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**National Rivers Authority
Thames Region**

Upper Thames Catchment Management Plan

Consultation Report

ENVIRONMENT AGENCY



123190

July 1994

**UPPER THAMES CATCHMENT MANAGEMENT PLAN
CONSULTATION REPORT**

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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 water resources, pollution control, flood defence, fisheries, recreation, conservation and navigation in England and Wales. Within the next five years the NRA will merge with Her Majestys Inspectorate of Pollution and the Waste Regulation Authorities to form the Environment Agency. This new agency will have wide ranging powers and responsibilities in terms of environmental management.
- 1.2 The NRA is funded through a variety of charges (e.g. water abstraction charges, flood defence levies, effluent discharge charges, rod and net fishing licence fees, navigation fees) and government grants from the Department of the Environment (DoE), Ministry of Agriculture, Fisheries and Food (MAFF), and Welsh Office (WO).
- 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 with 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 business like, efficient and caring towards its employees’.
- 1.4 The NRA is committed to preparing a sound and thorough plan for the future management of the region’s river catchments. This Consultation Report phase of the Catchment Management Plan (CMP) is a step towards achieving that goal for the Upper Thames catchment, which lies within the West Area of the NRA’s Thames Region (NRA TR).

CATCHMENT MANAGEMENT PLANNING

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

- 1.6 Although the NRA have a pivotal role to play in the management of the water environment the catchment management planning process recognises that a partnership approach between the NRA and others is essential. Consequently, this report has been produced as a means of progressing detailed consultation with all interested parties.
- 1.7 Each section of this document contains its own introduction but in summary the report comprises:
- a description of the relevant natural features of the catchment (Section 2);
 - a description of the actual and potential uses (e.g. ecology, water abstraction, navigation, flood defence) of the catchment and draft environmental objectives for the conservation and enhancement of these uses (Section 3);
 - a description of the current status of the catchment in relation to the key characteristics of water quality, water resources and physical features (Section 4); and
 - a presentation of catchment-specific issues (Section 5).
- 1.8 Within each section synoptic maps are used in conjunction with the text to illustrate relevant features.
- 1.9 To assist in the preparation of this plan a range of organisations and groups were contacted during April and May 1994. The results of this period of informal liaison are summarised in Appendix A.
- 1.10 The purpose of the consultation phase is to:
- consolidate and confirm 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.
- 1.11 This document is therefore part of a process that will enable a shared vision of the catchment to be developed which will guide all NRA activities for the next 5 to 10 years. This vision and its supporting strategies will be presented in the 'Final Report' of the CMP. The timetable for completing this report is currently May 1995. Regular monitoring and updating of the plan will be an integral part of the process ie. an annual progress report and a repeat of the process every 5 years.
- 1.12 The NRA welcomes comments on the document. Details of the consultation process and the overall programme are given in Section 6.

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;
- administration and planning.

2.2 The boundary of the Upper Thames catchment includes all land which drains to the Upper Thames extending to Buscot together with its tributaries the rivers Churn, Coln, Ray, Key, Cole, Swill Brook and Ampney Brook (see figure x).

2.3 The key statistics of the catchment are:

- Catchment Area (sq. km): 994 km²;
- Population (estimate): 230,000;
(Major towns: Swindon, Cirencester).
- Average Annual Rainfall (mm): 609.3;
- Main River Length xx (km) (maintained by NRA for flood defence purposes);
- Controlled Water Length xx (km) (monitored by NRA for water quality purposes).

OVERVIEW OF THE CATCHMENT

2.4 The area identified in this plan as the Upper Thames lies mainly within the counties of Gloucestershire and Wiltshire, with a small part of Oxfordshire in the south east corner. It covers the complete length of the River Thames upstream of Buscot Lock and includes all the tributaries joining in this section:

- River Leach;
- River Coln;
- Marston Mersey Brook;
- Ampney Brook;

- River Churn;
 - Swill Brook;
 - River Key;
 - River Ray;
 - Share Ditch;
 - Bydemill Brook;
 - River Cole.
- 2.5 The total length of the River Thames covered is 31.5km in this plan with an area of approximately 1000 km², which represents about 9% of Thames Region's total area.
- 2.6 The catchment can be divided along the River Thames with all the tributaries to the north rising from the Cotswold Hills and fed by spring outcrops, while those to the south being largely associated with clay catchments or the urban conurbation of Swindon.
- 2.7 The area is predominantly rural with the Cotswolds, an Area of Outstanding Natural Beauty (AONB), occupying the northern half. However, the settlement of Swindon (population 150 000) dominates the southern half. Other settlements include Cirencester, Wroughton, Cricklade and Highworth.
- 2.8 The area is skirted along its southern boundary by the M4 motorway and the A40 trunk road crosses in the north. The remains of the Thames and Severn Canal cross from Lechdale to the west, and further south are the scattered remnants of the Wiltshire and Berkshire Canal and the North Wiltshire Branch.
- 2.9 The Cotswold Water Park, currently split into an eastern and western section, also lies within the Plan area. It is the largest concentration of gravel pits and associated land in Great Britain, and covers some 5 700 hectares of which almost 1 000 hectares is open water in the form of approximately 100 man made lakes. It straddles the boundary between Gloucestershire and Wiltshire and includes parts of the Cotswolds and North Wiltshire.

TOPOGRAPHY

- 2.10 The Upper Thames catchment drains from the Marlborough Downs in the south and the Cotswold Hills to the north. The Marlborough Downs form an escarpment in the south east corner of the catchment and reach a height of 277m AOD at Liddington Castle.
- 2.11 The Cotswold Hills form the northern section of the catchment between the towns of Cheltenham, Cirencester and Northleach. The highest point in the catchment which exceeds 320m AOD, lies within the Cotswold Hills to the north east of Cheltenham.

Table 2.1 - Key Features of the Main Rivers

River	Area (km ²)	Topography/ Geology	Comments/Key Features
Churn	132.43	Cotswolds, steep sided valleys; Limestone	A spring fed river. Upper reaches are influenced by the Cirencester urban area. A number of mills and weirs have affected the channel.
Ray	83.91	Rolling hills; Clay	Catchment is strongly influenced by the Swindon urban area.
Ampney Brook	75.78	Lower Cotswolds; Limestone	A small, spring-fed brook.
Coln	177.21	Cotswolds, steep sided valleys; Limestone	A spring fed river. Very little urban development in the catchment.
Cole	140.82	Rolling hills; Clay	Fed by surface runoff, not groundwater.
Leach	78.09	Lower Cotswolds; Limestone	A spring fed river. Ephemeral (i.e. dries up) over its upper reaches.

(also need to insert Thames in table 2.1)

- 2.12 The main rivers in the catchment drain from the north and south to the Thames Valley in the centre, towards the confluence of the River Thames with the Leach, Cole and Coln at Lechlade. The River Thames rises from its source at Thames Head in the east and falls nearly 50 metres before leaving the catchment at Lechlade.

GEOLOGY AND HYDROGEOLOGY

- 2.13 In geological terms the catchment comprises a series of rock layers, or "strata". These strata slope downwards from north to south. In the Cotswolds the strata, beginning on the surface, are as follows; Great Oolite (limestone), Clay, Inferior Oolite (limestone), Cotswold Sands and the Lias. Immediately north of the River Thames these strata dip under clay and the clay becomes progressively thicker the greater the distance of the south of the River Thames.
- 2.14 The surface geology of the catchment can be divided into two distinct units; the Cotswolds to the North comprising of limestone and the clays to the South.
- 2.15 In terms of hydrogeology there are two important aquifer systems; the Great and Inferior Oolite. The clay portions of the catchment by their very nature have little water storage capacity and are considered as "non-aquifers".

- 2.16 The Great and Inferior Oolite aquifers are separated by a layer of impermeable clay. As a consequence of this separation the two aquifer systems are not considered to be in direct contact. However, the exchange of water between the two oolite layers may occur through faults, of which there are many. Hydrogeological investigations indicate that the groundwater system is complex and the possibility exists that groundwater may flow in both directions between the two layers. The hydrogeology of the northern part of the catchment especially is poorly understood.
- 2.17 Water levels in the oolite aquifers are dependent on the amount of water which percolates into the ground and volumes of water abstracted. Percolation is related to rainfall but the relationship is not simple. Annual rainfall and percolation data over the last 70 years is shown in Figures 2.1 and 2.2. The data over the last 10 years is of particular interest. The 10 years prior to 1992 had below average rainfall and percolation was the lowest experienced over the last seven decades.
- 2.18 Research into the cotswold aquifer system indicates that water levels in the upper oolite are strongly influenced by one year droughts. Thus, the low levels of percolation over the past ten years have probably had a significant impact on groundwater levels.

Note: a geological cross section of the catchment will be prepared.

RAINFALL AND RIVER FLOW

- 2.19 The average rainfall across the catchment is 609 mm. Rainfall varies depending on topography and meteorological conditions, from 900 mm/year in the Cotswolds to under 600 mm in the lower parts of the catchment.
- 2.20 The rivers in the northern part of the catchment flow across limestone, are fed by springs, tend to have high base flows and respond relatively slowly to rainfall. In some reaches water from the rivers percolate into the groundwater, for example through "swallow holes", and river flows may decrease over these reaches during low flows. This percolation of water may be a natural phenomenon but may also be influenced by groundwater abstraction regimes.
- 2.21 The rivers to the south of the catchment rise in London clay. In clay catchments summer flows tend to be low and the rivers respond very rapidly to rainfall, i.e. the rivers in clay are "flashy".
- 2.22 Hydrographs for the Rivers Coln, Cole, Churn and Thames show the differences between the flow characteristics of the rivers draining the limestone Cotswolds catchments and those draining the southern "clay" catchments. The River Coln displays the classic characteristics of a groundwater fed stream, with a high base flow, but comparatively low peak flood flows. The Churn shows some of the characteristics of a groundwater fed river, but has a lower baseflow than the Coln. The River Cole is very flashy and the hydrograph is typical of a clay catchment stream.

ADMINISTRATION AND PLANNING

- 2.23 The table below summarises the areas of the catchment covered by different Local Authorities.

<u>County Councils</u>	<u>Sq Km</u>	<u>%</u>	<u>District Councils</u>	<u>Sq Km</u>	<u>%</u>
Gloucestershire	594.4	59	Cotswold DC	594.4	59
Oxfordshire	54.3	5	Vale of White Horse DC	50.4	5
			West Oxfordshire DC	3.9	-
Wiltshire	358.7	36	North Wilts DC	163.2	16
			Thamesdown BC	195.5	20
Total	1007.4	100%	TOTAL	1007.4	100%

- 2.24 The population of the catchment area is estimated at 230,000. The main towns and their estimated 1991 populations are given below:

Swindon	150 000
Cirencester	17 600
Cricklade	3 900
South Cerney	3 000
Fairford	3 000
Highworth	8 000
Wroughton	7 000
Lechlade	2 500
Northleach	1 500
Ashton Keynes	1 400
Purton	4 000

- 2.25 Most of the County, District and Borough Councils 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 have an impact on, or interact with the water environment.

2.26 The following development plans apply to the catchment:

Structure Plans

Gloucestershire Structure Plan - 1st Alteration (Approved 1992)
Oxfordshire 2001 (Approved 1992)
North East Wiltshire Structure Plan (Approved 1993)

Local Plans

Cotswold District Local Plan (Deposit Draft 1993)
Vale of White Horse Local Plan (Consultation Draft 1993)
West Oxfordshire Local Plan (Deposit Plan 1993)
North Wiltshire Local Plan (Adopted 1993)
Thamesdown Local Plan (Deposit Draft 1994)

Minerals and Waste Local Plans

Oxfordshire Minerals and Waste Local Plan (Deposit 1993)
Wiltshire Minerals Local Plan 1989
Upper Thames Policy Review 1993 - Gloucestershire County Council

3. CATCHMENT USES

INTRODUCTION

- 3.1 This section describes current and future uses of the water environment within the catchment. Current uses include activities planned to be completed in the short-term whilst future uses include potential, possible and likely uses. For each of the catchment uses the following information is provided:

Catchment Perspective - this describes how the use manifests itself within the catchment.

Environmental Objectives - this contains draft environmental objectives for the conservation and enhancement of the use and/or the water environment. The objectives are broadly based.

Maps are used to enhance the information in the text and highlight the physical context of the use.

- 3.2 In most cases the description of the use is a summary of detailed reviews, investigations or studies produced by the NRA and/or other organisations. Support documents may therefore be available for those interested in learning more about the catchment.

- 3.3 A general description of each of the following twelve catchment uses is included in Appendix B.

- Nature Conservation;
- Fisheries;
- Landscape;
- Heritage;
- Amenity and Recreation;
- Navigation;
- Water Abstraction;
- Effluent Disposal;
- Rural Land Use;
- Urban Land Use;
- Mineral Extraction and Solid Waste Disposal;
- Flood Defence.

- 3.4 A period of informal liaison with relevant organisations and groups was conducted in April and May 1994. This process provided useful background information for the plan and is reported in Appendix A.

NATURE CONSERVATION

Catchment Perspective

- 3.5 The Oolitic limestone of the Cotswolds supports permanent unimproved grasslands and beech woods of high nature conservation value. Many of the river valleys contain flower rich meadows whilst the marl lakes of the Cotswold Water Park are of particular wildfowl and geological interest.
- 3.6 There are 25 sites of special scientific interest (SSSI) within the area (listed on Table 3.1). The Cotswold Water Park is of international importance and qualifies for SPA and RAMSAR status.
- 3.7 The Cotswold Water Park has become one of the largest concentrations of open water in southern Britain and as a consequence is of outstanding importance to the naturalist as an inland waterfowl site. The calcareous nature of the water makes natural vegetation and invertebrate colonization extremely rich and varied.
- 3.8 The Cotswold hills have been designated an Environmentally Sensitive Area (ESA) by MAFF and there are in addition a number of countryside stewardship schemes in operation in the area. Both schemes offer management agreements to farmers and land managers to enhance and conserve landscapes and habitats.
- 3.9 There are extensive areas of Ancient Woodland to the north and west of Cirencester particularly along the valleys of the rivers Churn and Cole.
- 3.10 The Upper Thames Otter Habitat project is run by the Bucks, Berks and Oxon Naturalist Trust (BBONT) in conjunction with the Gloucestershire Wildlife Trust and the NRA. This project which commenced in 1992, seeks to enhance and improve aquatic and riparian habitats to benefit all wildlife and especially to encourage wild otters to naturally recolonise the region. This project will continue during 1994/95.
- 3.11 River corridor surveys have been carried out within the last two years on the Rivers Cole, Ray, Churn and Ampney Brook and will be undertaken on the Rivers Coln and Leach in 1994/95. The corridor surveys on the Cole and Ray were commissioned to provide information which could be incorporated into the development plans for the creation of a community forest in the Swindon Area. Their general conclusion was that the rivers in the northern part of the catchment are associated with a higher ecological value than those in the south. These lower values in the south were attributed to intensive agriculture and urban development.

