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NRA

National Rivers Authority
Thames Region

RIVER CHERWELL CATCHMENT REVIEW

April 1994

Catchment Planning Section (West)
NRA Thames Region
(Internal Document)

NRA

National Rivers Authority
Thames Region

M E M O R A N D U M

To: See Distribution List

From: Jamal A Hamid Catchment Manager (West)

Our Ref: JH/HG/CHER/CR

Your Ref:

Date: 4th May 1994

RE: RIVER CHERWELL CATCHMENT REVIEW

*I enclose for your attention and information a copy of the above internal document prepared by Helen Brown, Catchment Planning West's industrial placement.

The document is a precursor to the River Cherwell Catchment Management Plan which will be started later on this year. In the meantime, this Review will be used by Mark Rowe (West Area's Business Planner) to identify and priortise sector objectives and actions, as appropriate.

The document has been produced with the help and advice of relevant in house Managers and Officers. May I take this opportunity to thank all those who have given time and information for the completion of Thames Region's first Catchment Review.

Jamal A Hamid

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RIVER CHERWELL CATCHMENT REVIEW

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1. INTRODUCTION

1.1 The National Rivers Authority (NRA) was established in the Water Act 1989. The NRA has defined it's role in the following 'Mission statement':

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

1.2 In order to effectively manage the water environment and sustain it for the future, the NRA has adopted the principle of Catchment Management Planning. This entails the preparation of Catchment Management Plans (CMP) for each natural river catchment within England and Wales. Through data evaluation, issue analysis, external liaison and consultation, the CMP provides a vehicle to focus attention on the water environment. The process involves all interested parties, in planning for the future well being of the catchment and establishes an integrated plan of action for managing the catchment over a period of five years, after which it is reviewed.

1.3 However, as a precursor to the commissioning of the Catchment Management Plans, brief and succinct Catchment Reviews are being drafted which will:

(a) provide a concise summary of the current status of the water environment;

(b) make full use of the knowledge of internal staff and their assessments of the value of the catchment to people and wildlife;

(c) provide a focus for integrating on-going NRA functional activities;

(d) promote, region wide awareness of issues and opportunities and priorities for action;

(e) facilitate the prioritisation and production of Catchment Management Plans.

1.4 The following review will provide a summary of catchment statistics, issues, current and future proposed NRA activity in order to achieve a broad awareness of potential cross functional opportunities and constraints. The document will also form the basis of the full Cherwell Catchment Management Plan due to start in August 1994, which will provide the focus for those concerned with the future health of the water environment of the River Cherwell.

2. CURRENT STATUS OF THE WATER ENVIRONMENT

2.1 This section will briefly summarise the natural features of the Cherwell Catchment as follows:-

- Area, population, rivers and water bodies;
- Land use planning;
- Geology and topography;
- Water Quality;
- Water Resources;
- Flood Defence;
- Conservation and Fisheries;
- Navigation and Recreation.

2.2 Key Statistics

Catchment area (sq. km)	906
Population of:-	
Cherwell District	117,804
Banbury	37,752
Bicester	20,248
Kidlington	13,886
Oxford	87,360
Total population of Cherwell catchment	63,461
Total number of properties in Cherwell catchment	58,747
Average annual rainfall (mm)	682
Total Main River length (km)	506
River Cherwell length (main river - km)	96

2.3 Overview

Situated to the north of Oxford, the Cherwell Catchment and the River Ray subcatchment drain an area of 906 sq.km (see Fig 1). The catchment is predominantly rural in character with the significant urban areas being Banbury, Bicester, and Oxford. Oxford is under continual pressure for new development and the Oxfordshire County Council has promoted a strict greenbelt policy under which it attempts to divert growth to its second tier settlements such as Kidlington. Development pressures in the catchment have been increased by the opening of the M40, which has made the Cherwell Catchment area more accessible from London and Birmingham.

