0102	At Sonning Weir	159	Y
Thames PTHR.0088	At Henley Bridge	108	Y
Mill Brk PTHR.0137	Below STW, South Moreton	60	N
Bradford's Brk PTHR.0009	At A329 Wallingford	93	Y
Cholsey Prk PTHR.0015	500m Above Cholsey STW	162	Y
Cholsey Brk PTHR.0016	500m Above Cholsey STW	37	N
Pang PPSR.0016	Folly Bridge, Bradfield	142	Y
Pang PPSR.0003	At Gauging Stn, Pangbourne	133	Y
Bourne (Berks) PPSR.0020	Englefield House	126	Y
Webbs Lane Str. PPSR.0009	Below Beenham Tip	44	N
Sul PPSR.0006	At Bridge 322, Sulham	71	Y
Sul PPSR.0007	At Saltney Mead, Pangbourne	57	N
Fawley Ct Str PTHR.0204	At Garden Centre Br, Henley	42	N
Wye PWYR.0012	At Bassetbury Lane, High Wycombe	62	N
Wye PWYR.0011	Above Wycombe Marsh Mill	45	N
Wye PWYR.0015	At Gauging Station, Hedsor	88	Y
Hughendon Str. PWYR.0015	At Hughendon Park Car Park, High Wycombe	76	N

Achieved = If the observed BMWP exceeds the lower confidence limit of the RIVPACS predicted BMWP score for the site.

APPENDIX D2: WATER QUALITY CHEMICAL STANDARDS

RIVER ECOSYSTEM CLASSIFICATION

Class	Dissolved oxygen % saturation 10%ile	BOD mg l ⁻¹ 90%ile	Total ammonia mg N l ⁻¹ 90%ile	Un-ionised ammonia mg N l ⁻¹ 95%ile	pH lower limit as 5%ile upper limit as 95%ile	Hardness mg/l CaCO ₃	Dissolved copper µg/l 95 %ile	Total zinc µg/l 95 %ile	General description
RE1	> 80	< 2.5	< 0.25	< 0.021	6.0-9.0	≤ 10 > 10 and ≤ 50 > 10 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Very good quality (suitable for all fish species)
RE2	> 70	< 4.0	< 0.6	< 0.021	6.0-9.0	≤ 10 > 10 and ≤ 50 > 10 and ≤ 100 > 100	5 22 40 112	30 200 300 500	Good quality (suitable for all fish species)
RE3	> 60	< 6.0	< 1.3	< 0.021	6.0-9.0	≤ 10 > 10 and ≤ 50 > 10 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000	Fair quality (suitable for high class coarse fish populations)
RE4	> 50	< 8.0	< 2.5	-	6.0-9.0	≤ 10 > 10 and ≤ 50 > 10 and ≤ 100 > 100	5 22 40 112	300 700 1000 2000	Fair quality (suitable for coarse fish populations)
RE5	> 20	< 15.0	< 9.0	-	-	-	-	-	Poor quality (likely to limit coarse fish populations)

APPENDIX D3: GQA CLASSIFICATION

Water quality	Grade	Dissolved oxygen	Biochemical oxygen demand (ATU)	Ammonia
		(% saturation) 10 percentile	(mg/l) 90 percentile	(mgN/l) 90 percentile
GOOD	A	80	2.5	0.25
GOOD	B	70	4	0.6
FAIR	C	60	6	1.3
FAIR	D	50	8	2.5
POOR	E	20	15	9.0
POOR	F	-	-	-

APPENDIX D4: POLLUTION INCIDENT CLASS DEFINITIONS

MAJOR CATEGORY 1

A major pollution incident involving one or more of the following:

- potential or actual persistent effect on water quality or aquatic life for more than one week;
- closure of potable water, industrial or agricultural abstraction necessary;
- extensive fish kill (more than 100 of 'notable' species);
- excessive or repeated breaches of consent conditions plus environmental impact;
- extensive remedial measures necessary;
- effect on amenity value;
- effect on conservation value.

SIGNIFICANT CATEGORY 2

A significant pollution incident which involves one or more of the following:

- notification to abstractors necessary;
- fish kill (10-100 of 'notable' species, or less if species of particular importance (eg. migratory salmonids);
- measurable effect on invertebrate life;
- water unfit for stock;
- bed of watercourse heavily contaminated;
- amenity value to the public, owners or users reduced by odour or appearance;

OR breach of consent conditions.