Table 3.1 - Upper Thames - Sites of Special Scientific Interest
(the sites which relate to the water environment will be plotted on the map - the table will then be removed)

Name	Grid Ref.	Nearest watercourse	Type
Barnsley Warren	SP 055064	Ampney Brook	BotG
Elmlea Meadows	SU 079948	Thames	BotG
Foss Cross Quarry	SP 056092	Ampney Brook-remote	GeoL
Hampen Railway Cutting	SP 062205	Remote	GeoH
Hornsleasow Roughs	SP 117323	Remote	BotG
Puckham	SP 010224	Trib of Colne-remote	Bot3
Whelford Meadow	SP 168000	Coln	BotG
Winson Meadows	SP 0903081	Coln	BotG
Wicklesham & Coxwell Pits	SU 28559425 SU 28959415 SU 29209420	Cole-remote	GeoG
Tuckmill Meadows	SU 240900	Tuckmill Brook	BotG
Burderop	SU 165810	Ray	BotW
Clattinger Farm	SU 012933	Thames/Swill Bk	BotG
Clouts Wood	SU 137796	Ray	BotW
Coate Water	SU 188820	Dorcan Brook(Cole)	FauB
Emmet Hill Meadow	SU 009901	Thames/Swill Bk	BotG
North Meadow	SU 098944	Thames	BotG
Okus Quarry	SU 147836	Ray	GeoP
Restrop Farm & Brockhurst Wood	SU 073866	Thames/Key	Bot2
The Coombes	SU 228826	Trib of Cole	BotG
Old Town Railway Cutting	SU 153832	Ray	GeoJ
Upper Waterhay Meadow	SU 069837	Thames	BotG
Pike Corner	SU 036934	Thames/Swill Bk	BotG
Stony Furlong Railway Cutting	SP 063106	Trib of Coln	GeoL
Distillery Farm Meadow	SU 027892	Thames/Swill Bk	BotG
Wildmoorway Meadows	SU 066973	Churn	BotG

Key to types:

BotG -	Botanic/grassland	GeoL -	Geological/Limestone
BotM -	Botanic/marshland	GeoH -	Geological/Hampen/ Marly Form
BotW -	Botanic/woodland	GeoG -	Geological/gravel
Bot2 -	Botanic/grassland woodland	GeoP -	Geological/Portland Succession
Bot3 -	Botanic/grassland woodland marshland	FauB -	Fauna/bird population

- 3.12 A landscape assessment of the Coln and Leach has been carried out as part of a study into low flows. The results of this assessment will be incorporated into the study into low flow impacts on the Coln and the Leach, which is scheduled to be completed in (?).

Environmental Objectives

- 3.13 To safeguard and enhance the special ecological interest for which sites have been designated (e.g. SSSI).
- 3.14 To promote all aquatic life and dependent non-aquatic organisms, so that the ecosystem is consistent with the physical, chemical and biological characteristics, flow regime and location of the water.

FISHERIES

Catchment Perspective

- 3.15 The catchment provides some high quality game and coarse fishing. The chalk streams to the north of the catchment, including the Leach, Coln and Churn, contain good populations of brown trout whilst the streams to the south tend to support coarse fisheries. There are 25 angling clubs in the catchment and this large number is indicative of high level of fishing interest. The condition of the fisheries in each of the main rivers, based on the most recent surveys, are described below.
- 3.16 The River Thames supports a coarse fishery. When last surveyed in 1987 poor water quality, probably attributable to effluent from the Swindon Sewage Treatment Works, was having a noticeable impact on the fishery. With recently improved effluent quality from the works the fishery should improve.
- 3.17 The River Leach supports a thriving brown trout population. In the downstream reaches rainbow trout are present as a consequence of escapes from fish farms. Coarse fish from the River Thames are also found in the lower reaches.
- 3.18 The Coln below Bibury is managed as a trout fishery, both recreational and commercial. The river is regularly stocked with takeable size trout. Trout are also present in some of the upper reaches. In general the Coln fishery is good, however, the recruitment of young fish is poor, possibly as a consequence of flow constraints and the siltation of spawning gravels.
- 3.19 The fishery in the Ampney Brook is poor, mainly as a consequence of very low flows. In 1989, 90 and 91 the Brook dried up completely and the only fish present have migrated into the Brook from the River Thames.
- 3.20 Upstream of the Cotswold Water Park the River Churn is an important recreational brown trout fishery. The river is regularly stocked. Downstream of the Water Park coarse fish tend to dominate as a consequence of a change in habitat and fish moving upstream from the River Thames. The trout fishery in the upper reaches does not perform as well as expected.
- 3.21 The River Ray below Swindon STW is a viable coarse fishery and sustains a healthy fish population. However, further downstream the fishery deteriorates. Upstream of Swindon STW the fishery is not viable as a consequence of insufficient flows.

- 3.22 The River Cole contains a coarse fishery. This fishery does not perform as well as might be expected. Pollution incidents are a likely cause for the poor performance. In addition, drainage works appear to have detrimentally affected instream habitat.
- 3.23 The Cotswold Water Park provides a mixture of high quality game and coarse fisheries.
- 3.24 Both the Water Park and many of the rivers are regularly stocked by the NRA and Angling Clubs. Stocking is carried out for a variety of reasons, including the replacement of stock caught by anglers, establishment of fisheries in the newly filled extraction pits and to re-establish the fishery following a pollution incident.
- 3.25 The NRA undertakes surveys of the fisheries every five years. These surveys collect data on habitat, biomass (the weight of fish averaged out over an area) and collect general information on a range of factors, including flows and the impacts of pollution incidents.
- 3.26 Improvements to the fishery habitat in the River Ray are being considered by the NRA and a habitat improvement scheme is planned for the River Cole. This scheme is part of the Rivers Restoration Project. In both the Ray and the Cole, the improvements in habitat are required as a consequence of unsympathetic drainage and channel maintenance activities.

Environmental Objectives

- 3.27 To sustain a natural fish population appropriate to the typical physical, chemical and biological characteristics and flow regime features of the relevant sites.
- 3.28 To safeguard and maintain the water quality of all designated salmonid and cyprinid fisheries.

LANDSCAPE

Catchment Perspective

Landscape Character

- 3.29 The Cotswold hills (covering the north part of the catchment area) are considered to be a high quality landscape. It is characterised by open wolds, dry stone walls, ancient beech woods and shelter belts, deep river valleys with meandering streams and historic towns and villages. The appearance of the Cotswold landscape changes according to varying farming regimes and the seasons. It has developed from grassland and meadow to a grain production area and has recently moved to the cultivation of colourful crops such as linseed and oil seed rape.
- 3.30 The River Churn valley to the north of Cirencester is an attractive open, flat valley with water meadows. The Coln and Leach occupy narrow, deep valleys which break up the smooth, undulating expanse of the Cotswold dip slope.
- 3.31 The central part of the catchment area is occupied by the valley of the upper Thames. The landscape of the Cotswold Water Park is varied and is constantly changing. It takes on a wetland appearance ranging from derelict mineral workings to mature lakes. It forms a central feature within the broad clay vale landscape of the Upper Thames.
- 3.32 In the south part of the catchment area are the Swindon urban area and the chalk uplands of the North Wessex Downs. Land use in the southern half of the catchment area is dominated by Swindon, by transport corridors and other infrastructure uses such as the airfields at Fairford, South Cerney and Kemble.

Landscape Designations

- 3.33 The very high quality and variety of the Cotswolds landscape has been recognised by its destination as an Area of Outstanding Natural Beauty. The northern section of the catchment area between Cirencester and Brockhampton lies entirely within Cotswold AONB. A management plan for the AONB is in preparation.
- 3.34 The southern part of the catchment area to the south east of Swindon lies within the North Wessex Downs AONB which can be described as one of the most extensive and least spoilt downland tracts in southern England.
- 3.35 The countryside areas to the north of Wroughton and Wanborough, south and east of Highworth, and south west of Cirencester are designated by the respective local authorities as either Important Local Landscapes, Special Landscape Areas or Areas of High Landscape Value.
- 3.36 The rural areas around Swindon, Cirencester, Chedworth, Cowley and Faringdon are also protected as rural buffer zones or important areas of open land. These

policy areas act as physical breaks and buffers to prevent coalescence between settlements and have a particular open character and appearance.

- 3.37 Landuse can have a significant impact on the water environment. Planners and developers need to consider the sustainability of the water environment in their decisions. Changes in the landscape continue to take place as a result of new development, changing farming practices and demands for recreation and tourist use of the countryside. These trends will continue in the future and pressures may become more extensive as the need to reduce agricultural production increases. Large areas of the Cotswolds, for example, may revert to livestock production as European Community policies are revised.

Environmental Objectives

- 3.38 To safeguard the special landscape interest for which sites have been designated (e.g. Area of Outstanding Natural Beauty).
- 3.39 To conserve and enhance all river corridor and water related landscapes.
- 3.40 To ensure that the negative impact of new developments on the water environment is minimised, and that the opportunities for enhancing the water environment as part of new development are recognised.

HERITAGE

Catchment Perspective

- 3.41 The counties of Wiltshire, Oxfordshire and Gloucestershire contain a wealth of archaeological features which vary from isolated visible remains such as earthworks, to broad tracts of countryside where the range of features creates an archaeological landscape. Important features within the catchment area include barrow groups, ancient trackways and Roman roads, Iron Age hill forts and the archaeological features of the North Wessex Downs and Upper Thames Valley.
- 3.42 Although much of the area is famous for its ancient landscape, it also has many features representing later periods including Saxon and medieval settlements and their field systems, and post medieval features such as water meadows. In terms of industrial heritage, there are a number of important features such as the Thames and Severn and Wilts and Berks Canals. There are a large number of Ancient Monuments in the catchment area with particular concentrations in Cirencester and Cricklade.
- 3.43 The Catchment Area also has a large number of conservation areas, buildings of historical or architectural interest, large country houses and many parks and gardens of special historic interest as listed by English Heritage.

Environmental Objectives

- 3.44 To safeguard the special archaeological and heritage interest for which sites have been designated (e.g. Conservation Areas).
- 3.45 To conserve and enhance areas of archaeological and heritage value.

AMENITY AND RECREATION

Catchment Perspective

- 3.46 The catchment area is of value for both informal countryside recreation and leisure, and for organised sports activities. There is an extensive network of rights of way including a number of long distance paths such as the Thames Path, the Ridgeway and the d'Arcy Dalton Way.
- 3.47 The Thames Path was designated by the Secretary of State for the Environment in September 1989. It is being jointly promoted by the Countryside Commission and the NRA and the declared intention is to establish a walkway for over 200 miles from the Thames Barrier at Greenwich to the source of the River Thames near Kemble, Gloucestershire.
- 3.48 The Cotswold Water Park is an important recreation resource. Thirty four lakes accounting for about half the total water area of the park are used for some form of water-based recreation including water skiing, dinghy sailing, jet skiing, windsurfing, game and coarse angling. A few areas have been developed as Country Parks (Keynes and Neigh Bridge) or for public access and picnicking. Public footpaths and bridleways have also been improved and developed. Several lakes remain unrestored and there is further potential for recreational activities.
- 3.49 A number of tourism related developments have taken place in the western section of the Water Park, including The Watermark holiday homes development, Cotswold Hoburne caravan park and Gloucestershire County Council South Cerney Water Sports Centre. Permission has also been given for two golf courses and a hotel at Fairford and South Cerney and there are proposals for an international rowing and canoeing course at Cleveland Lakes.

Environmental Objectives

- 3.50 To maintain or improve water quality, river flow and channel characteristics in order to prevent public nuisance arising from visual and smell problems (?).
- 3.51 To protect and promote all appropriate water related recreational uses.
(maintain & enhance recreational use, balance with other uses)

NAVIGATION (confused needs editing)

Catchment Perspective

- 3.52 Within the plan area navigational responsibilities are limited to the River Thames for only 19.2km (12 miles) above Buscot Lock. The present upstream limit for powered craft is at Inglesham only 4km (2.5 miles) above Buscot, and the upper limit for all craft is at Town Bridge, Cricklade.
- 3.53 The actual navigable limit is therefore a considerable distance downstream from the designated navigable limit. These differences in designation have not caused problems in the past, however, from a management perspective it presents an anomaly.
- 3.54 The only lock within the area is St. Johns Lock at Lechlade. It is here that the statue of Father Thames rests. This originally marked the site of Thames Head near Kemble in Gloucestershire but was moved to its present site in 1974.
- 3.55 Moorings are limited within the section and are fully utilised. There are about 50 moorings situated at the Roundhouse, the Trout, Lechdale and Inglesham (privately owned), as well as at St. Johns Lock, and Buscot Lock (NRA owned). Another 120 (approximately) off-river moorings exist at the Riverside Marina, Lechdale.
- 3.56 Upstream of Inglesham navigation is restricted by depth and low bridges. This part of the river is thus used only by small craft. Above Cricklade canoes use the river during higher flows only with the permission of the riparian landowner.
- 3.57 There are plans to reopen the Severn-Thames and Wilts-Berks canal. Whilst these canals will undoubtedly provide a valuable recreation resource, their reopening raises a number of issues including water supply, pollution and conflict with other uses. Probably of most immediate concern is the issue of water resources as a consequence of the limited water supplies available in the catchment.

Environmental Objective

- 3.58 To maintain or improve water quality, water resources and physical characteristics in order to sustain the Thames navigation.