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Physical Features

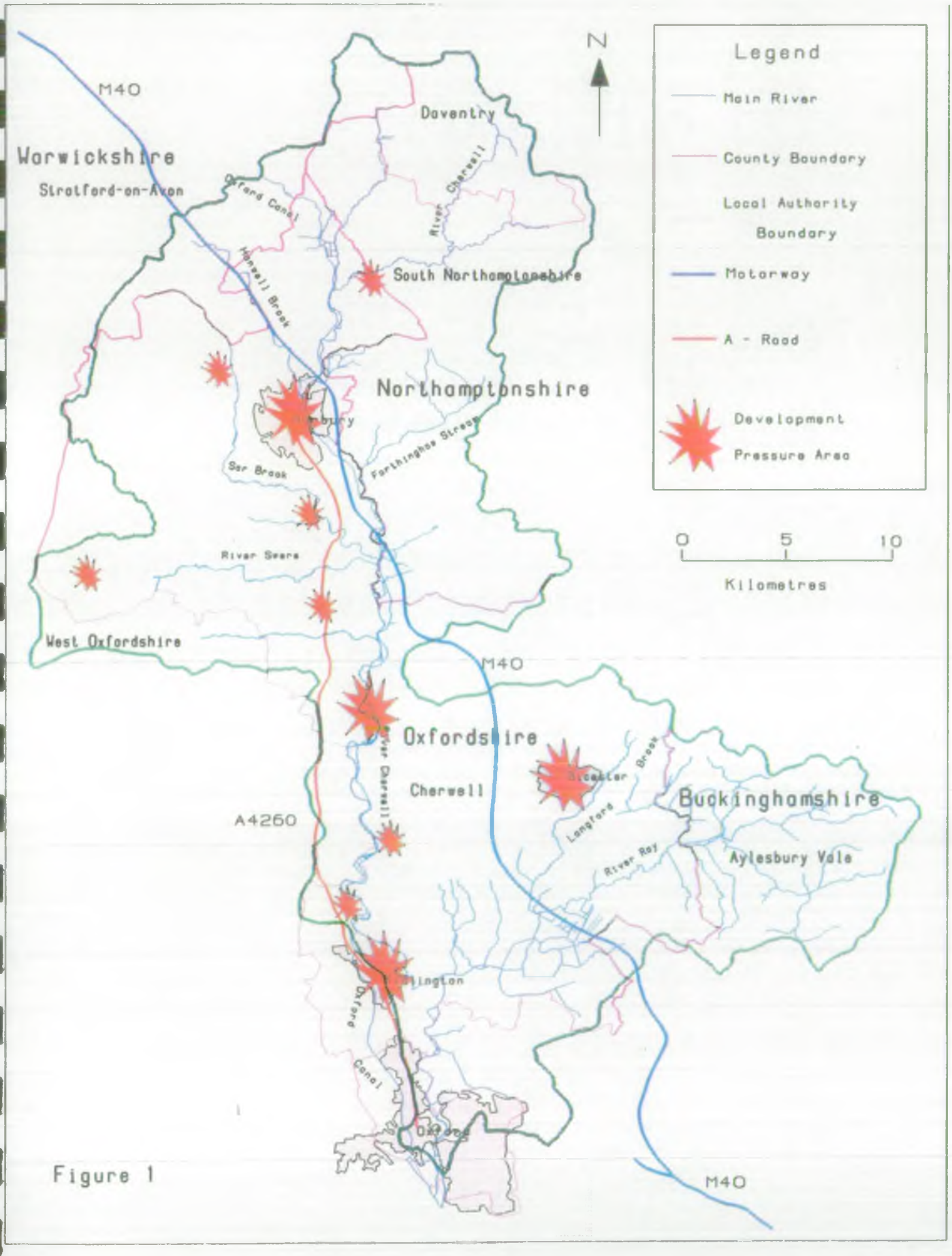


Figure 1

2.4 Land use planning

The local authorities concerned with land use planning in the River Cherwell catchment are currently in the process of producing and revising their statutory land use development plans. Below is a list of local authorities who are concerned with the Cherwell Catchment:-

Buckinghamshire County Council	- Replacement Structure Plan
Northants County Council	- Structure Plan Review
Oxfordshire County Council	- Structure Plan Review
Warwickshire County Council	- Structure Plan Review
Aylesbury Vale District Council	- District Wide Local Plan
Cherwell District Council	- District Local Plan
Daventry District Council	- District Local Plan
Oxford City Council	- District Local Plan
South Northants District Council	- District Local Plan
South Oxfordshire District Council	- District Local Plan
Stratford Upon Avon District Council	- District Local Plan
West Oxfordshire District Council	- District Local Plan

The NRA will continue to monitor the progress of the Cherwell District Local Plan through the Public Inquiry and to its final adoption, to observe the inclusion of the 'NRA Guidance Notes for Local Planning Authorities' by Cherwell District Council (which presently stands at 77.7%). Oxford County Council are in the process of making the 5th set of alterations to their Structure Plan with the consultation document anticipated at any time now.