MINOR CATEGORY 3

Incidents which on investigation prove unlikely to have a notable effect

UNSUBSTANTIATED CATEGORY 4

Unsubstantiated ie. no evidence of a pollution incident.

APPENDIX D5: HMIP INCIDENT DEFINITIONS

EMERGENCY

- a hazardous condition at a site involving the release of harmful (including radioactive) substances off site which causes or is likely to cause a hazard to the public; or
- a release of harmful (including radioactive) or offensive substances to the environment which causes a major response from the emergency services or causes or is likely to cause widespread public alarm; or
- the discovery of harmful (including radioactive) substances in the public domain which could cause a hazard to the public.

INCIDENT

- an event of lesser significance than an emergency but which may attract public or media interest and requires action or investigation by HMIP.

APPENDIX D6: Prosecutions and Fines over the past Five Years

Type of Business	Water Course	Location	Date of Offence	Date of Conviction	Sentence	Pollutant
Engineering	River Wye	High Wycombe	27.12.90	11.6.91	£700	Gas Oil
Contracting	Spade Oak Brook	Bourne End	4.1.91	26.11.91	Absolute Discharge	Silt
Paper	River Wye	Wycombe Marsh	25.6.92	22.12.92	£2500	Latex Solution
Sewerage	Fawley Ditch	Henley	6.5.93	7.10.93	£2000	Sewage Sludge
Brewery	Bradford's Brook	Wallingford	23.6.93	9.3.94	£500	Steep Water
Sewage	River Thames	Hambleton	11.5.94	12.12.94	£2500	Sewage Effluent
Metal Plating	River Wye	High Wycombe	2.12.94	21.11.95	£7500	Cyanide
Construction	River Wye	High Wycombe	18.1.95	20.8.95	£750	Oil and Silt
Manufacturing	Hughenden Stream	High Wycombe	27.1.95	20.8.95	£1000	Thermal Oil

There have been no prosecutions under EPA90 relating to the three processes authorised by HMIP within the catchment

APPENDIX D7: POLICY STATEMENTS ON LICENSING ABSTRACTION

Introduction

D7.1 The abstraction of water is controlled under the Water Resources Act 1991. This summary presents the key policy statements contained in the General Statement of 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)

D7.2 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 monitored continuously 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

D7.3 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 five or ten year intervals and some may be subject to control in relation to a prescribed groundwater level.

Consumptive Abstractions from Unconfined Aquifers

D7.4 Policy G4: Within 250 m of a perennial, groundwater-fed stretch of river or within its main floodplain, whichever is the greater distance, consumptive groundwater abstractions will be treated as abstractions from a river (see G2 above).

D7.5 Policy G5: Beyond the limits prescribed in Policy G4 consumptive groundwater abstractions may be allowed, provided that the level of resource utilisation permits, but they will generally be subject to control in relation to prescribed river flow or, less commonly, prescribed groundwater level.

D7.6 In some cases, some reservoir storage will be required to make such abstractions fully reliable.

Non-Consumptive Abstractions

D7.7 Policy G6: Where a very high proportion (95% or more) of the water taken is returned to the source of supply upstream, 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

D7.8 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 5,000 m³ (1.1 million gallons) per year and 20 m³ (4,400) gallons per day.

Abstractions for Spray Irrigation

D7.9 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.

D7.10 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 for the applicant.

D7.11 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

D7.12 Policy G11: Abstractions from the tideway of the River Thames will normally be permitted, provided that there is no conflict with water quality or fisheries requirements.

D7.13 Appeal: All of 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.

**APPENDIX D8: LAND USE BANDS FOR THE RIVER THAMES
(BENSON to HURLEY) PANG & WYE CATCHMENT**

River Code	Reach No.	Reach Length	Downstream Name	Upstream Name	Land Use Band
0001/29	16	4.350	Marlow Weir	Hurley Weir	A
0001/31	17	5.350	Hurley Weir	Hambledon Weir	A
0001/32	18	3.750	Hambledon Weir	henley Bridge	C
0001/33	19	5.800	Henley Bridge	Shiplake Weir 'A'	B
0001/34	20	5.900	Shiplake Weir 'A'	Cooling Water Channels	B
0001/35	21	6.925	Cooling Water Channels	Popular Island Head	A
0001/36	22	6.200	Popular Island Head	Whitchurch Weir	A
0001/38	23	6.200	Whitchurch Weir	Goring Weir 'A'	C
0001/39	24	6.200	Goring Weir 'A'	Molesey Brook	C
0001/40	25	4.640	Cholsey Brook	Benson Weir	C
0112/00	1	6.200	River Thames	M.R.L	C
0113/00	1	6.800	River Thames	Road Bradfield	D
0113/00	3	4.750	Shallow Ford	M.R.L	D
0113/00	2	6.700	Road Bradfield	Shallow Ford	D
0089/00	1	4.600	River Thames	Glory Mill Road	B
0089/00	2	3.950	Glory Mill Road	M.R.L	C