WATER ABSTRACTION

Catchment Perspective

- 3.59 Water is abstracted from both surface and groundwaters in the catchment. The majority of groundwater is abstracted from the two limestone layers, the Greater and Inferior Oolite with the Greater Oolite providing the largest source. Gravels form a small but significant source, whilst chalk forms a very small source. The volume of water abstracted in 1992 and the source from which it is obtained are presented in Table 3.2.
- 3.60 Fish farms account for 99% of surface water abstractions (in 1992). Water abstracted by fish farms is returned to the catchment and does not result in a net loss of water. The consumptive use of surface water represents 1% of the total surface water abstractions. The bulk of the water for consumptive uses is abstracted from groundwater.
- 3.61 The general NRA policy concerning abstractions is that applications for major consumptive abstractions will be declined. However, the NRA probably will allow small abstractions which are unlikely to have a major impact on the environment.
- 3.62 If population and economic development in the catchment increases this will lead to an increase in demand for water. In order to meet this increase the NRA may be forced to allow greater rates of abstraction, or develop further water resource schemes (no!). Prospective schemes for the catchment are discussed in subsequent sections.

Table 3.2 - Water Abstraction by Source Type

Use	Sources and abstraction in 1992						Total
	Gt. Oolite	Inf. Oolite	Up. Jura	Gravels	River	Chalk	
Public Water Supply	38.81	19.82			0.0	0.32	53.95
Private Water Supply	.28	0.47	0.0	0.02	0.15	0.03	0.95
Agriculture	1.11	0.06	0.15	0.24	0.23	0.14	1.93
Spray Irrigation				0.10	0.40		0.5
Washing				5.30			5.30
Industrial Processes	0.04			0.17			0.21
Fish	0.13				85.21		85.34
Water Transfer	0.02				0.08		0.1
Cooling	0.00						0.00
Flow Augmentation	0.00						0.00
Totals	35.39	20.35	0.15	5.83	86.07	0.49	148.28

Environmental Objectives

- 3.63 To safeguard potable, industrial and agricultural abstractions with respect to water quality and quantity. Water quality should be maintained to meet appropriate standards with the aim to safeguard public health, avoid damage to crops and protect the well-being of supplied animals.
- 3.64 To manage water resources in such a way that a balance is achieved between all abstractors and the natural environment in order that the best use of water resources is made.

EFFLUENT DISPOSAL

Catchment Perspective

- 3.65 There are 161 consented effluent discharges in the Upper Thames catchment. The larger sewerage discharges and the standards they are required to achieve are shown in Table 3.3 whilst information on the total number of discharges is presented in Table 3.4.

Table 3.3 - Major Sewage Effluent Discharges

River and effluent source	Consented Volume (m³/d)	Type of discharge	General Consent Conditions (BOD/SS/AmmN all mg/l)
River Ray			
Swindon STW	132,900	Sewage effluent	17/11/5
Wroughton	6,000	Sewage effluent	30/20/4
Thames			
Cirencester	40,000	Sewage effluent	25/10/12
Purton	2,835	Sewage effluent	45/30
Coln			
Fairford	1000	Sewage effluent	45/30
Cole			
Highworth	5,700	Sewage effluent	35/20/10
Shrivenham	6,000	Sewage effluent	45/30
Leach			
Leachlade	4,975	Sewage effluent	45/30/5

Table 3.4 - Other Major Discharges

Type	Sub-Type	Sub Total	Sub Total (Vol m ³ /day)	Total	Total Volume m ³ /day
Thames Water Utilities STW				30	213,157
Non TWUL STW				94	1,923.8
Private	Fish farms	9	182,364		
	Mineral Workings	8	64,287		
	Farms	9	253.5		
	Other	11	11,159	37	258,063.5
Totals				161	500,144.3

- 3.66 The largest number of consented discharges are for private sewage treatment works. However, these comprise a small amount of the overall quantity of effluent discharged to the catchment. In terms of effluent volume sewage treatment works belonging to TWUL discharge the largest amount of effluent. Fishfarms are the second largest contributor of effluent. Mineral workings also contribute a significant quantity of effluent.
- 3.67 Note: It is suggested that the ratio of Q_{95} to DWF at the discharge locations is included. This information will demonstrate the importance of effluent discharges to maintaining river flows and will also make the public aware of the high level of treatment at some sewage treatment works. In addition this information is useful for assessing the management options for combined storm overflows, in accordance with the Urban Pollution Management Group Guidelines.
- 3.68 Whilst effluent disposal is always an issue from the water quality management perspective it is a particular issue on the River Ray. During a low flow a significant proportion of the flow of the Ray is made up from effluent from the Swindon STW. Recently the Swindon STW has been upgraded, resulting in improved water quality. This improvement should result in a healthier river ecosystem in the River Ray.
- 3.69 In 1993 only two sewage treatment works were recorded by the NRA as failing to meet their discharge consent. These works were Andoversford and Purton, both of which are operated by TWUL.
- 3.70 The NRA will ensure that discharge consents are set so that water quality objectives will be achieved. The consents for certain STW's are being reviewed as part of the AMP II programme being undertaken by Thames Water. The

existing consent levels are being reduced and limits on ammonia are being incorporated. The discharge points for the consents under review are shown on the map opposite.

Table 3.5 - Changes to Consents

STW	Current Consent (SS/BOD/Amm-N)	Future Consent
Ampney St Peter	45/3	30/20/10
Ashton Keynes	45/30	45/30/10
Blunsdon	45/30	20/10/08
Fairford	45/30	45/30/10
Kempsford	45/30	45/30/06
Lechdale	45/30/05	30/15/03
Shrivenham	45/30	45/30/10

- 3.71 Increases in population in the catchment will mean that the volume of effluent will increase. The NRA will ensure that water quality targets are met in the future.

Environmental Objectives

- 3.72 To control the discharge of effluent to the water environment in such a way that water quality objectives are met and other uses are not compromised.

RURAL LAND USE (section could be combined with 'landscape' & should make reference to agriculture)

Catchment Perspective

- 3.73 A large part of the study area is open countryside and much is of high environmental value. Future land use is determined primarily by planning policy.

Landscape Protection

- 3.74 Policies (whose?) seek to protect areas of national, regional and local importance for landscape value including in particular Areas of Outstanding National Beauty, Special Landscape Areas, Areas of High Landscape Value and Rural Buffers or other important areas of open land. These policies frequently have implications for the protection of the water environment.
- 3.75 Policies focus on countryside management, particularly the management of public open space, rights of way and water areas. They seek to retain key landscape features, remove eyesores, protect natural habitats and provide interpretation facilities for visitors. New rights of way and Country Parks will be created where possible and opportunities for increasing public access to the countryside will be encouraged. The restoration of disused railways and canals is encouraged.
- 3.76 The Great western Community Forest Project covers the southern part of the catchment area. This one of twelve national forest projects to be undertaken by the local authorities in association with the Countryside Commission and the Forestry Commission. It will cover 2 000 hectares around Swindon and will seek to create a variety of landscapes incorporating farmland, wetland, meadows, lakes and parkland as well as woodland. It is intended to increase tree cover to between 25% - 35% in the Community Forest Project area, to conserve and enhance waterside landscapes and habitats and integrate conservation and recreation opportunities along the rivers.

Heritage Protection

- 3.77 Wiltshire County Council has identified the area south of the Cotswold Water Park as an important archaeological landscape. The Upper Thames - Cricklade - Purton Areas of Special Archaeological Significance as defined by Wiltshire County Council lies within the catchment area. The aim of this designation is to protect areas of archaeological landscapes rather than individual sites and within these areas, there is a high priority for archaeological investigation and conservation.
- 3.78 Cirencester contains nationally important archaeological remains and a number of sensitive areas have been defined within the "Archaeological Urban Area."

Nature Conservation

- 3.79 The local planning authorities will seek to protect areas of international, national, regional or local nature conservation importance. Certain areas are afforded protection at county or district level such the designation of part of the Cotswold Water Park within North Wiltshire as an Area of High Ecological Value. Local Nature Reserves will be created where possible.

Protection of the Water Environment

- 3.80 Policies seek to control development within or affecting river valleys and to enhance river valleys themselves. Policies generally encourage improved access to rivers and low key recreation use of watercourses.
- 3.81 The Cotswold District Local Plan seeks to protect the open undeveloped character of the water meadows south east of Baunton and the area alongside the River Churn within the village of South Cerney.
- 3.82 The River Ray Parkway project seeks to safeguard this area to the south of Swindon as open land providing opportunities for recreation and nature conservation.

Environmental Objective

- 3.83 Where water is abstracted for agricultural use or used to support rural activities the water environment should be maintained to meet appropriate standards with the aim of safeguarding public health, avoiding damage to activities and protecting the well-being of animals and fish.

URBAN LAND USE

Catchment Perspective

Gloucestershire

- 3.84 Within the northern part of the catchment area Gloucester County Council exercise a policy of development restraint. Cirencester is the main town in the north part of the catchment area but development pressure here is resisted and where possible diverted to Swindon. Limited residential development is planned in Cirencester and in Lechlade and Fairford. Development boundaries are defined around towns and villages.
- 3.85 Bypasses are planned for both Fairford and Lechlade as well as major improvements to the A417/419 from Swindon to Gloucester which include the following schemes:
- Blunsdon Bypass;
 - Latton Bypass, including the grade separated junctions within the Water Park Spine Road West and East;
 - Cirencester and Stratton Bypass;
 - North of Stratton to Nettleton Improvement;
 - Crickley Hill (Birdlip) Improvement.
- 3.86 A link through the eastern section of the Cotswold Water Park is also proposed.

Wiltshire

- 3.87 Swindon is the main urban centre within the catchment area and the primary focus for new growth. It has a large manufacturing base including motor vehicles, engineering and pharmaceuticals and has undergone major recent expansion. Further development for residential, business and leisure use is anticipated within the urban area whilst protecting key open areas such as along the River Ray. The former Great Western Railway workshops have been proposed for major mixed use redevelopment.
- 3.88 A major new housing and employment development area is planned to the north of Swindon up to 2001 with a capacity to accommodate 27 000 people. Twenty nine hectares of employment land are proposed together with 8 500 houses. An amenity lake will be provided as part of the Moulden Hill County Park.
- 3.89 Limited growth is planned for Highworth, Wroughton and Crickdale together with employment development at the South Marston industrial estate and airfield.

Environmental Objectives

- 3.90 To influence and control future built development in such a way that other uses are not compromised.
- 3.91 To seek enhancements to the water environment through development.
- 3.92 To ensure that infrastructure required to protect and enhance the water environment is provided in advance of its need.
- 3.93 To influence and control infrastructure provision in such a way that other uses are not compromised.

MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

Catchment Perspective

- 3.94 The main activity in the catchment area is the extraction of sand and gravel from the Thames Valley. This was begun during the 1920's and is concentrated within the Cotswold Water Park. The eastern section around Lechlade and Fairford is largely within Gloucestershire whilst the western section around South Cerney and Ashton Keynes is within Wiltshire and Gloucestershire.
- 3.95 The gravel reserves have been on average 4 to 5 metres deep under shallow overburden and, due to a high water table, extraction sites have become lakes rather than being restored to dry land.
- 3.96 In the eastern section extraction has been concentrated to the south and east of Fairford and more recently north of Kempsford. In the west, the main extraction areas have been at the Shorncliffe and to the north, south and east of Ashton Keynes.
- 3.97 The County Councils intend to concentrate further aggregate extraction in the Cotswold Water Park. Wiltshire County Council have identified a number of areas of search for further extraction in the Ashton Keynes area although they anticipate that these may be insufficient to meet anticipated needs to 2001 (Wiltshire Minerals Local Plan, 1989).
- 3.98 Gloucestershire County Council have recently prepared the Upper Thames Policy Review (1993) which points to the need to identify new resource areas to meet latest forecast requirements. Former resource areas at Cerney Wick, to the east of Fairford and north of the Keynes Country Park have been identified as priority areas with a large area at Down Ampney identified as a further reserve area.
- 3.99 The local authorities seek to maintain a stock of land to provide a ten year supply of aggregates, to minimise the adverse environmental impact of mineral extraction, to protect long term reserves, and to ensure the satisfactory restoration of workings. They also set out detailed criteria for the Assessment of applications by the planning authorities including consideration of the impact on the water environment.
- 3.100 Note: More information on landfills will be added.

Environmental Objectives

- 3.101 To control and influence mineral extraction, restoration and after-use and solid waste disposal in such a way that other uses are not compromised.

FLOOD DEFENCE

Catchment Perspective

- 3.102 The map opposite highlights the areas in the catchment that are known to have flooded in the past and the limits of the main river, over which the NRA have responsibility for flood hazard management.
- 3.103 The Cotswold Water Park is thought to provide an important flood alleviation and storage facility. However, little information exists on the hydraulic and hydrologic processes associated with the Water Park and therefore the precise role the Park plays in reducing flooding is unknown.
- 3.104 Weed cutting is undertaken on a regular basis during the summer months to ensure that flooding on adjacent lands is kept to a minimum. The cutting occurs on main rivers and is undertaken by the NRA.
- 3.105 Current flood forecasting relies upon a combination of telemetered information from a number of sites and information from flood defence staff in the field. Flood warnings are issued by NRA head office in Reading to Thames Valley Police and local Councils. Annual Flood Warning seminars are also held to review the flood forecasting and warning process.
- 3.106 Certain areas in the catchment are prone to flooding. These areas include Somerford Keynes, Ashton Keynes and South Cerney. None of these areas are located on a main river and the flooding has mainly involved very small watercourses. Flood management in these areas is largely the responsibility of the local authorities. Studies into alleviating the flooding situation at Somerford Keynes are being undertaken at the time of preparing this plan.
- 3.107 Flood hazard management policy in the catchment comprises two strands - Standards of Service and the Thames Non-Tidal Flood Plain Policy. Both of these policy strands have recently been introduced and will determine flood hazard management in the catchment into the foreseeable future. The implications of these policies are discussed later in this report.

Environmental Objectives

- 3.108 To provide effective defence for people and property against flooding from main rivers.
- 3.109 To provide adequate arrangements for flood forecasting and warning.

4. CATCHMENT STATUS

INTRODUCTION

- 4.1 This section compares the current status of the catchment (where it is known) with overall standards/targets in respect of water quality, water resources and physical features.
- 4.2 Comparison of the 'current status' with the 'overall target' enables issues - which may be problems due to failures to meet targets, or conflicts due to differing uses having opposing requirements - to be identified. The issues identified in this way are summarised at the end of the following sections on water quality, water resources and physical features.
- 4.3 A range of data and information has been used to assess the catchment status. The assessment incorporates the results of a consultation exercise undertaken by the NRA and analysis of existing data on the catchment which is held by the NRA and is publicly available.