Figure 1 shows areas within the Cherwell Catchment that have been identified for new residential or commercial development in the structure plans and local plans. Between 1986 and 2001 land for 12400 new dwellings was allocated in the Cherwell District. On the 1st April 1992, land for 1898 dwellings was still unaccounted for. In Banbury land for 4400 new dwellings has been allocated between 1986 to 2001. 1878 new dwellings have been completed before April 1992. A new housing estate to the north of Banbury has been identified with the provision of a new link road.

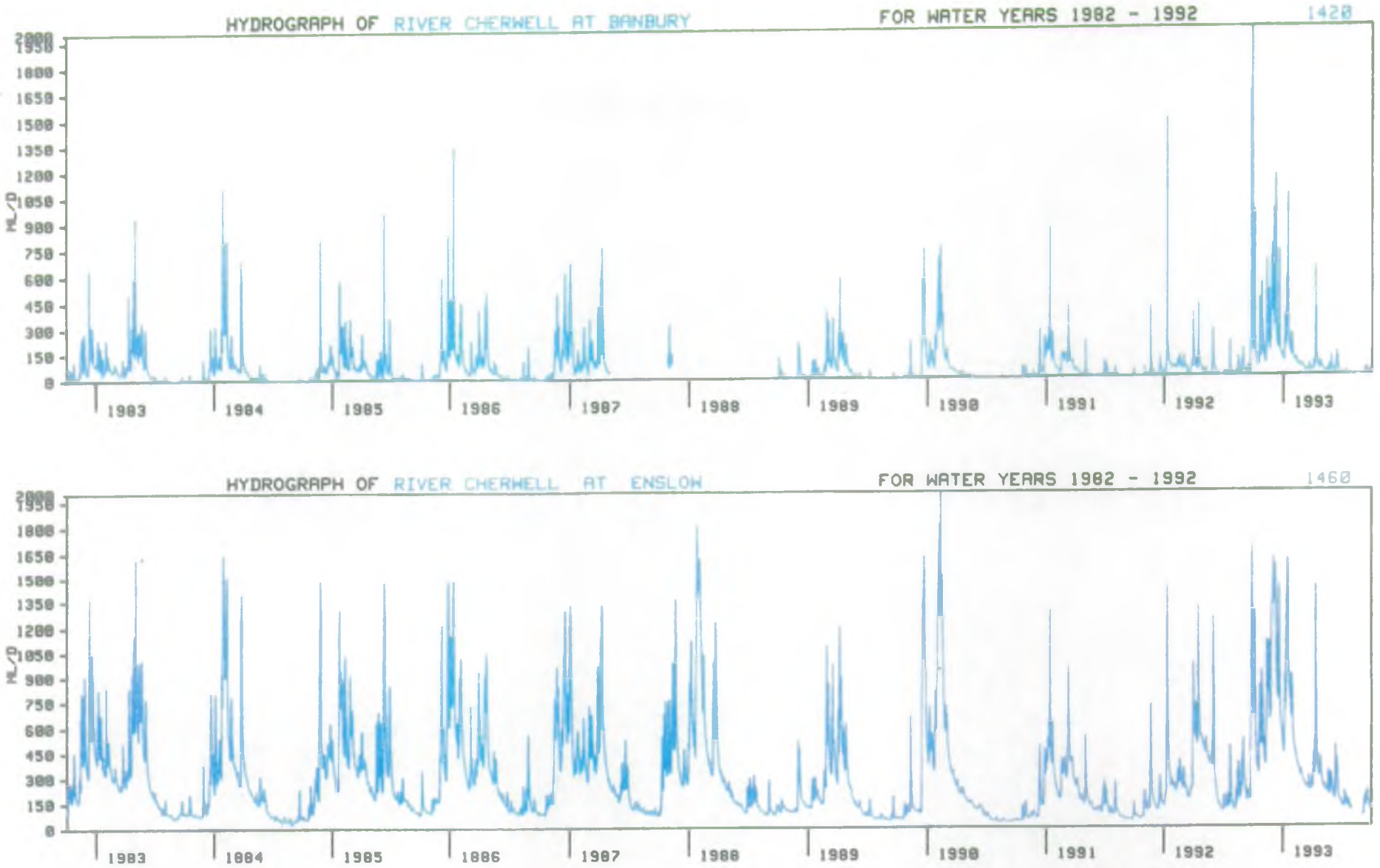
In Bicester, the other major urban area in the Cherwell Catchment, 4900 houses were allocated between 1986 and 2001. Of these dwellings, 1822 have been completed before April 1992 and 2723 have been committed. The major land allocation is at Slade Farm to the north west of the town centre. These proposed new developments will have a number of implications for water based planning such as land drainage and water resource planning.