APPENDIX D9: SITES OF SPECIAL SCIENTIFIC INTEREST IN THE CATCHMENT

SITES OF SPECIAL SCIENTIFIC INTEREST			
SITE	AREA (HA)	MAIN RIVER	HABITAT
Ashridge Wood	15.6	River Pang	Woodland
Aston Rowant	128.5	River Thames (Cholsey Brook)	Calcareous grassland
Aston Rowant Cuttings	4.0	River Thames (Cholsey Brook)	Other habitat
Aston Rowant Woods	209.7	River Thames (Cholsey Brook)	Calcareous grassland, scrub & woods
Aston Upthorpe Downs	38.7	River Pang	Calcareous grassland, scrub & woods
Bear, Oveys & Great Bottom Wood	58.6	River Thames	Woodland
Berins Hill Bank	1.8	River Thames	Calcareous grassland & scrub
Berrick Trench	1.9	River Thames	Woodland
Bix Bottom	103.0	River Thames	Calcareous grassland, scrub & woods
Bolter End Sand Pit	0.3	River Thames	Quarry
Bradenham Woods, Park Woods & the Coppice	129.1	River Wye	Calcareous grassland, scrub & woods
Briff Lane Meadows	8.7	River Pang	Marsh, grasslands, scrub & woods
Buttlers Hangings	3.9	River Wye	Calcareous grassland , scrub & woods
Coombe Wood, Frlsham	19.0	River Pang	Woodland
Fayland Chalk Bank	1.4	River Thames (Hamble Brook)	Calcareous grassland & scrub
Fern House Gravel Pit	1.3	River Wye (Hughenden Stream)	Quarry
Frieth Meadows	0.0	River Thames	Hedge, marsh & grassland
Gomm Valley	4.1	River Wye	Calcareous grassland, scrub & woods
Harpsden Wood	25.8	River Thames	Woodland
Hartslock	42.2	River Thames	Grassland, fen & woods
Highlands Farm Pit	0.6	River Thames	Other habitat

SITE	AREA (HA)	MAIN RIVER	HABITAT
Holies Down	5.8	River Thames	Calcareous grassland
Hollowhill & Pullingshill Woods	23.0	River Thames	Woodland
Homefield Wood	6.1	River Thames	Calcareous grassland & woodland
King's Copse	13.8	River Pang	Woodland
Lambridge Wood	73.8	River Thames	Standing water & woods
Lardon Chase	14.8	River Thames	Calcareous grassland & scrub
Millfield Wood	9.5	River Wye	Calcareous grassland & woods
Moorend Common	28.0	River Wye	Dry heath, marsh, grassland & woods
Moulsford Downs	11.3	River Thames	Calcareous grassland, scrub & woods
Naphill Common	71.1	River Wye	Dry dwarf shrub heath, standing water & woodland
Pishill Woods	61.7	River Thames	Woodland
Priests Hill	1.0	River Thames	Other habitat
Rodbed Wood	2.2	River Thames	Standing water & woodland
Shirburn Hill	64.5	River Thames (Cholsey Brook)	Calcareous grassland, scrub & woods
Streatley Warren	31.1	River Thames	Calcareous grassland & scrub
Sulham & Tidmarsh Woods	73.8	River Pang	Acid, marshy, neutral grassland, marsh & woods
Swain's Wood	16.2	River Wye	Calcareous grassland, scrub & woods
Temple Island Meadows	23.5	River Thames (Temple Island Side Channel)	Neutral grassland, standing water, swamp & woods
Turville Hill	21.9	River Thames	Calcareous grassland & scrub
Warren Bank	3.1	River Thames	Calcareous grassland & scrub
Widdenton Park Wood	23.9	River Wye	Flush & spring woodland
Wormsley Chalk Banks	14.1	River Thames	Calcareous grassland & scrub

APPENDIX E:

Glossary

GLOSSARY

<i>Abstraction</i>	Removal of water from surface or groundwater, usually by pumping.
<i>Abstraction Licence</i>	Licence issued by the NRA under S38 of the Water Resources Act 1991 to permit water to be abstracted. The maximum abstraction rates are specified in the licence.
<i>Aquifer</i>	A rock formation containing water in recoverable quantities.
<i>Baseflow</i>	That part of the flow in a watercourse made up of groundwater and discharges.
<i>Biochemical Oxygen Demand (BOD)</i>	A measure of the amount of oxygen consumed in water, usually as a result of its organic content.
<i>BS7750</i>	British Standard covering the production and implementation of environmental management systems
<i>Catchment</i>	Area bounded by the watershed from which water runs off to any given river valley.
<i>Confluence</i>	The point at which two rivers meet.
<i>Consent</i>	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.
<i>Countryside Stewardship Scheme</i>	Scheme set up by the Countryside Commission in which landowners are granted aid to manage their land in an environmentally sensitive manner.
<i>County Structure Plans</i>	Statutory documents produced by county councils outlining their strategy for development over a 10 to 15 year timescale.
<i>Catchment Management Plan</i>	Catchment Management Plan - an integrated plan for the catchment which covers all the functions of the NRA. CMPs provide the strategy by which catchments will be managed.
<i>Cyprinids</i>	Coarse fish of the carp family, ie. roach, dace, bream, etc.
<i>Dangerous Substances</i>	Substances defined by the European Commission as in need of special control because of their toxicity, bioaccumulation or persistence. The substances are classified as List I or List II according to the Dangerous Substances Directive (76/464/EEC).
<i>Dissolved Oxygen (DO)</i>	The amount of oxygen dissolved in water. Oxygen is vital for life so this measurement is an important, but highly variable, indicator of the 'health' of the water. It is used to classify waters.
<i>Diffuse pollution</i>	Pollution without a single point source, eg. acid rain, pesticides, urban run-off, etc.
<i>Directive</i>	Legislation issued by the European Community which is binding on the member states.
<i>District Local Plans</i>	Statutory documents produced by district or borough councils to implement the development strategy set out in county structure plans. Specific land use allocations are identified.
<i>Floodplain</i>	Land adjacent to a watercourse and covered by water in times of flood.
<i>Geomorphology</i>	The study and science of landforms and the processes that form them.

<i>Groundwater</i>	Water contained in the pores and fissures of aquifers (water bearing strata).
<i>Hydrometry</i>	Measurement of hydrological entities.
<i>Invertebrate fauna</i>	Animals which lack a vertebral column - used for biological classification; macro-invertebrates are animals of sufficient size to be retained in a net with a specified mesh size.
<i>Landfill</i>	Site used for solid waste disposal into/onto land.
<i>Macrophytes</i>	Emergent aquatic plants.
<i>MAFF</i>	Ministry of Agriculture, Fisheries and Food.
<i>Main River</i>	Some, but not all, watercourses are designated as "main river". "Main river" status for a watercourse must first be approved by MAFF. The NRA has the power to carry out works to improve drainage or protect land and property against flooding on watercourses designated as 'main river'.
<i>NRA-TR</i>	National Rivers Authority (Thames Region).
<i>Operational Investigation</i>	A regionally-funded research project (particular to the NRA).
<i>Potable water</i>	Water suitable for human consumption.
<i>Prescribed flow (flow constraint)</i>	A river flow incorporated as a condition in an abstraction licence, such that abstraction must cease once the flow in the river falls below this value.
<i>Riparian Owner</i>	A person/organisation with property rights on a river bank.
<i>River Corridor</i>	Land adjacent to a watercourse with visual, physical or ecological links to it.
<i>River Quality Objective (RQO)</i>	The level of water quality that a river should achieve in order to be suitable for agreed uses.
<i>Salmonids</i>	Fish classified as belonging to the Salmon family, ie. salmon, trout, char, etc.
<i>Septic Tank</i>	A small tank receiving and treating sewage by biological processes.
<i>Set-aside</i>	Land temporarily withdrawn from agricultural production, grant aided by MAFF.
<i>Silage</i>	A winter feed for cattle. Silage is produced in the summer by bacterial action on freshly cut grass.
<i>Site of Special Scientific Interest (SSSI)</i>	A site given a statutory designation by English Nature as a result of its nature conservation or geological value.
<i>Sludge</i>	Accumulated solids from the sewage treatment process. Sludge can be incinerated, spread on farm land, etc.
<i>Slurry</i>	Animal waste in liquid form.
<i>Source Control</i>	A collective term used to describe the management of run-off at or near the point of impact of rainfall and before it reaches the piped drainage and sewerage systems of urban