WATER QUALITY

Introduction

- 4.4 A principal aim of the NRA is to achieve a continuing improvement in the quality of rivers through the control of pollution. To achieve this aim, the NRA seeks to maintain waters that are already of high quality; to improve waters of poorer quality and to ensure all waters are of an appropriate quality for their agreed uses.
- 4.5 Water quality improvements cost money and in many cases it is the public who pay the bill for these improvements either directly or indirectly. It is important to relate the cost of any proposed improvements to the benefits in deciding on whether or not individual schemes should go ahead and in assigning priorities.
- 4.6 The quality of surface waters is evaluated by the NRA in a number of ways using a range of statutory, non-statutory, objective and subjective standards. Monitoring of chemical substances enables the NRA to assess compliance with the relevant EC Directives and to classify the chemical status of the river. The chemical classification system is non-statutory and acts as a management tool enabling the NRA to assess the state of the river and monitor changes in the rivers over time and space.
- 4.7 Chemical monitoring provides an indication of conditions in the river at the precise time of monitoring but is unlikely to provide information on water quality between sampling times. Biological monitoring, unlike chemical monitoring, provides an indication of the river's health over time and can be used to detect a greater range of water quality problems than routine chemical monitoring.
- 4.8 Nutrient concentrations are measured at certain locations. High nutrient levels can alter the natural ecological balance in rivers and lakes, in some cases causing excessive plant growth and nuisance algal blooms.
- 4.9 Visual appearance of a waterbody is important from an aesthetic perspective. At present visual appearance is not systematically monitored and a system for classifying appearance is being developed by the NRA at the time of preparing this plan.
- 4.10 Information on water quality is held on a public register which is available for inspection at the NRA Reading Office (Tel: 0734-535000). The information held on the register includes: water quality classifications, applications for consents and issued consents, sampling information and details of prosecutions.

Surface Waters

- 4.11 **Chemical status:** A system of "River Quality Objectives" (RQOs) was, until earlier this year, used to classify and assess the quality of rivers and canals. A new chemical classification system, known as "Statutory Water Quality

Objectives" (SWQOs) was adopted by the NRA earlier this year. This new system was introduced to overcome a number of limitations in the RQO system.

4.12 (new paragraph) The current General Quality Assessment (GQA) chemical quality of rivers in the Upper Thames catchment is given on map *. This shows rivers in this catchment to range in quality from Grade B (ie of good quality) to grade F (ie of bad quality).

4.13 The SWQO system comprises five classes as follows:

Class RE1 : Water of very good quality suitable for all fish species.

Class RE2 : Water of good quality suitable for all fish species.

Class RE3 : Water of fair quality suitable for high class coarse fish populations.

Class RE4 : Water of fair quality suitable for coarse fish populations.

Class RE5 : Water of poor water quality which is likely to limit coarse fish populations.

Class RE6 : 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 E.

4.14 The new SWQO regulations have not been implemented by the government. In this plan Provisional Water Quality Objectives (PWQO's) are used rather than Statutory WQO's. The PWQO's are the closest equivalent to the existing RQO's. Depending on how the SWQO regulations are implemented by government the PWQO's may change.

4.15 The chemical targets for the catchment were set when the RQO system was introduced in the 1970's. These RQO targets have been converted into PWQO's. The compliance with PWQO's in 1993 are set out on Map ?? Water quality either complied or exceeded the PWQO's for 35 of the 50 reaches but failed to comply over the remaining 15.

4.16 Some PWQO's maybe too stringent and may not take sufficient accounts of other river uses. The reaches which the NRA consider have PWQO that are too stringent are as follows:

- Swill Brook: From West Crudwell to Flagham Book;
- Swill Brook: From Flagham Brook to the River Thames;
- Coln: From the source to Compton Abdale Stream;
- Coln: From Compton Abdale Stream to Bilbury Tract Stream;

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- Lydiard Brook: From the source to Rodbourne tip;
- Dudgrave Stream: From the source to the River Coln;
- Veneymore Ditch: From the Leach to the Leach (?).

- 4.17 The River Ray fails its PWQO below the Swindon STW. Improvements to the works were completed in 1993 and should result in an improvement in water quality in the Ray. The NRA anticipate that the Ray will meet its target PWQO in future years as a direct consequence of the improvements to the Swindon STW.
- 4.18 A further seven reaches fail their target PWQO (Table 4.1). The causes for the failures have not been determined and research into the reasons for the failures is required before action can be taken to ensure that the target PWQO is met. As part of water quality investigations the NRA has commissioned a study into small, rural sewage schemes.

Table 4.1 - Reaches Which Failed to Meet Their PWQO and For Which the Causes of Failure Are Unknown

River	Reach	PWQO
Coln	From Dudgrove Stream to the River Thames	1
Coln	From Bilbury Trout Farm to Bibury Mil Race	2
Lertwell Brook	From Ashbury to Tuckmill Book	2
Liden Brook	From Liddington to the River Colne	2
River Thames	From the source to Swill Brook	2
Tuckmill Brook	From Idstone to Shrivenham STW	2
Westrop Brook	From the source to Bydemill Brook	4

- 4.19 **EC Directives:** Three EC water quality Directives apply to the catchment. The Fisheries Directive (78/659/EC) applies to designated sections which are marked on Map ???. This directive is concerned with ensuring that water quality in the designated reaches is capable of supporting certain types of fish. Two fish types are incorporated into the directive; (i) salmonid, which includes trout, grayling and salmon, and (ii) cyprinid, which includes coarse fish species, such as roach and perch.
- 4.20 The River Ray below Swindon STW and the River Thames below the Ray confluence failed to meet the targets set out in the EC Fisheries Directive. As stated earlier in this section improvements have been carried out at the Swindon STW and the improvements should result in these reaches of the Rivers Ray and Thames complying with the EC Fisheries Directive.
- 4.21 Sections of the Rivers Thames, Leach and the Ampney Brook rivers have been recommended by the NRA to the Department of the Environment for designation under the Fisheries Directive. The locations of the sections proposed for EC designation are shown on Map ??
- 4.22 The second of the three Directives, the Dangerous Substance Directive (76/464/76 EC) applies to all waters in the catchment. Two sites in the catchment are monitored to assess compliance with this Directive, one on the River Ray at

Moredon Bridge where levels of mercury are measured, the other on the River Thames at Eysey where cadmium is measured. These sites were chosen because they are downstream of discharges which are known to contain these dangerous substances. Both sites comply with the Directive.

- 4.23 The third EC Directive, the Urban Waste Water Treatment (UWWT) Directive (91/271/EEC), applies to the whole catchment. This Directive specifies the level of treatment an STW should provide in relation to the size of the discharge and the sensitivity to eutrophication of the waters receiving the discharge. Receiving waters which have eutrophication related problems, i.e. excessive weed or algal growths, may be designated by government as "sensitive" under the UWWT Directive.
- 4.24 The River Ray is classified as "sensitive". Further investigations into eutrophication in the Ray are planned by the NRA. These are discussed in a following section on nutrient status.
- 4.25 **Biological status:** The health of the river ecosystem is monitored using macroinvertebrates. These are the small animals which live on the beds of watercourses. Macroinvertebrates respond to any variations in water quality. By monitoring the state of the macroinvertebrate community a wider range of water quality conditions, such as spillages or persistent toxic contaminants, can be detected than through chemical water quality monitoring.
- 4.26 Macroinvertebrate samples are collected using standard NRA techniques. Species found during sampling are scored in accordance with their tolerance to pollution using a system established by the Biological Monitoring Working Party and known as the BMWP system. A high BMWP score indicates good water quality whilst a low score represents poor water quality.
- 4.27 Care must be taken interpreting macroinvertebrate data because macroinvertebrate populations vary according to physical condition of the river, such as whether the river has a rocky or muddy bed. In some cases low BMWP scores may be a natural phenomenon rather than a consequence of pollution. To assist in the interpretation of biological data a computer programme has been developed which predicts the BMWP scores for an unpolluted stretch of river taking into account the local physical conditions. This system allows an accurate comparison to be made between the unpolluted and current state of the waterway which takes into account the physical characteristics of the river.
- 4.28 The reaches which failed to meet their predicted BMWP scores are shown on Map ??? and biological scores are listed in Appendix E. The streams in the Northern half of the catchment mostly achieve high BMWP scores which indicates they have good water quality. Scores in the upper Churn are particularly high indicating exceptionally good water quality. Many reaches in the smaller brooks fail to meet their predicted BMWP scores. Sections of watercourses which failed to meet their targets or which showed large changes in the biological scores over the last five years are listed in Table 4.2.

Table 4.2 - Sections of Watercourse Having Poor Biology or Showing a Large Change in Biological Status Over the Last Five Years

Watercourse	Biological Issue	Cause	Comment
Ray above Swindon STW	Poor biology	Urban run-off and pollution	In urban areas intermittent pollution in small streams is a common problem
Ray below Swindon STW	Poor, but improving biology	Impacts of urban pollution; improvements in Swindon STW	Biological health in the Ray has improved as a consequence of improvement to the Swindon STW
Key	Poor biology	A possible cause is the Purton STW	Further investigation into the cause of the poor biology is required
Skill and Liden Brooks	Fluctuating biological scores	Unknown	Further investigation is required
Bydemill Brook and Veneymore Stream	Declines in biological quality since 1990	Unknown	Further investigation is necessary
Ampney and Marston Mersey Brooks	Biological improvements since 1990	Higher flows	Both these streams dried up in the drought of the 1990's. Their biology has now recovered
Churn at Cerney Wick	Improvement since 1990	Higher flows	The higher flows since 1990 have resulted in a healthier ecosystem in the Churn

(some of the causes aren't)

- 4.29 **Bacteriological monitoring:** Total and faecal coliforms are indicators of the level of contamination by faecal material from animals and humans. These bacteria may be from a number of sources including point sources, such as sewage treatment works and spillages from agricultural slurry tanks, and diffuse runoff from urban areas and farmland. The results of bacteriological monitoring are presented in Appendix E.
- 4.30 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 Officer, and not the NRA.
- 4.31 **Nutrient Status:** Nutrients are essential to the normal functioning of ecosystems. However, in excessive quantities nutrients may cause nuisance aquatic plant (macrophytes) and algal growths which is termed "eutrophication". The human activities which tend to cause excessive nutrient levels are agricultural practices and effluent discharges.

- 4.32 Eutrophication-related problems are of concern in the catchment. As mentioned earlier in this section the River Ray downstream of the Swindon STW is classified as eutrophic. The NRA are planning to undertake macrophyte surveys of the Ray to assess the scale of the eutrophication problem.
- 4.33 Intensive algal surveys are planned for the River Thames. These surveys will provide information for the SWORP proposal, the Severn-Thames Transfer and the implementation of the Urban Waste Water Treatment Directive. Initial results of the algal surveys indicate that there is a substantial increase in algae in the River Thames downstream of the River Ray.

Pollution Incidents

- 4.34 The number of recorded pollution incidents has grown over recent years. This increase appears to be attributable to a range of factors, such as better communication facilities (e.g. setting up of 'pollution hotlines') and greater environmental awareness amongst the general public, rather than a genuine increase in pollution incidents.
- 4.35 The NRA divide pollution incidents into three classes, major, significant and minor, depending on their severity. The criteria used to assess the class of incident are given in Appendix E. The location and type of all pollution incidents in the Upper Thames catchment in 1992/3 are shown on Map ???. There were 285 incidents recorded, 19 of which were classed as significant. There were no major incidents.
- 4.36 Details of all the incidents recorded over 1992-3 are presented in Table 4.3.

Table 4.3 - Pollution Incidents (1992/93)

Pollution Type	Thames Direct	Leach	Coln	Ampney Brook	Churn	Ray	Cole	Total
Oil	8	2	5	0	8	30	31	84
Sewage	30	0	7	1	4	9	11	62
Agriculture	20	0	3	0	0	7	6	36
Chemical	3	0	0	0	6	11	5	25
Natural	10	0	6	0	3	2	5	26
General	7	1	3	0	4	24	11	50
Not known	0	1	1	0	0	0	0	2
Total	78	4	25	1	25	83	69	285

4.37 The NRA operates a proactive approach to pollution control and prevention. There are four strands to this approach:

1 Farming and Agriculture:

- All farms throughout the catchment are visited by NRA staff periodically;
- NRA staff provide advice on Grant Aid schemes for farm improvements;
- Herbicide use near waterways is controlled by regulations which are administered by the NRA;
- Groundwater Protection Zones are being established by the NRA and this protection concept will provide a further means of controlling pollution in certain areas;
- The NRA also raises awareness of water pollution prevention by giving regular presentations to farming and community groups;

2. Industry:

- NRA staff seek to raise awareness amongst industry of water pollution prevention.

3. Other Activities:

- NRA staff target a number of other activities in the catchment as part of their inspection programme, including marinas, Ministry of Defence installations and mineral extraction sites.

4. Public Education:

- Part of the pollution prevention strategy involves the dissemination of information to the general public. This includes NRA staff speaking to various groups, including schools and community groups.

4.38 Note: We suggest that information on prosecutions and fines over the past five years is incorporated (Appendix E).

Groundwater Quality

4.39 The quality of groundwater is important in terms of water supplies. In addition, groundwater quality is important from the perspective of surface water quality because groundwater contributes significant quantities of water to river flows, particularly in the north of the catchment.

4.40 The NRA intends to develop statutory water quality objectives for groundwater similar to the system developed for surface waters. Groundwater quality monitoring sites have been established in the catchment for assessing compliance with the SWQ system for groundwater quality and to gain baseline information on water quality.

- 4.41 There are a number of discharges to groundwater in the catchment and groundwater in the areas immediately adjacent is monitored.
- 4.42 The NRA has published a national policy on the protection of groundwater. The first stage of implementing this policy is the publication of groundwater vulnerability maps. This map is shown opposite. A Nitrate Vulnerable Zone has been proposed by the NRA for the area around the water abstraction site at Fairford (see map). This proposal is currently undergoing public consultation.