2.5 Hydrology

The River Cherwell rises at Charwelton in Northamptonshire and flows 96km to its confluence with the River Thames near Iffley Fields at Oxford. The Cherwell shares its valley with the Oxford Canal. In places they share the same channel and at Nellbridge they cross. Within the catchment there are small reservoirs at Wormleigton, Boddington, and Clattercote which provide water for the canal, and a raw water storage reservoir at Grimsbury for potable water supply owned by Thames Water Utilities Limited.

Figure 2 shows hydrographs produced from readings taken at Spiceball Park on the River Cherwell, downstream of Grimsbury water intake and at Enslow using information from 1982 to 1992. As can be seen, flows during the winter months are high as a result of run-off from the clay catchment, but the flows achieved during the summer months at Banbury are very low and may propagate aesthetic and ecological impacts on the watercourse. The summer months of 1990 show this occurrence clearly. Gauge weirs used to monitor the flows, frequently get bypassed under flood conditions. Therefore it would be useful to address this issue when new gauging stations are being installed. This would lead to an improvement in the flood flow assessments.

Figure 2


HYDROGRAPH OF RIVER CHERWELL AT BANBURY
FOR WATER YEARS 1982 - 1992
1420
Ml/d
2000
1950
1800
1650
1500
1350
1200
1050
900
750
600
450
300
150
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
HYDROGRAPH OF RIVER CHERWELL AT ENSLOW
FOR WATER YEARS 1982 - 1992
1460
Ml/d
2000
1950
1800
1650
1500
1350
1200
1050
900
750
600
450
300
150
0
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
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10 Dec 1993

The building of the Oxford Canal was authorised in 1764 with the dual purpose of moving coal and providing a link from the Coventry Canal to the River Thames. The present canal is 124 km long. Jurisdiction over the water quality and recreation is shared between the NRA Thames Region and British Waterways, with navigation and engineering being the sole responsibility of British Waterways. The NRA Thames Region has sole responsibility for the statutory fisheries on the Oxford Canal and British Waterways control the recreational fishery.

2.6 Geology

The River Cherwell (Figure 3) runs north-south traversing most of the north east-south west Jurassic clay and limestone succession which dips gently south east towards the London basin. The Upper Cherwell basin centred on Banbury, represents a breach of the northern Cotswold Range, where the river has cut down to the lower lying Lias clay and is surrounded by the higher ground of the middle/upper Lias plateaux and remnants of the middle jurassic oolite. This higher ground rises to 227m at the Shenton / Epwell Hills at the south west end of the Edges Hill Escarpment which is of the middle Lias marlstone. Middle Lias Limestone is known as 'Banbury Ironstone' and is a source of distinctive orange/brown building stone.

The Cherwell flows over the dip-slope of the Great Oolite group between Steeple Aston and Tackley. Further south, the former cement works at Shipton forms the largest quarry face in the district. The lower Cherwell catchment occupies much of the low lying Oxford clay vale through Otmoor where a major tributary, the River Ray enters at Islip. The south eastern watershed is formed by a limestone escarpment with overlying Kimmeridge and Portland Beds at Brill and Shotner Hill. The River Cherwell meanders across a widening floodplain characterised by gravel deposits overlying clay before joining the Thames at south Oxford.

2.7 Topography

The breach of the northern Cotswold Range rises within the Upper Cherwell basin to between 183m and 240m at the catchments highest point of 240m, Whichford Hill Farm (grid ref SP330/330). The catchments lowest contour point is in central Oxford adjacent to Florence Park at 55m (grid ref SP525/045).

2.8 Water Quality

The NRA's present system of 'River Quality Objectives' was developed from a National Water Council policy document in 1978 and classifies and assesses watercourses in England and Wales on the basis of their concentrations of BOD, DO and ammonia. As can be seen below, each watercourse was given a current objective and an objective for the future (as set in 1979).