	areas (see <i>Swale</i>). They include balancing ponds, permeable pavements and underground water butts.
<i>Springs</i>	Natural emergence of groundwater at the surface.
<i>Swale</i>	An example of source control attenuation, swales are grass channels used to convey and treat run-off.
<i>Statutory Water Quality Objectives (SWQOs)</i>	Water quality objectives set by the Secretary of State in relation to controlled waters.
<i>Sustainable</i>	Capable of being maintained at a steady state without exhausting natural resources or causing ecological damage.
<i>Sustainable Development</i>	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
<i>Topography</i>	Physical features of a geographical area.
<i>Transpiration</i>	Loss of water through evaporation by plants.
<i>Turbidity</i>	Measure of the light scattering properties of the water caused by suspended matter.
<i>Watercourse</i>	A stream, river, canal or channel along which water flows.

APPENDIX F:

Acronyms

ACRONYMS

AMP	Asset Management Plan
AOD	Above Ordnance Datum
AONB	Area of Outstanding Natural Beauty
ASPT	Average Score Per Taxon
BBONT	Buckinghamshire, Berkshire and Oxfordshire Naturalist Trust
BC	Borough Council
BMWP	Biological Monitoring Working Party
BOD	Biochemical Oxygen Demand
BPEO	Best Practicable Environmental Option
BW	British Waterways
CC	County Council
CMP	Catchment Management Plan
CTR	County Trust Reserves
DC	District Council
DoE	Department of the Environment
DO	Dissolved Oxygen
DTp	Department of Transport
EA	Environmental Assessment.
EPA	Environmental Protection Act (1990)
ETSU	Energy Technology Support Unit
DWI	Drinking Water Inspectorate
EC	European Commission
<i>E.Coli</i>	<i>Escherichia coli</i>
ESA	Environmentally Sensitive Area
FWAG	Farming and Wildlife Advisory Group
GIS	Geographical Information System.
GQA	General Quality Assessment
HMIP	Her Majesty's Inspectorate of Pollution
LA	Local Authority
LUB	Land Use Band
LNR	Local Nature Reserve
MAFF	Ministry of Agriculture, Fisheries and Food
ML	Megalitre
MoD	Ministry of Defence
MRL	Main River Limit
NNR	National Nature Reserve
NRA	National Rivers Authority
NRA-TR	National Rivers Authority, Thames Region
NVZ	Nitrate Vulnerable Zone
NWC	National Water Council
OFWAT	Office of Water Services
OI	Operational Investigation
RE	River Ecosystem
RIVPACS	River Invertebrate Prediction and Classification Scheme
RQO	River Quality Objective

SLA	Special Landscape Area
SNCI	Site of Nature Conservation Importance
SoS	Standards of Service
SSSI	Site of Special Scientific Interest
STW	Sewage Treatment Works
SWO	Surface Water Outfall
SWQO	Statutory Water Quality Objective
TWUL	Thames Water Utilities Limited
UWWTD	Urban Waste Water Treatment Directive
WQO	Water Quality Objective
WRA	Waste Regulation Authority
WTW	Water Treatment Works

Units

Length: 10 mm = 1 cm (equivalent to 0.394 inches)
 100 cm = 1 m (equivalent to 39.37 inches)
 1,000 m = 1 km (equivalent to 0.621 miles)

Area: 10,000 m² = 1 ha (equivalent to 2.47 acres)

Flow: 1,000 l/s = 1 m³/s (equivalent to 35.31 cusecs)
 1,000 m³/d = 11.6 l/s (equivalent to 0.41 cusecs)
 1 Ml/d = 11.6 l/s (equivalent to 0.41 cusecs)

Volume: 1 Ml = 1,000 m³

CONTACTING THE NRA

The National Rivers Authority operates a 24-hour free emergency telephone line.

Telephone the emergency hotline to report all environmental incidents, such as pollution, poaching and flooding, or any signs of damage or danger to our rivers, lakes and coastal waters.

Your prompt action will help the NRA to protect water, wildlife, people and property.

NRA EMERGENCY HOTLINE

0800 80 70 60