Water Quality Issues

- 4.43 The water quality issues are as follows:
- Some Provisional Water Quality (Chemical) Objectives (PWQO) are too stringent and cannot realistically be achieved;
 - Sections of the following watercourses fail to meet their PWQO and the reasons for the failures are unclear; Rivers Coln and Thames, Lertwell, Liden, Tuckmill and Westrop Brooks;
 - The River Ray below Swindon STW fails to meet both its PWQO and the EC Fisheries Directive. However, in the future the River Ray is expected to meet these targets as a consequence of improvements to the Swindon STW;
 - The NRA has recommended that the length of river designated under the EC Fisheries Directive is increased. Additional lengths of river recommended for designation include sections of the Rivers Thames, Leach and Ampney Brook;
 - Biological monitoring indicates that the quality of groundwater fed streams has improved since 1990 as a consequence of higher flows;
 - Sections of the Rivers Ray, Key, Shill, Liden, Bydemell and Veneymore Brooks have poor biology which indicates they are polluted. The causes of the pollution are unknown except in the case of the River Ray;
 - Intermittent pollution is an ongoing management issue and urban sources of pollution are a particular problem on the River Ray;
 - A groundwater protection zone is in the process of being established around the abstraction site at Fairford.

WATER RESOURCES

- 4.44 In managing water resources the NRA has to strike a balance between environmental considerations and the requirements of abstractors such as the water undertakers (Water Plc's) who have a statutory obligation to provide water. To achieve a balance account must be taken of both the needs of the aquatic ecosystem and the need to supply water.
- 4.45 In order to manage water resources at a catchment scale the NRA uses an abstraction licensing system. Nationally, the NRA has developed a water resources strategy which was published in early 1994. The implementation of this strategy will probably have implications for the way water resources are managed throughout the UK, including the Upper Thames catchment.(also now regional strategy)
- 4.46 Currently the NRA do not intend to grant licences for large, new abstractions. The NRA is actively promoting demand management measures to reduce water consumption. In addition, the NRA has looked at the possibility of transferring water from the Severn to the Thames catchment to reduce water shortages. The issues associated with this scheme are discussed in Section 5.
- 4.47 The NRA is also considering Thames Water's proposal to build a large new reservoir, known as the South West Oxfordshire Reservoir Proposal (SWORP). The SWORP scheme is associated with a number of aquatic related issues and these are discussed further in Section 5.
- 4.48 There is widespread public concern about the impacts of water abstraction on river flows in the catchment. At present the NRA is in the process of identifying rivers in the Thames Region which have significant low-flow problems related to abstractions. A methodology for assessing the "significance" of the low-flow problem has recently been developed. Currently the Ampney Brook and the River Churn have been selected for assessment the impact of low flows using this newly developed methodology.
- 4.49 Targets for water flows, or "prescribed flows" have not been set for the catchment. Such targets can only be set when the natural flow regime for each stream has been assessed in considerable detail. For example, certain reaches of a river may naturally become dry during a severe drought and it would not be appropriate to set a minimum flow for these reaches. Currently there is not sufficient information to allow prescribed flows to be set.
- 4.50 The issues related to water resources are as follows:
- implications of national policy, particularly the Severn-Thames transfer and the South West Oxfordshire Reservoir Scheme;

- flows and levels in some rivers;
- the setting of ecologically acceptable flows and the associated information requirements.

FLOOD DEFENCE

- 4.51 The NRA has 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". Five land use types are used to decide the required level of service, ranging from A (heavily urbanised) to E (non-intensive agriculture). Associated with each land use class is a target which specifies the maximum acceptable frequency of flooding. The standards of service for designated areas in the catchment are listed in Appendix E.
- 4.52 There are a number of problems in applying the Standards of Service. For example (i) an area may not meet its target but the cost of works to ensure that the target is met may exceed the benefit. (ii) Landuse changes over time and therefore the standards of service targets may become out of date and may require constant updating. (iii) The standards only apply to certain reaches and the approach may not be consistent with a total river or total catchment approach.
- 4.53 'The Non-Tidal Floodplain Policy' has been adopted by the NRA. This policy precludes most development in areas which flood more frequently than once in one hundred years. Development which is allowed in these areas must meet the following requirements:
- flood flows must not be impeded;
 - the storage capacities associated with flood plains 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 water courses must not be obstructed;
 - environmental impacts must be kept to acceptable levels.
- 4.54 The assessment of whether a target level of service is achieved and the definition of areas which suffer from flooding once in one hundred years both require long historical hydrometric records. Such records currently do not exist for the Thames Valley.
- 4.55 There are a number of local flooding issues. These do not directly involve the NRA because the issues do not occur on designated main rivers. Local authorities have the permissive powers for these watercourses. However, the NRA has become involved in flood management on these minor watercourses through encouraging discussion between the local authorities and the communities affected.
- 4.56 The role of the Cotswold Water Park in flooding is unknown as a consequence of a lack of understanding of the hydraulic processes in the park area. This lack of understanding is of concern given that further mineral extraction is planned and

that mineral workings are thought to have resulted in properties being subject to increased flooding risk.

4.57 The following is a summary of the flooding related issues:

- the standards of service concept is difficult to apply;
- Long periods of record are required to successfully implement current NRA policies but sufficient lengths of record are not available.(S105?)
- there are localised flooding issues but these are generally the responsibility of the local authorities and not the NRA;
- the role of the Cotswold Water Park in flood storage is unknown.

RIVERINE ENVIRONMENT AND FISHERIES

- 4.58 The quality of the river environment is important in terms of fisheries, conservation and amenity use. A methodology for assessing general environmental conditions associated with a river has not yet been developed, however, the NRA is conducting research in this area. Therefore, specific targets for the river environment cannot be set. In general terms the river environment should be capable of supporting the range of uses that could reasonably be expected to take place.
- 4.59 One method the NRA uses to obtain general information on riverine environments is the River Corridor Survey. Whilst the results of these surveys cannot be interpreted in a rigorous, objective way they do provide an indication of environmental issues, such as the locations where habitat enhancement schemes would be of maximum benefit. The Rivers Ray, Cole, Churn and the Ampney Brook have all be surveyed in the last 5 years and the Thames and Coln will be surveyed in 1994/95.
- 4.60 The NRA has developed targets for fisheries based on the amount of fish (biomass) 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 throughout the Thames catchment. Individual water courses are usually surveyed once every 5 years. The reaches which failed to meet the biomass targets are shown on Map??? and the reasons for failing to meet the biomass targets are listed in Table 4.4.
- 4.61 NRA Fisheries Officers suggest that the fishery is not performing as well as expected, possibly as a consequence of a lack of suitable spawning gravels. Channel maintenance and drainage (dredging) activities are thought to have detrimentally affected spawning gravels.
- 4.62 River habitat enhancements are planned by the NRA for the River Cole. The NRA is considering undertaking a habitat enhancement scheme on the River Ray. These schemes seek to ameliorate the impacts of channel maintenance and drainage activities.
- 4.63 There are a number of conflicts between fisheries and other users. Such conflicts include the impact of channel maintenance on fisheries habitat, and recreational activities, such as jet skies, in the Cotswold Water Park.

Table 4.4 - State of the Fishery

River	Performance of the Fishery	Comments
Ampney Brook	Poor	The river dried up in 1989, 90 and 91
River Churn	Biomass targets not achieved in 1990 in the upper reaches.	Flow restrictions in the upper reaches were probably having an impact on the fishery
River Cole	Biomass targets not achieved in 1992.	The failure to meet the targets appears to be attributable to fish kills associated with pollution incidents.
River Coln	Reaches biomass target.	Level of recruitment is poor, possibly as a consequence of low flows and poor habitat.
River Leach	Biomass target achieved.	
River Ray	Biomass target not achieved in 1991.	Poor effluent quality from the Swindon STW probably is responsible for the fishery failing to meet its target. The STW has been upgraded since 1991 and the effluent quality ought to have improved.
River Thames	Biomass levels are not available.	Effluent from Swindon STW is thought to be having an impact on the fishery.

4.64 The issues in terms of the riverine environment and fisheries relate to:

- low flows;
- poor habitat as a result of drainage activities;
- effluent from Swindon STW affecting water quality, although this situation ought to have improved;
- conflict between fisheries and other users.

5. CATCHMENT ISSUES

INTRODUCTION (repetition/unnecessary?)

5.1 In the previous sections a number of issues were identified. In this section these are grouped and discussed under the following inter-related headings:

- river flows and levels;
- water quality protection and enhancement;
- flooding in certain areas;
- fisheries
- the Cotswold Water Park;
- recreation and plans to re open canals;
- the increasing water demand, Severn-Thames transfer, SWORP;
- integrated management of the entire catchment;
- communication.

5.2 In the late 1980's and early 1990's there was considerable public concern about **river flows and levels** in the Coln and other groundwater fed streams. The NRA undertook a study into the Coln to determine the cause of the reductions in flows. Low flows in the rivers were also having an impact on **fisheries and conservation management**. **Communication** is an issue, in that information about the causes of the low flows needs to be understood by users of the river, including fishermen, conservation groups and water abstractors.

5.3 As part of a programme of **water quality protection and enhancement** driven by EC Directives the consent standards of point source discharges will be raised. This action has implications on **fisheries and conservation**. In addition, the relationship between **river flows** and discharge quantity needs to be considered in terms of effluent dilution ratios. **Groundwater quality protection** is also an issue, both in terms of quality of abstracted water and the quality of groundwater fed streams. Protecting groundwater concerns the **integrated management** of the catchment and requires **communication** between the key players.

5.4 **Flooding** is an issue in certain areas. A system of targets known as "standards of service" has been set for the catchment but compliance with these is difficult to assess because long periods of hydrometric data are required and these are not available for the catchment at present. The collection of long records has implications under the concept of **integrated management**, in this case referring to integration over time. Channel maintenance for flood purposes is an issue in terms of **fisheries and conservation** because maintenance can impact on habitats.

- 5.5 The **fishery** does not appear to be performing as well as expected in many reaches of the catchment. **Water quality** may be a factor, although it appears likely that a key cause is a lack of suitable habitat, including the silting of spawning beds. Siltation may be related to **river flows and levels**. As mentioned above **flood management** can impact on the fishery habitat. In addition, **integrated management** of the catchment is an issue because a range of activities in the catchment, both in time and space, can impact on the fishery, such as the condition of the riparian vegetation.
- 5.6 Management of the **Cotswold Water Park** involves a number of issues and uses, including **fisheries, flooding, recreation and conservation**. Mineral extraction from the area is continuing and the park is undergoing constant development. In order to ensure the sustainability of uses of the area it will be necessary to develop an **integrated** approach to the Park system.
- 5.7 There are a number of **recreation** issues, for example, facilities for canoeists are very limited. Plans to reopen the **Severn to Thames Canal** and the **Wilts and Berks Canal** have implications for **river flows and levels** (i.e. water resources), **water quality** and **fisheries**.
- 5.8 The **Severn-Thames transfer and SWORP** touches on a number of issues, including **fisheries, flooding, river flows and levels, and water quality**.
- 5.9 The concept of **integrated management** embodies the fundamental principles of catchment management planning. Integrated means the interconnection of activities over space and time. In terms of space we suggest that the full range of issues and opportunities must be looked at a catchment scale and in a totally integrated manner. For instance, certain agricultural policies could be integrated into a long term vision of the catchment which takes accounts of the needs of farmers and the requirements of a healthy water environment. The time element of the integration concept refers to maintaining long term records and "looking ahead" to foresee problems. An example of the need to maintain a time-based perspective is flood hazard management where long periods of hydrometric records are required. In effect, integrated management is a "catch all" which includes all issues which impact on the water environment, from planning decisions to implementing agricultural policies.(waffly)
- 5.10 A virtual subset of **integrated management** is the issue of **communication**. By communication we mean the interactions and exchange of information between the various users, management agencies and interest groups in the catchment. The concept of communication is relevant to every issue in the catchment.
- 5.11 All the issues listed above are discussed under the following headings:

Overview: A brief summary of the issue.

Issue: A discussion of the key features of the issue.

- 5.12 **Way Forward:** A consideration of the strategies to address the issue and a discussion of the implications of adopting these. Advantages and disadvantages of the strategies are then considered. Detailed analyses of the possible strategies, their costs and timetables for implementation, have not been prepared and are beyond the scope of the Consultation Report.
- 5.13 **Implementation:** The agencies, groups and individuals responsible for implementing the way forward.

RIVER FLOWS AND LEVELS

Overview

- 5.14 Flows and water levels in the rivers fed by groundwater were a cause for recent public concern.

Issue

- 5.15 During the drought of the 1989 -92 there was considerable public concern about flows, levels, water quality and instream ecology in the groundwater-fed watercourses in the northern part of the catchment. The public attributed the flow reductions to groundwater abstractions. The NRA commissioned a study to look at the causes of flow reductions and changes to the aquatic ecosystem in the Coln River. The main findings of the study are as follows:

- a) Severe one year droughts and, in particular, low winter rainfalls have a significant impact on river flows. The river dried up in 1890 and it appears to dry up periodically, albeit rarely (?).
- b) Groundwater abstraction appears to be a minor factor in reducing river flows compared with the impact of the drought in the late 1980's.
- c) Smaller flows have resulted in a reduction in aquatic plant growth. These plants are normally so abundant that they hold back river flows and cause river levels to rise. The reduction in weed and the consequent decrease in levels has had a severe impact on both the appearance and the ecology of the river.
- d) A change in plant species composition seems to have occurred, with water crowfoot being replaced by attached algae in some reaches. The reasons for the change are not clear, but may be related to river flows.
- e) Siltation of the river bed, which was a key concern amongst anglers, is probably a consequence of reduced river flows.
- f) River and land management do not appear to have contributed significantly to the observed problems. However, dredging in the 1950's may still be having an impact on the aquatic ecosystem in some reaches.
- g) The groundwater system in the catchment is not fully understood.

- 5.16 It should be noted that the groundwater system in each of the Cotswold catchments probably varies from river to river. Therefore, the findings of the Coln investigation cannot necessarily be applied to other catchments. Specific studies are required to determine the causes of the reported low flows in the other Upper Thames catchments

Way Forward

- 5.17 The report on the Coln presented a number of recommendations. These recommendations and other suggestions are presented below as possible ways forward.

1. Monitor the changes in aquatic plants and undertake research

The change in aquatic plants from species such as water crowfoot to attached algae has been reported by river users in many catchments in the Thames region. Research into this problem ought to be undertaken and a monitoring programme established to provide baseline data.

Advantages Increased understanding. This understanding will assist in the accurate identification and assessment of the problem. In addition, this type of monitoring could be incorporated in river corridor surveys.

Disadvantages Cost of monitoring and research.

2. Increase the knowledge of groundwater processes in the area

The aquifer system and therefore groundwater processes in the catchment are complex and not fully understood at present. Further studies into the groundwater system ought to be undertaken.