A new quality classification system has been proposed known as 'Statutory Water Quality Objectives' (SWQOs). The implementation of the SWQOs is dependant on the Government issuing regulations to enact the scheme.

As part of the NRA's routine activities monitoring results will be used to calculate a General Quality Assessment (GQA) for each watercourse. This will include chemical and biological monitoring with nutrient status and aesthetics also accounted for. Figure 4 shows the present General Quality Assessment for the River Cherwell catchment.

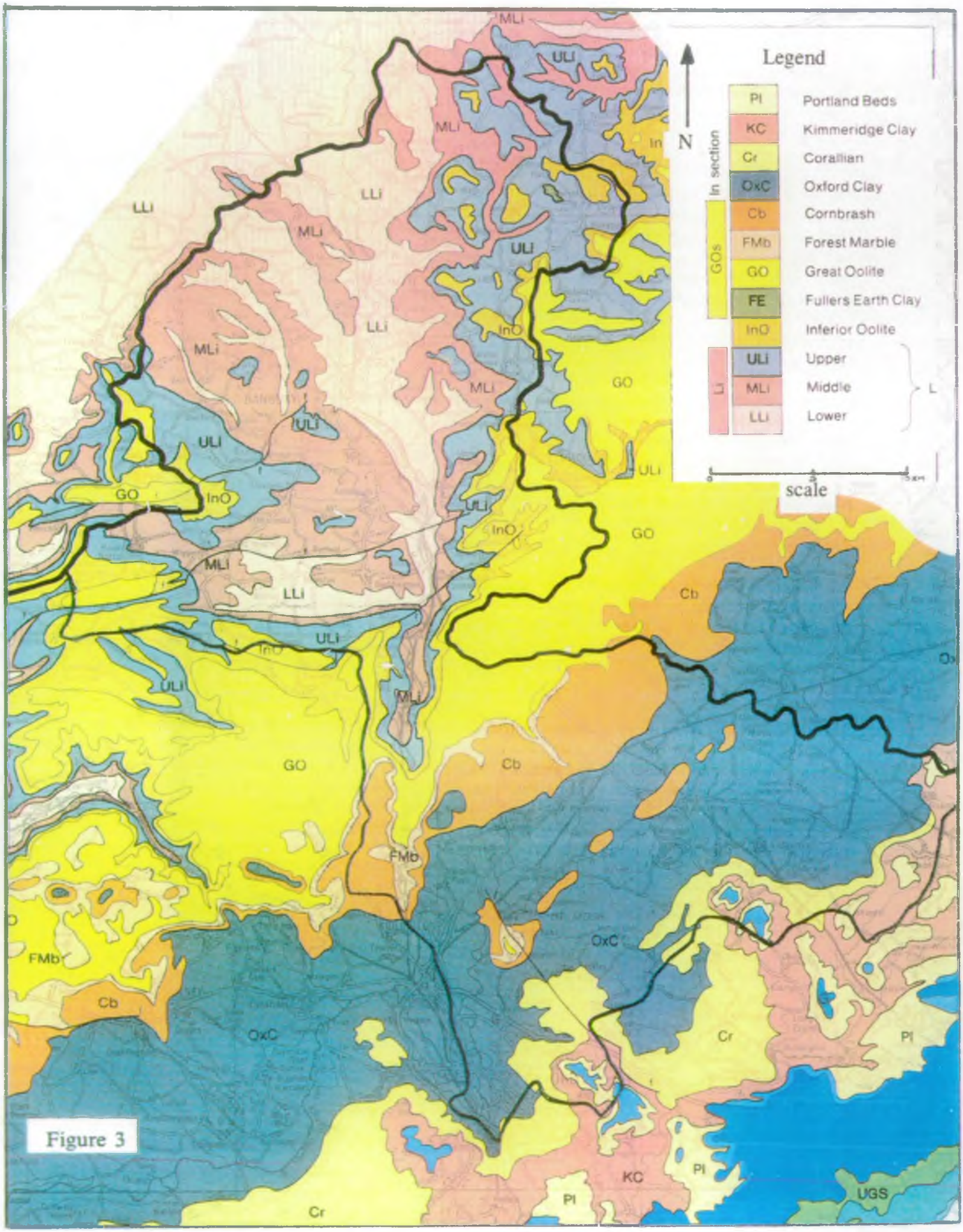
Legend
N
In section
GOs
LI
Pl Portland Beds
KC Kimmeridge Clay
Cr Corallian
OxC Oxford Clay
Cb Cornbrash
FMb Forest Marble
GO Great Oolite
FE Fullers Earth Clay
InO Inferior Oolite
ULi Upper
MLi Middle
LLi Lower
L
scale
MLi
ULi
LLi
InO
GO
Cb
FMb
OxC
Cr
Pl
KC
UGS

Figure 3

The RQOs for the Reaches of the Cherwell Catchment are shown below. All the watercourses in the catchment have achieved their RQOs with the exception of Summerstown Ditch which is only meeting class 3 instead of class 2B due to Marsh Gibbon STW. These results are the latest available (September 1990), and were published on the 19th September 1990.

River	Reach	Length (kms)	Current Objective	Future Objectives
Cherwell	Source to Banbury water intake.	34.0	1B	1B
	Banbury intake to Banbury STW.	3.1	2B	1B
	Banbury STW to Kings Sutton.	7.3	3	1B
	Kings Sutton to Thames.	52.1	2A	1B
Langford Brook	Poundon to Stratton Audley.	2.4	E	E
	Stratton Audley to Bicester STW.	6.6	1B	1B
	Bicester STW to the Ray.	5.4	3	2B
Oxford Canal	Fenny Compton to Cherwell.	24.8	2A	2A
	Aynho Weir Lock to Cherwell.	20.6	2A	2A
	Shipton Weir to Castle Mill Stream	12.6	2A	2A
Ray (oxon)	Source to Cherwell	31.9	3	2B
Ashby Brook	Source to Moreton Brook.	5.8	E	E
	Moreton Brook to Cherwell.	7.0	1B	1B
Bloxham Brook	Source to Milcombe.	1.4	E	E
	Milcombe to Sor Brook.	7.8	1B	1B
Byfield Brook	Source to Westhorp.	2.7	E	E
	Westhorp to Cherwell.	3.5	1B	1B
Chacombe Brook	Source to Chacombe STW.	5.7	E	E
	Chacombe STW to Cherwell.	3.2	1B	1B
Croughton Brook	Source to SP557334 (Croughton STW).	2.3	E	E
	SP557334 (Croughton STW) to Ockley Brook.	4.0	1B	1B
Farthinghoe Stream	Source to Marston St Lawrence.	1.0	E	E
	Marston St Lawrence to Cherwell.	10.1	2B	2B
Gallos Brook	Upper Heyford to Caulcott.	1.3	E	E
	Caulcott to Ray.	13.7	2B	2B
Highfurlong Brook	Priors Marston to Priors Marston STW.	1.9	E	E
	Priors Marston to Cherwell.	13.8	1B	1B