Advantages Increased knowledge and more accurate information.
Information for setting minimum acceptable flows.

Disadvantages Cost - groundwater investigations can be expensive.

3. Set minimum acceptable flows

Minimum flows provide a useful management tool but have not been set for the catchment. Setting minimum flows requires a detailed understanding of the hydrology of the individual streams in the catchment.

Advantages Enable targets to be set.
Allows performance to be assessed.

Disadvantages Minimum acceptable flows are very difficult to set, particularly for the streams which "dry up" periodically, albeit extremely rarely. A thorough understanding of the hydrology of the streams is required. Often there is an insufficient length of data to set MAFs.

- 4. Undertake catchment specific studies in the other Cotswold catchments**
In terms of Cotswold catchments (other than the Coin) where there are public concerns about low flows further studies are required.

Advantages The causes of the low flows can be clearly identified, uncertainty will be reduced, public debate lessened and effective action plans can be formulated.

Disadvantages Cost.

Implementation

- 5.18 The NRA has a lead role to play in all the above options. In terms of the first option English Nature may wish to become involved in a large scale study into aquatic plants. TWUL may wish to participate in further studies into the aquifer system in the catchment.

WATER QUALITY PROTECTION AND ENHANCEMENT

Overview

- 5.19 Chemical targets of certain reaches are too stringent. In other reaches chemical targets are not met. Biological monitoring indicates pollution in the Rivers Key and Ray and in many of the smaller brooks in the southern part of the catchment. A groundwater protection zone is in the process of being established at Fairford.

Issue

- 5.20 The Provisional Water Quality Objectives (PWQO) for sections of the Rivers Coln, Dudgrove Stream, Verey more Ditch, Swill and Lydiard Brooks are not being met at present. These PWQOs are very stringent and could not be met without a substantial public investment. It is unlikely that this investment could be justified on a cost/benefit basis or in relation to the benefits of capital expenditure on other environmental enhancement projects in the catchment.
- 5.21 Additionally, sections of the Rivers Coln and Thames and the Lertwell, Liden and Westrop Brooks fail to meet their PWQO. The causes of the failures are unknown, but could include pollution from agricultural sources or from small rural sewage schemes.
- 5.22 Biological monitoring indicates poor water quality in sections of the Rivers Key and Ray, and in the Shill, Liden, Bydemill and Vineympore Brooks. In the River Key and the smaller brooks the sources of pollution may be from agricultural activities or discharges from rural sewerage schemes. The reasons for poor biology in the River Ray is intermittent pollution from urban sources and possibly run-off from contaminated land.
- 5.23 A nitrate sensitive area at Fairford has been proposed by the NRA. This zone will assist in the protection of groundwater quality at the TWUL abstraction at Fairford. In addition, the NRA is commencing a groundwater quality monitoring programme which will provide base line information.

Way Forward

- 5.24 The following ways forward for each of the issues identified above are suggested:
- chemical targets which are too stringent;
 - failures to meet chemical and biological targets;
 - protection of groundwater.
1. **Lower certain PWQO**
The PWQO for certain reaches should be downgraded from RE1 to RE2, where an RE1 target cannot realistically be achieved. It will be necessary to define which reaches ought to have their PWQO changed.

Advantages: Large amounts of public money will not be spent on very minor improvements to the aquatic environment.

Disadvantages: Cost of investigation to determine which reaches should have lower PWQO.

2. Undertake research into the causes of failures to meet chemical and biological targets

The research programme will need to focus on the following areas:

- impacts of small rural sewerage schemes on water quality;
- means to control pollution incidents from urban and agricultural sources;
- the problems associated with run-off from contaminated land, particularly in the Swindon area.

Advantages: The result of the research will enable decision-makers to identify failures to meet targets.

Disadvantages: Cost of research.

3. Continue a proactive approach to pollution control. NRA currently operate a proactive approach to pollution control. This approach should be continued.

Advantages: Pollution incidents are kept to a minimum.

Disadvantages: Cost of proactive programme.

4. Protection of Groundwater Quality

There are two parts to this way forward; (i) establishment of a monitoring programme, (ii) establishment Nitrate Sensitive Areas (NSA) and other protection/remediation measures as necessary.

Advantages: Monitoring will provide information to water managers. The establishment of NSA will assist in protecting groundwater quality and will result in overall savings to the public in relation to the treatment of water.

Disadvantages: Costs of monitoring and costs associated with establishing NSA's.

Implementation

- 5.25 The NRA has a role to play in all the above options. TWUL may wish to become involved in options 1 and 4. Farmers, MAFF, local authorities and industry all have roles to play in options 3 and 4.

FLOODING

Overview

- 5.26 Flooding occurs in certain places in the catchment. The NRA operates two different flood management policies and the implementation of both of these is associated with a number of problems.

Issue

- 5.27 In some parts of the catchment localised flooding is a problem. The towns affected by localised flooding problems include Ashton Keynes, Somerford Keynes and South Cerney. In the majority of cases the flooding affects minor watercourses where the NRA does not have statutory responsibility for flood hazard management. (The NRA has responsibility for flood hazard management on designated main rivers only). However, the NRA does tend to become involved in these localised issues as a consequence of being viewed by the public as the agency responsible for flood management. In these cases the normal approach of the NRA is to set up communication links with the relevant local authority, which has statutory responsibility for flood hazard management, and the affected community.
- 5.28 On designated main rivers the NRA operates two parallel flood management policies; (i) the Non-Tidal Flood Plain Policy, and (ii) a system of Standards of Service for different types of landuse.
- 5.29 The Non-Tidal Floodplain Policy seeks to limit development in areas which flood more frequently than once in one hundred years. However, at present it is not possible to accurately determine the 100 year flood because a very long period of river flow record - usually 1000 years of record - is required and record of this length is not available. In addition, a range of factors may affect flood levels such as land use changes and alterations to the channel. Thus, there are significant problems in implementing the one in a hundred year flood concept.
- 5.30 The NRA implements the Non-Tidal Flood Plain Policy on the basis of land which flooded during the major 1947 flood as a surrogate for the one in a hundred year flood. This is a simple and robust approach but it should be noted that the flood in 1947 may not be a 100 year event.
- 5.31 Implementing the Standards of Service policy is problematic. Flooding on some landuse types may fall short of the required target but the costs of raising flood protection to the required standard may significantly outweigh the benefits. In effect the policy appears to assume that the current landuse in an area is acceptable whereas in some circumstances it may be more appropriate to encourage landuse changes rather than set impossibly high standards of service.
- 5.32 Another problem with the Standards of Service approach is that it is implementation on a reach by reach basis which makes the policy difficult to

integrate into a total catchment perspective. A further problem is that land use may change over time necessitating a change in the standard of service. For example, a flood scheme may be designed to provide a low level of protection but subsequent development may require a higher level of service, or high value agricultural land may be placed under "Set Aside" which will reduce the level of service required and will result in a loss of investment in flood protection works. The Standards of Service concept, therefore, is not straight forward to apply in reality.

- 5.33 The Cotswold Water Park is associated with flooding issues. These are discussed in the following section on the Water Park.

Way Forward

- 5.34 Ways forward for each of the three issues identified; (i) localised flooding, (ii) implementation of the Non Tidal Flood Plain Policy and (iii) implementation of the Standards of Service Policy are as follows:

1. **Localised Flooding**

In terms of flooding which does not occur on "designated main rivers", i.e. flooding for which local authorities have responsibility, the NRA may wish to continue to act as a broker between the affected community and the local authority.

Advantages NRA can disseminate the extensive experience it has in flood hazard management to both the affected community and the local authority. Better flood hazard management may result.

Disadvantages The NRA has no statutory involvement in localised flooding and would probably have to be invited to participate in the management process.

2. **Non Tidal Flood Plain Policy**

Continue to use the 1947 flood as the surrogate for a one hundred year flood.

Advantages Using the 1947 flood provides a clearly definable benchmark around which flood hazard management can be arranged.

Disadvantages The 1947 flood may not be the "100 year" event and using this flood as a bench-mark may result in either too high or too little flood protection.

3. **Undertake a Large Scale Study to Determine the 100 Year Flood**
Using computer modelling techniques it may be possible to define the 100 year flood with a good degree of accuracy.

Advantages Better information for decision making.

Disadvantages Cost of the study.

4. **Standards of Service Approach**
Conduct a research programme into the application of the Standards of Service Approach, perhaps using a range of different catchments as case-studies.

Advantages The results of the research programme will allow water managers to apply the Standards of Service concept in a more effective manner.

Disadvantages The research may take many years to complete, therefore the Standards of Service approach may not be able to be effectively applied for a number of years.

Cost of research, although the long term benefits of having an effective flood hazard management system in place may well exceed the cost of the research.

Implementation

- 5.35 The NRA has a lead role to play in all the above options. Local authorities and communities have a role to play in option 1.

FISHERIES

Overview

- 5.36 Throughout much of the catchment the fishery does not appear to be performing as well as could be expected. In addition, there is conflict between fisheries and other users in the catchment.

Issue

- 5.37 The biomass targets on the Rivers Churn, Cole, Ray, Thames and the Ampney Brook are not being attained. The river ecosystems appear to be capable of supporting a good quality fishery and the reasons for the lower than expected performance of the fishery are unknown. Possible reasons include the impact of the drought in the early 1990's and poor recruitment which may be related to a lack of spawning gravels.
- 5.38 There are conflicts between fisheries and other uses. For example, in the Cotswold Water Park some recreational uses, such as jet skiing are in direct conflict with fisheries use.

Way Forward

- 5.39 The following ways forward are suggested:

1. **Monitor the state of the fishery**

Baseline information, including fish habitat assessment, is required to determine the state of the fishery and to detect changes. Currently the NRA survey the rivers in the catchment approximately every five years and we suggest that this programme continues.

Advantages

Better information.

Results of fishery enhancement efforts can be assessed and monitored.

Disadvantages

Cost of monitoring.

2. **Investigate the cause of the small amount of suitable spawning gravels**

There does not appear to be an obvious explanation for the reported reduction in spawning gravels. Further research into this area is required.

Advantages

Better information allowing an accurate assessment of the problem.

Information obtained may be incorporated into other management activities which may have an impact on

spawning gravels, such as channel maintenance for flood management purposes.

Disadvantages Cost of investigations.

3. Reduce the impact and frequency of pollution incidents

In the River Cole catchment spillages appear to be having an impact on the fishery. The NRA ought to ensure that pollution incidents are kept to a minimum. The issue of pollution incidents is discussed further in a previous section.

Advantages Improvement in the fishery.

Disadvantages Cost.

4. Prepare a Fisheries Plan

A fisheries plan ought to be prepared for the catchment.

Advantages The development of the fishery would be planned in a sustainable manner;
The plan could be used to resolve conflicts between fisheries and other users;
A fisheries plan could form part of an overall strategy for the Cotswold Water Park;
Longterm costs associated with fisheries management could be reduced.

Disadvantages Upfront costs of preparing the plan.

Implementation

- 5.40 The NRA has a key role to play in monitoring the state of the fishery and in conducting research into fish habitat in the catchment. Anglers may also have a role to play. Involving anglers in both a monitoring programme and fish habitat studies may be beneficial from a communications perspective (see later).
- 5.41 In terms of reducing the risk associated with pollution incidents the NRA has a key role to play. Other agencies and individuals also have an important role, including farmers, industrial operators, transport operators and TWUL.

COTSWOLD WATER PARK

Overview

- 5.42 Aggregate extraction in the Cotswold Water Park is associated with a number of issues including impacts on; fisheries, flooding and nature conservation.

Issue

- 5.43 The Cotswold Water Park is a nationally important water feature and internationally important in terms of wildlife. From the catchment perspective the Park is important in terms of the fishery, flood hazard management, recreation and conservation. Its importance to conservation is reflected in a number of SSSI in the area. The Park is currently used for aggregate extraction and the extraction needs to be carefully managed to ensure that current uses are sustained and that opportunities, rather than problems, are created.

Way Forward

- 5.44 Three ways forward have been identified:

1 A Landuse Strategy

The NRA has developed a vision for the Cotswold Water Park which seeks to ensure that future development is environmentally sustainable, and in particular takes account of the environmental sensitivity of the area. A strategy for implementing this vision, i.e. a way forward, has been prepared by the NRA and comprises the following three elements:

1. Areas where the NRA are likely to formally object to extraction through the planning process, such as SSSI's.
2. Areas where extraction followed by restoration to agriculture is acceptable.
3. Areas where extraction followed by restoration to diverse wildlife habitats, including open water and wetlands, is acceptable.

The NRA intends to implement the strategy through the planning process and will advocate certain development options at the appropriate planning fora.

Advantages The advantages of this strategy include the potential enhancement and sustainability of the aquatic environment in the Water Park.

Disadvantages None.

2 Further studies

In order to ensure that extraction in the Cotswolds is environmentally sustainable research is required. In particular the following areas require further investigation:

- The hydrology, hydrogeology and hydraulics of the Cotswold system needs investigating. The purpose of this investigation will be to assess the impacts of mineral extraction on both flooding and water quality.
- Landscape assessment. The impact of future developments on the overall landscape needs to be assessed, particularly in relation to the Thames Path National Trail. Other bodies, such as the County and District Councils and the Countryside Commission, may wish to be involved.
- Buffer zones. It is widely known that buffer zones are beneficial from a number of environmental perspectives, including water quality protection and ecological enhancement. However guidelines for their implementation have not been developed. Further information is required on the type and location of buffer zones which would maximise their benefit in the Water Park Area.

Advantages The main benefit from the above the above studies will be better information for decision making.

Disadvantages Cost.

3 Actions to reduce flood hazard

In the absence of detailed research, certain actions can be taken to reduce flood hazard. This approach is in keeping with the concept of precautionary action. The main action to reduce flooding is to undertake extraction perpendicular rather than parallel to groundwater contours.

Advantages Reduction in flood risk.

Disadvantages None.

Implementation

- 5.45 The NRA has a role to play in all the above options. For some options a range of organisations will be involved, for example, local authorities and English Nature. All the relevant agencies will need to communicate and coordinate their activities to ensure the sustainable management of the region.