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Water Quality

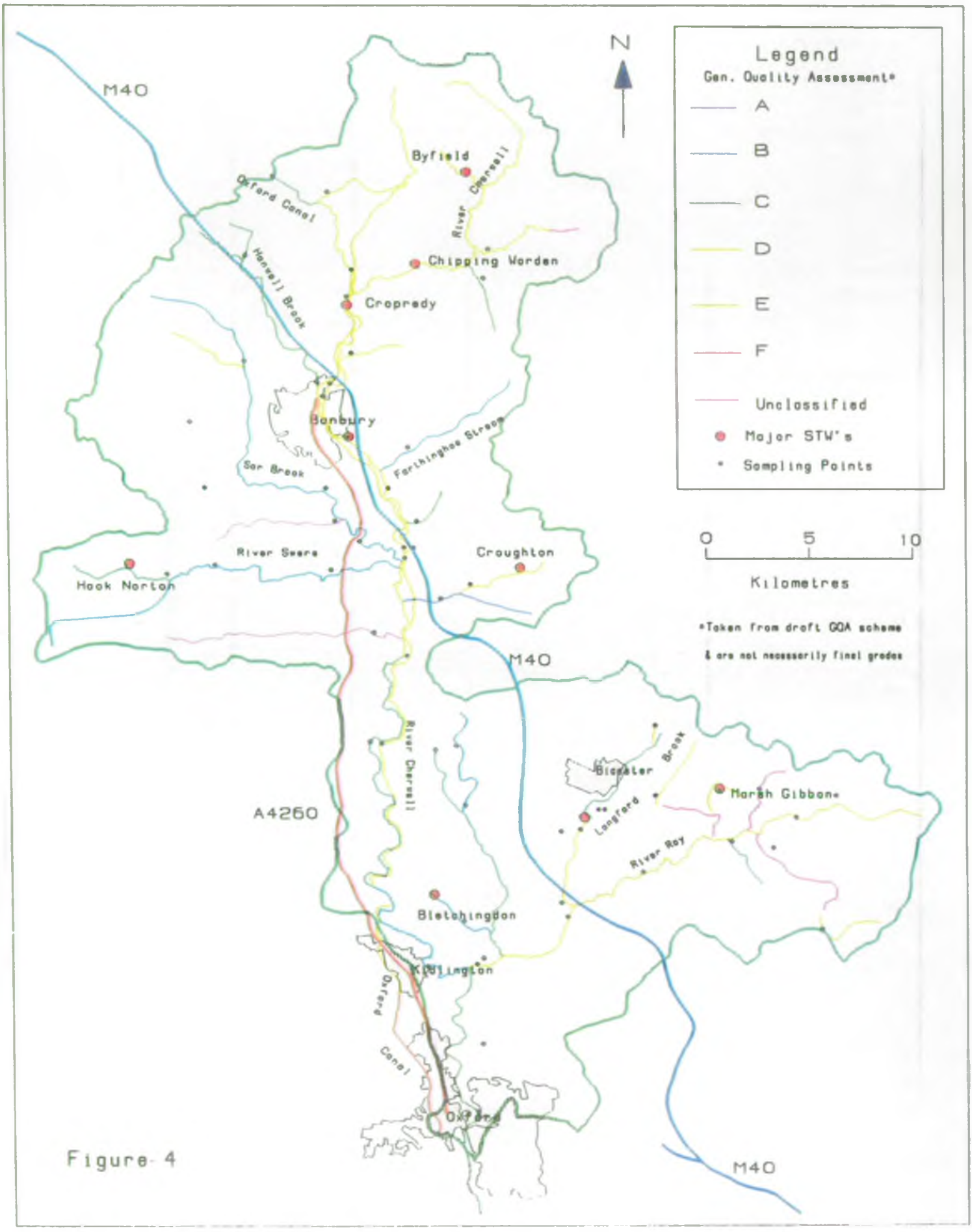

Figure 4

River	Reach	Length (kms)	Current Objective	Future Objectives
Hornton Stream	Source to Hornton.	3.7	E	E
	Hornton to Sor Brook.	0.9	1B	1B
Kings Sutton Stream	Farthinghoe to Upper Astrop.	2.3	E	E
	Upper Astrop to Cherwell.	2.8	2B	2B
Ludgershall Brook	Brill to Ludgershall.	4.2	E	E
	Ludgershall to Ray	3.0	2B	2B
Ockley Brook	Source to SP552313.	1.6	E	E
	SP552313 to Cherwell.	6.8	1B	1B
Sor Brook	Source to SP379465.	O.6	E	E
	SP379465 to Cherwell	27.6	1B	1B
Summerstown Ditch	Summerstown to Cutters Brook	2.4	2B	2B
River Swere	Source to Cherwell	24.9	1B	1B
Hanwell Brook	Avon Dasset to Oxford Canal	14.0	2B	2B
Deddington Brook	Source to SP386299.	1.9	E	E
	SP386299 to Cherwell.	16.1	1B	1B

The NRA also carry out biological monitoring to provide additional water quality information. The number and species of macroinvertebrates found can give an indication of a river's overall health. The Biological Monitoring Working Party (BMWP) initially devised the scoring system for assessing water quality for the 1980 Water Quality Survey of England and Wales. This system has now become internationally accepted. As a guide, a BMWP score of 100+ will generally indicate a good water quality and a score closer to 0 indicates a poor and unacceptable water quality.

The BMWP scores for the River Cherwell Catchment for 1992 are shown on Figure 5. The River Cherwell from Oxford to upstream of the confluence with the Oxford Canal is of a very high river quality (BMWP score 151+). From this point to where the Charlton Brook joins the River Cherwell the water quality is good with a BMWP score over 100. The Ray tributary has fairly good water quality with Audley Brook, Gibbinshole Ditch and Ludgershall Brook having low water quality. Other Tributaries of the River Cherwell such as Byfield Brook, Charlton Brook, Leys Farm Ditch and Bletchington Brook possess low quality water with BMWP scores between 16 to 50. There are no rivers of very bad quality water.