RECREATION AND CANAL RESTORATION

Overview

5.46 There are a number of recreational issues in the catchment:

- on the one hand the NRA promotes recreational use of rivers but on the other hand it does not support water-contact activities such as swimming. These two approaches used to be integrated;
- community interest groups support the reopening of the two canals in the catchment, the Severn to Thames and the Wilts and Berks canal. Certain sections within the NRA may also be in favour of these proposals. However, there is concern that there may be insufficient water to operate the canals;
- certain user groups, in particular canoeists, are under represented in terms of recreational facilities in the catchment.
- The Thames is navigable for power boats as far as Inglesham, however the river is defined as a navigable watercourse for a further ten miles upstream.

Issue

5.47 The NRA seeks to promote the best practicable recreational and amenity use of waterways. An increase in recreational use inevitably leads to an increase in water contact, for example people falling into the river from boats. As a general policy the NRA discourages contact recreation on the grounds of health risk. Therefore, the NRA policies to encourage recreational use of waterways but to discourage contact recreation need to be integrated.

5.48 Nationally the reopening of canals is viewed as a "good thing". Certain community based groups, in particular the Cotswold Canal Trust, are actively promoting the reopening of the Severn-Thames canal and this proposal may also receive the support of certain departments within the NRA. In addition there are proposals to reopen the Wilts-Berks Canal.

5.49 Canals require an appreciable quantity of water to run successfully. As has been discussed in the flows-levels section earlier there are already significant water resource constraints in the catchment. There may be insufficient water to operate the canals and the reopening of the canals may result in a significant water resource conflict.

5.50 The British Canoe Union has pointed out that there are few canoe facilities in the Upper Thames catchment. NRA staff with responsibility for recreation concur with the Canoe Association's view. There may be the possibility that other user groups are similarly under represented in terms of recreational facilities.

- 5.51 The Upper reaches of the Thames are defined as a navigable waterway but are not currently navigable to power boats as a consequence of insufficient depth. Major river works would be required to make this section navigable and there may be a number of impacts on other users and the aquatic ecosystem.

Way Forward

- 5.52 The following ways forward are suggested:

1. Internal NRA conference with the purpose of integrating NRA policies on recreational use and contact recreation

A conference or workshop comprising members of the NRA could provide a useful forum for integrating NRA policies on recreation.

Advantages The NRA recreation policy may become more clearly defined. More concise and more accurately targeted policy may result.

Disadvantages Costs.

2. Develop a target/management system for contact use

It may be possible to develop a system which enables water managers to identify the more desirable areas for contact recreation. The NRA could then encourage and discourage contact recreation, and by implication recreation in general, in certain areas. Such a system may go some way to integrating the conflict between different NRA policies.

Advantages A more coherent recreation policy could be formulated.

Disadvantages Cost; developing a classification system for contact recreation is inherently problematic and may require primary research into water contact, pathogens and health risk.

3. Conduct a thorough investigation into the environmental aspects of reopening the Severn-Thames canal and the Wilts and Berks canal.

To ensure that canal restoration has negligible impact on the environment an environmental impact assessment ought to be undertaken. This assessment should pay specific attention to the water resource related aspects of the canals.

Advantages The environmental issues can be identified.

The water resource constraints can be objectively assessed.

Disadvantages Cost; however, an EIA will probably have to be undertaken as part of a scheme to reopen the canal.

4. Develop recreation facilities for specific activities

Where it is clear that recreational facilities are lacking for certain uses, such as canoeing, the NRA may be prepared to provide these facilities or encourage the user group if they seek to provide the facilities themselves. However, the provision of additional recreational facilities should not be conducted on an ad-hoc basis but should be viewed from a total catchment perspective.

Advantages Facilities will be provided for user groups who need them.

Disadvantages Cost of providing facilities; potential conflict between uses.

5. Development of a recreation strategy for the Thames catchment

Recreation in the Upper Thames portion of the Thames catchment cannot be considered in isolation to recreation throughout the rest of the catchment. An overall recreation strategy for the catchment is required to ensure that recreational developments are planned in an integrated rather than piecemeal fashion. Work is being undertaken by the NRA in this respect in conjunction with the Sports Council.

Advantages A recreation strategy will enable balanced development to occur. This may assist in resolving the legal issues associated with navigation on the upper reaches where the river is classed as a navigable waterway but is not navigable to powered craft at present.

Disadvantages Cost of developing the policy.

ANGLING??

Implementation

5.53 The NRA has a key role in many of the above ways forward. In terms of promoting the canal development a number of different agencies have an involvement, including local authorities and the relevant canal promotion groups. Users groups, such as canoeists, have a key role to play in working with the NRA to provide facilities.

INCREASED WATER DEMAND IN SWINDON, SEVERN TO THAMES TRANSFER AND THE SOUTH WEST OXFORDSHIRE RESERVOIR PROPOSAL (SWORP)

Overview

- 5.54 Major expansion is planned to the north of Swindon which will increase water demand. Water resources are nearly fully committed in the catchment. Various schemes have been suggested to increase water resources including transferring water from the Severn to the Thames and the construction of a large reservoir (SWORP). There are a number of environmental issues associated with these schemes.

Issue

- 5.55 Water resources in a number of locations around England are insufficient to meet projected demand. Planned development in Swindon provides a case study of the type of water resource problem which occurs in the Thames catchment. Swindon is planned to grow over the next ten years with the addition of 10,000 houses or approximately 27,000 people. This development and associated employment related activities will increase overall water demand in the Swindon area further.
- 5.56 (thames regional strategy also) In an effort to plan carefully for the supply of water the NRA has published a Water Resource Strategy for England and Wales. As part of this strategy the NRA has proposed moving water from areas with surplus water resources to those areas with shortages. One such scheme is the transfer of water from the Severn to the River Thames and/or the construction of a large storage reservoir in South West Oxfordshire, known as SWORP.
- 5.57 The Water Resource Strategy for England and Wales has recommended that water conservation measures, such as demand management, should be introduced before large scale transfer schemes are investigated. However, the report also considers that baseline environmental investigations into the transfer schemes ought to be undertaken now in case the schemes are considered necessary in the near future.

Way Forward

- 5.58 The issues raised above mainly concern the National Water Policy. Therefore many of the ways forward concern national rather than catchment level options.

1 Seek to reduce demand

The first step towards a more sustainable water resource management regime is to use water more efficiently. It is the NRA's position that water companies and OFWAT should be given the statutory duty to promote the efficient use of water.

Advantages

Projected water consumption may increase more slowly, or even reduce.

Disadvantages Efficiency is a difficult concept to define and promote. In addition, water demand will eventually increase in line with population increases and economic growth irrespective of the efficiency with which water is used.

2 Discourage further development in areas with insufficient water resources

The NRA is becoming increasingly involved in planning issues to ensure that its interests are protected. As part of this involvement the NRA seeks to promote development in areas which have a surplus of water resources.

Advantages Water supply constraints will be reflected in the siting of new developments.

Disadvantages Large parts of the England and Wales including the Thames catchment are likely to suffer from water resource constraints within the next 20 years. It is not feasible to limit new development over such large areas.

3 Collect baseline environmental data for future planning purposes (responsibility on the developer to do this) Should it be decided at some time in the next 20 years that the Severn to Thames transfer or SWORP ought to go ahead a large amount of environmental information will be required to ensure that the impacts of the transfer are minimised. The collection and analysis of environmental data takes many years and to ensure that adequate environmental information is available it is suggested that background studies are initiated.

Advantages Better information for the decision making process.

Disadvantages Cost.

Implementation

5.59 The NRA, Water Companies, the Water Regulator (OFWAT), water consumers, planning agencies and central government all have a role to play in the implementation of the above options.

INTEGRATED MANAGEMENT

Overview

- 5.60 Sustainable management, which is the overall concept guiding the development of this catchment plan, requires an holistic integrated approach.

Issue

- 5.61 As a key part of the move towards sustainable human uses of ecosystems, an integrated approach to natural resource management is required. The following scenario, concerning a hypothetical catchment draining agricultural land, illustrates the need for integrated approaches at the catchment scale.

Agricultural development of wetlands and river margins led to channel works being undertaken to reduce flooding. In the main these works involved channel straightening, widening and deepening. As a direct result of this work the fish habitat suffered. As an indirect result of agricultural activity nutrient levels in rivers increased bankside vegetation decreased and both of these effects led to an increase in aquatic plant growth. The plant growth resulted in flooding and to control flooding weedcutting was undertaken. This cutting was both expensive and to some extent environmentally damaging. Over time public policy changed and attempts were made to restore instream fish habitats, however these efforts did not extend to the entire river ecosystem, including the riparian vegetation but focused on the bed of the river itself. At about the same time agricultural land was being "Set Aside" but the overall environment did not benefit from the set aside policy because the policy was not integrated into the total catchment perspective.

- 5.62 In the above example the different uses of the catchment have not been integrated. The management of the hypothetical river requires considerable effort in terms of both flood defence and ecosystem restoration and from the overall perspective the ecosystem has suffered.
- 5.63 Developing integrated management approaches represents a substantial challenge to all those who live in and use a catchment. The concept of integration requires specialists to broaden their perspective and appreciate the impact of specific activities on the entire catchment and over different periods of time.

Way Forward

- 5.64 Three ways forward have been identified; (i) a research programme into integrated management, (ii) NRA participation in planning issues, and (iii) long term monitoring (integrated management overtime).

1. Develop a research programme into integrated management using specific catchments

Research into the practical aspects of integrated management is required. Certain catchments should be chosen as case studies to explore the problems and practicalities of implementing the concept of integrated catchment management. The Upper Thames catchment lends itself well to such a programme on account of the large number of sub catchments, one or two of which would be chosen for a research project.

Advantages The techniques of integrated catchment management can be developed in a structured environment. The results and achievements can be disseminated to natural resource managers throughout England and Wales.

Long term catchment management costs, such as flood defence and channel works, may be significantly reduced.

Disadvantages Upfront costs of the research.

The research must involve a range of people whose lives and possible economic livelihood may be affected by this project and who therefore may be unwilling to act as "guinea pigs" in a "live" research project.

2. Involvement by the NRA in planning and development issues

It is better to influence development proposals at an early stage rather than have to react to decisions when they are made. There is a role for the NRA to promote the protection and enhancement of the water environment at the earliest possible stage in planning and development issues.

Advantages: Planning and development issues will take account of impacts on the water environment.

Disadvantages: Costs to the NRA of becoming involved in planning/development issues.

3. Long term monitoring

Long term monitoring is necessary to ensure changes over time and trends are detected.

Advantages: Better information for decision makers; long term savings as a consequence of more accurate decision making.

Disadvantages: Costs.

Implementation

- 5.65 A range of agencies would need to be involved in the research project, including farmers, local authorities, MAFF, NRA, Universities, communities, other central government agencies. A funding agency would be required to provide the up-front costs of research. The NRA has a key role to play in influencing planning/development decisions and in long term monitoring.

COMMUNICATION

Overview

- 5.66 Good communication between the various groups involved in catchment management is required to ensure that the catchment is managed on a sustainable basis.

Issue

- 5.67 The actions of a range of individuals and user groups impact on the catchment and affect different uses. All groups, both statutory and non-governmental, need to communicate to ensure that development at the catchment scale is sustainable and that the ability of the ecosystem to support different uses is sustained.
- 5.68 A possible approach to encourage communication between the different "players" in the catchment is for the NRA to facilitate a working group. This group could comprise representatives from the statutory agencies and leading interest groups.

Way Forward

- 5.69 Views are sought on the merits of the NRA leading a "catchment working group" or other similar groups.

Advantages There are a number of benefits to be obtained from a working party type of approach.

Disadvantages The working party needs to be carefully structured to ensure that all groups have access to the resources necessary to enable them to successfully contribute to the decision making process.

Implementation

- 5.70 All interested parties have a role in the establishment and success of a system of working groups.

6. CONCLUSIONS

THE NEXT STEPS

- 6.1 This document has been produced through internal discussion, informal liaison with a wide range of organisations (see Appendix A) and a desk study of readily available reports produced by organisations such as local authorities.
- 6.2 Whilst every effort has been made to ensure the accuracy of the information the plan may contain a number of omissions and inaccuracies. The next step, therefore, is to formally consult with organisations, groups and individuals interested in the future of the catchment's water environment. Consultation will enable the NRA to:
- clarify the extent and distribution of current uses of the catchment;
 - assess the importance of catchment uses;
 - identify the wide range of likely, possible and potential future catchment uses;
 - expose catchment specific issues to a wide audience;
 - ensure decisions on the future management of the catchment are based on accurate information and the fullest possible range of views from interested parties.
- 6.3 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 considered:
- have the current and future uses of the catchment been correctly identified?
 - have the issues been fairly addressed and what opinions do you have on them and the options we propose?
 - have any issues been missed?
 - how should the evaluation of the issues and the development of strategies and action plans be progressed?
- 6.4 During the consultation period comments can be submitted in writing to:

Upper Thames Catchment Management Plan
National Rivers Authority Thames Region
Isis House
Howbery Park
Wallingford
Oxon OX10 8BD

- 6.5 Our Project Manager for the CMP, Jamal Hamid, can also be contacted on
All comments must be with us by
- 6.6 The consultation phase incorporates a number of separate but linked activities.
These include:
- a launch;
 - distribution of the full plan and/or a summary leaflet of key organisations, groups and individuals;
 - a display for use in libraries and other public areas;
 - public meetings as appropriate; and
 - news, radio and television releases.
- 6.7 At the end of the consultation phase results of the process will be considered in detail before producing a definitive Catchment Management Plan. The Final Plan will define both a strategy for the future management of the catchment and a series of action plans for the NRA and others to implement in order to deliver the strategy.
- 6.8 The information and views you provide are therefore a very important step in the overall process. It is hoped that you will respond positively to this initiative so that a shared vision for the Upper Thames Catchment can be developed.

APPENDIX A - RESULTS OF INFORMAL LIAISON

APPENDIX A - RESULTS OF INFORMAL LIAISON

A.1 The following provides a summary of the issues raised by different organisations through the informal consultation exercise.

PARISH COUNCILS

- Low water levels in rivers and brooks i.e.:
 - Ampney Brook
 - River Coln
 - River Leach.
- Great Oolite aquifer being over abstracted;
- Concerned about abstraction from rivers for domestic/commercial supply;
- Choking of rivers by weeds;
- Effects of gravel extraction in Cotswold Water Park on water levels;
- Flood risks from River Thames after gravel working;
- Water quality in rivers/brooks i.e. Tuckmill Brook;
- Diminishing wildlife especially birds;
- Need for water supply reserves in time of drought.

LOCAL AUTHORITIES (County/District Councils)

- Excessive water abstraction from oolites;
- Lowered river levels and low stream flows;
- Concern over provision of adequate water supplies;
- Need for positive environmental protection policies and practices;
- Protect pure water resources in gravels;
- Concern over nitrate/phosphate levels in rivers;
- Restrain building on flood plain;
- Promote access for recreation/leisure along riverside paths.
- Concern over flooding;
- Need for river management e.g. weeds, dredging;
- Preservation of river banks e.g. Coln, to prevent flooding;
- Importance of Cotswold Water Park for nature conservation, recreation and mineral extraction;
- Support restoration of canal network.

LANDOWNERS (through County Landowners Association)

- Prevent pollution of springs flowing into Coln;

- Concern over lowered water levels in springs, Ampney Brook and rivers Thames, Churn, Coln, Leach and Swill Brook;
- Need for river management e.g. weed clearing;
- Concern over sudden rises in level in Thames and the resulting flooding of crops;
- Concern over impacts of abstraction by TWUL at Baunton especially during droughts;
- The impacts of the SWORP;
- Fertilizer run off and associated effects on the river ecosystems;
- Ecological deterioration/loss of wildlife as a result of lowered water levels in streams etc;
- Deteriorating river quality affecting fisheries;
- Access needs to be recognised not only near large settlements and River Thames, but also in rural areas and around streams;
- Perceived threat of major water transfer scheme on the environment.

QUANGOS/INTEREST GROUPS/NON GOVERNMENT ORGANISATIONS

- | | |
|--------------------------------------|--|
| Great Western
Community
Forest | <ul style="list-style-type: none">• Concern over nitrate and phosphate levels, pesticides, agricultural and urban area run-off and resulting pollution in rivers.• Loss of herb rich meadows in river corridors.• Reduction in wildlife.• Promote waterside landscapes, countryside stewardship and river restoration projects.• Need for more natural river landscapes for wildlife and recreation.• Safeguard recreation routes e.g. along Rivers Ray and Cole. |
| Thames Water | <ul style="list-style-type: none">• The CMP should reflect realities of funding, timescales and priorities. Costs and benefits, nature and timing of improvements should be identified. |
| Angling
Interests | <ul style="list-style-type: none">• Restrict abstraction licences from the Thames tributaries to prescribed flows.• Impacts of flood management on the fishery.• Concern over quality of tributaries (Thames). |
| Cotswold
Canals Trust | <ul style="list-style-type: none">• Severn and Thames canal - could relieve flooding.• Proposal to back pump water up the canal to provide water for navigation and increase low flows in Thames Head waters, thereby avoiding water resource conflicts. |
| NFU | <ul style="list-style-type: none">• Interested in effects on water quality of agricultural run off and sewage sludge.• Water availability and abstraction licensing. |
| CPRE | <ul style="list-style-type: none">• Limit abstraction/impacts on river flows.• Protect water quality and wildlife.• Restrain development if water supply infrastructure is out of phase. |
| National Trust | <ul style="list-style-type: none">• Mention Countryside Stewardship Schemes and Rivers Restoration Project. |

Friends of the Earth

- Important issues include:
 - Lowflows
 - Development on flood plains
 - Recreation impact
 - Monitoring
 - Protection of potable sources
 - Water quality issues
 - Contaminated Land
 - Eutrophication
 - Water logged soils
 - ESAs and Nitrate SAs
 - Landfill and minerals industry

RSPB

- Safeguard habitat for breeding birds, invertebrates and aquatic plants in Cotswold Water Park.
- Create wetland habitats, grassland and reedbeds in Cotswold Water Park.
- Safeguard SSSIs.
- Include a commitment to prepare and implement water level management plans for important wetland wildlife sites.
- Have regard to Environmental Procedures for Inland Flood Defence Works.

British Canoe Union

- Acknowledge canoeing on water sites in catchment and also potential for additional sites. Rivers Thames, Ray, Churn and Cole are used by canoes.
- Access agreements on all canoeable rivers are desirable.
- Recognition by NRA of the need for more access for recreation purposes to land held by NRA.
- Correlate fees paid by canoeists on River Thames with development of canoe site facilities
- Prevent changes in river engineering (weirs and sluices etc) which jeopardise canoeing activity.
- Water quality.

APPENDIX B - DEFINITION OF CATCHMENT USES

APPENDIX B - DEFINITION OF CATCHMENT USES

ECOLOGY

- B.1 This use relates to the protection of all aquatic flora and fauna along with dependent organisms. Dependent organisms are plants and animals which rely, at some stage of their life cycle, on the aquatic environment or associated land. A healthy river corridor will be characterised by a diverse and abundant plant and animal community and a variety of habitat types. The habitats of rivers, gravel pits, still waters, springs, wet pasture, mill leats and canals are all considered within this section.

FISHERIES

- B.2 This use relates specifically to the maintenance of breeding populations of salmonoid (i.e. game) and cyprinid (i.e. coarse) fish. European Commission (EC) Freshwater Fisheries Directive (78/659/EEC) "on the quality of waters needing protection or improvement in order to support fish life" provides a statutory basis for the protection of water quality in certain rivers. 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 quality;
- they are exploited by commercial and recreational fisheries;
- they contribute to the diversity of the water environment.

LANDSCAPE

- B.3 The landscape reflects the complex interplay between the natural environment and man's activities. Geomorphology, topography and drainage provide the basic elements of the landscape and, together with associated vegetation and settlement patterns, determine the essential landscape character of different areas.

HERITAGE

- B.4 Heritage deals with features of archaeological significance, areas which have been designated as conservation areas because of their urban form, and sites which are of heritage value because of their historic or archaeological importance. Many of these sites have a strong relationship with the landscape.

AMENITY AND RECREATION

- B.5 Activities such as walking, bird watching, angling, boating, sailing, rowing and picnicking bring people into close proximity with the water. The principal concerns are general aesthetic acceptability of water features, access to and along watercourses and the provision of appropriate facilities.

NAVIGATION

- B.6 This use relates to those waterways for which there is a statutory right of passage for boat traffic. The amenity and recreation, fisheries and landscape and heritage elements of navigation are considered in other use category descriptions.

WATER ABSTRACTION

- B.7 This use deals with surface and groundwater abstractions for potable (i.e. public water supplies) and non-potable (e.g. industrial, agricultural, recreational) supplies. Major potable abstractions are operated by Water Supply Companies. Since 1963 abstractions have been licensed to ensure they do not have a significant impact on existing sources of the natural water environment, including surface water flows. Abstractions of less than 20m³ per day for domestic use do not require a licence from the NRA.

EFFLUENT DISPOSAL

- B.8 This use relates to the disposal of domestic, industrial and agricultural effluents to the river system. The conditions to be met by a discharge are set out in a discharge consent which is issued by the NRA and applies to the specific discharge. Discharges can affect both the quality and quantity of a river. In terms of water quality discharges can have a severe impact on a river. From a water quantity perspective effluent discharges can maintain river flows during times of drought.
- B.9 When setting a discharge consent the NRA takes account of both the upstream water quality and the flow in the receiving water body. The NRA has a statutory role to monitor discharges and assess the effluent quality against the specifications in the consent.

RURAL LAND USE

- B.10 This section outlines the planning policies of the local authorities at structure plan and local plan level dealing with conservation of both the natural and built environment.

URBAN LAND USE

- B.11 This section includes the policies of the relevant local authorities at structure and local plan level dealing with future development. It sets out the general strategy and policies for individual land uses.

MINERAL EXTRACTION AND SOLID WASTE DISPOSAL

- B.12 Mineral extraction has the potential to affect the catchment through subsidence or effluent discharge whilst works are active. When they are closed their possible use as solid waste disposal sites could lead to contamination of ground and surface water. The County Councils are the licensing authority with respect to extraction of natural resources and must through their Minerals Plan achieve adequate mineral supplies with minimal environmental cost.

FLOOD DEFENCE

- B.13 This use deals with the protection of people with property from flooding from natural watercourses. Certain watercourses are designated as 'main river'. On main rivers the NRA have permissive powers to: construct new defences; maintain defences; and, control the actions of others so that the risk to existing and future uses (e.g. development) can be minimised. The NRA TR are the primary group involved in flood defence matters but on ordinary rivers Local Authorities are the first point of contact. For flooding from sewers the responsible group is either the Local Authority or Thames Water Utilities Limited.
- B.14 The standard of flood protection can be measured in terms of the frequency at which (e.g. 1 in 50 years), on average, it will prove ineffective. The standards considered appropriate vary according to the land use to be protected and the economics of providing the service. Flood defence work is closely associated with the physical form of the river and the adjacent areas. There is therefore the potential for conflict with uses which depend on the structure of the river e.g. fisheries and ecology.

APPENDIX C - GLOSSARY

APPENDIX C - GLOSSARY

AOD	-	above Ordnance Datum
BC	-	Borough Council
CC	-	County Council
CMP	-	Catchment Management Plan
DC	-	District Council
DoE	-	Department of the Environment
EC	-	European Commission
LNR	-	Local Nature Reserve
MAFF	-	Ministry of Agriculture, Fisheries and Food
MoD	-	Ministry of Defence
MRL	-	Main River Limit
NRA	-	National Rivers Authority
NRA TR	-	National Rivers Authority Thames Region
RQO	-	River Quality Objective
SSSI	-	Site of Special Scientific Interest
SWQO	-	Statutory Water Quality Objective
TWUL	-	Thames Water Utilities Limited
WO	-	Welsh Office
NRA	-	National Rivers Authority
RQO	-	River Quality Objectives
SWQO	-	Statutory Water Quality Objectives
PWQO	-	Provisional Water Quality Objectives
UWWT Directive	-	Urban Wastewater Treatment Directive
TWUL	-	Thames Water Utility Limited

UNITS

Length	-	10mm = 1 cm (equivalent to 0.394 inches) 100cm = 1m (equivalent to 39.37 inches) 1000m = 1km (equivalent to 0.621 miles)
Area:	-	10 000 m ² = 1 ha (equivalent to 2.47 acres)

Upper Thames Catchment Management Plan

Density: - 1 000 ng/l - 1 ug/l (equivalent to 3.53×10^8 ounces)
 - 1 000 ug/l = 1 mg/l (equivalent to 3.53×10^5 ounces)

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 = 11.61 l/s (equivalent to 0.224 mgd)

APPENDIX D - DESCRIPTION OF RESPONSIBILITIES

APPENDIX E - LISTS, DATA AND STANDARDS

*Upper Thames Catchment Management Plan***BMWP Scores at Each Site (1992/93 Data)**

Site	Reach	Score	Achieves Target Class
Ampney Brook	At Sheeppen Bridge	161	Y
Blunsden Brook	At Roadbridge, Water Eaton	42	N
Broadwell Brook	At Friars Court, Clanfield	106	Y
Bydemill Brook	Above Thames	43	N
Cerney Wick Brook	At Spine Road South Cerney	116	Y
Churn	At North Cerney	202	Y
Churn	At Gauging Station, Cerney Wick	192	Y
Cole	At B4019, Coleshill	153	Y
Coln	At Fossebridge	160	Y
Coln	At Roundhouse, Lechlade	166	Y
Derry Brook	At Roadbridge, Ashton Keynes	81	Y
Dudgrove Stream	At Gate 7, RAF Fairford	89	Y
Faringdon Brook	At 4095, Great Faringdon	32	N
Great Brook	At Chimney Lane, Aston	190	Y
Halfacre Brook	Below Clanfield	46	N
Haydon Wick Brook	Above Ray, Haydon Wick	42	N
Highmoor Brook	Below Norton Ditch	39	N
Key	At A419 Roadbridge, Cricklade	39	N
Leach	At B4449, Leachlade	164	Y
Lenta Brook	At Hinton Marsh Farm	65	N
Lenta Brook (East)	At A420 Roadbridge	23	N
Lertwell Brook	Near Zulu Buildings, B400	52	N
Liden Brook	Opp Lower Earls court Fm Building	63	N
Lydiard Brook	Above Ray (Wilts)	93	Y
Marston Mersey Brook	At R/b below Marston Mersey	90	Y
Radcot Cut	Above Great Brook	165	Y

Upper Thames Catchment Management Plan

Site	Reach	Score	Achieves Target Class
Ray	At Moredon Bridge, Swindon	57	N
Ray	At Morris Street, Swindon	75	N
Ray	At Seven Bridges, Cricklade	80	N
Share Ditch	At Roadbridge, Castle Eaton	38	N
Shill Brook	Above Carterton STW	105	Y
Shill Brook	At Roadbridge, Black Bourton	111	Y
South Marston Brook	At Nightingale Lane, Sth Marston	63	N
Swill Brook	At High Bridge, Ashton Keynes	160	Y
Thames	At Eysey	184	Y
Thames	At Water Intake, Buscot	127	Y
Tuckmill Brook	Above Shrivenham STW	79	N
Tuckmill Brook	75m below Shrivenham STW	48	N
Veneymore Stream	Below Little Faringdon Trout Fm	96	Y
Wadley Stream	At Duxford	64	Y
Waterloo Ditch	At Coleshill	82	Y
Wroughton Ditch	Below Wroughton STW	46	N

Microbiological Surveillance of the Upper Thames Catchment 1991-1994
(Including a Subjective Assessment of Levels of Bacterial Contamination)

Watercourse	Number of Sites Sampled	Number of Samples					Problem Areas
		Total	Background Levels	Treated Sewage Present	Poorly Treated Sewage Present	Gross Faecal Contamination	
Thames	8	155	96	55	4	0	d/s Ashton Keynes S.T.W.
Swill Brook	1	4	3	1	0	0	
Derry Brook	1	4	4	0	0	0	
Cerney Wick Brook	1	18	6	9	3	0	South Cerney
Churn	7	24	19	5	0	0	
Key	1	4	2	2	0	0	
Ray (Wilts)	6	32	0	28	3	1	Entire length d/s Wroughton Ditch
Hreod Burna	1	4	0	4	0	0	Hreod Burna School
Lydiard Brook	1	4	3	1	0	0	
Coln	13	66	42	22	2	0	Withington, Fossebridge
Shipton Stream	1	4	1	3	0	0	Shipton Solers
Cole	2	2	2	0	0	0	
Dorcan Brook	1	1	1	0	0	0	
South Marston Brook	1	1	1	0	0	0	
Lertwell Brook	1	1	1	0	0	0	
Tuckmill Brook	2	2	2	0	0	0	