Consented Discharges

There are 153 consented discharges in the Cherwell Catchment. The table below identifies the volume, consent conditions and population equivalent of some of the STWs owned by TWUL. They have been selected using the criteria that the consented discharge was above 1 Ml/d and the population equivalent was above 1500. For Banbury the (i) consent conditions are for the summer and (ii) consent conditions are for the winter. All the volumes given are the maximum discharges permitted except those in brackets which are dry weather flows.

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Biological Monitoring

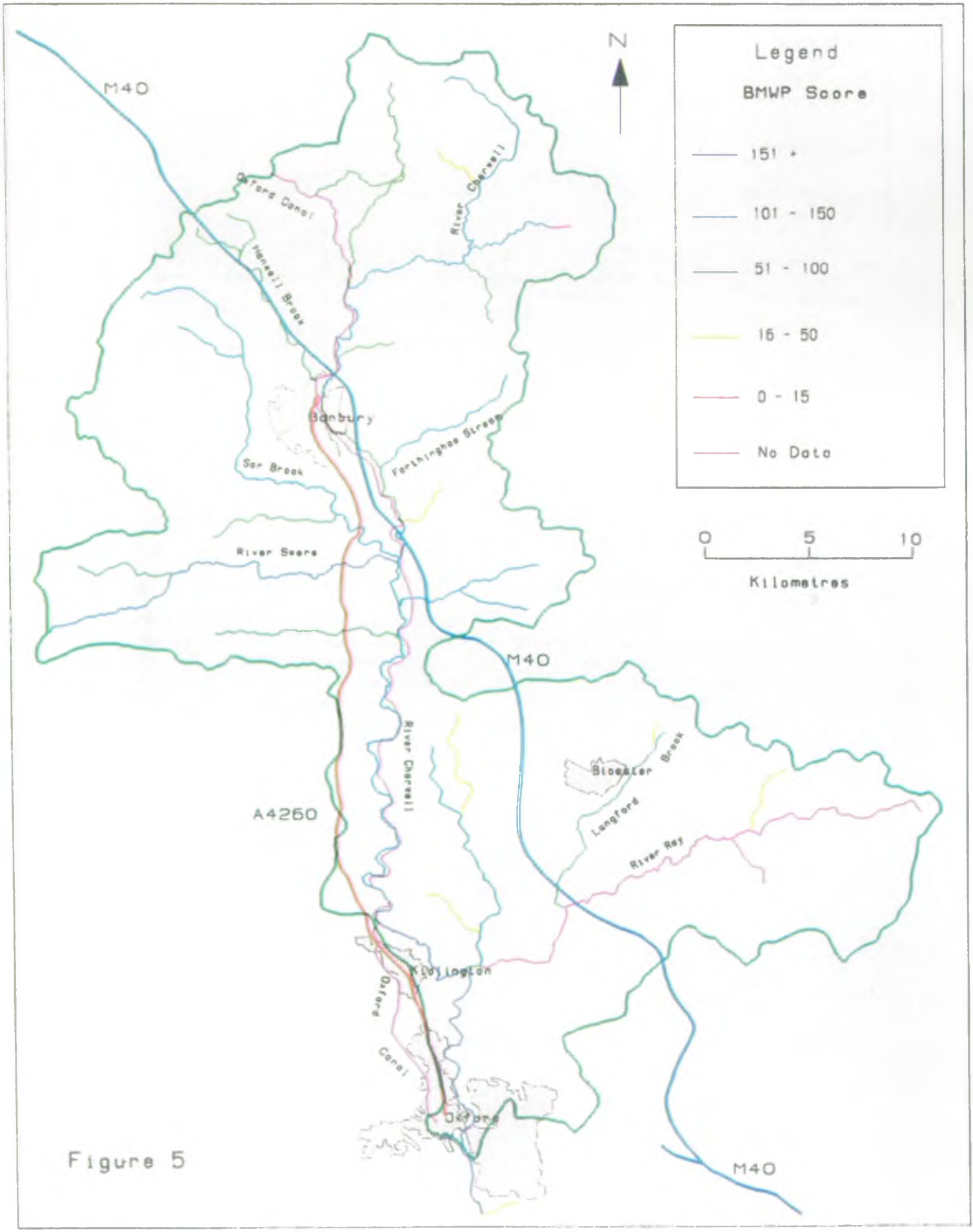
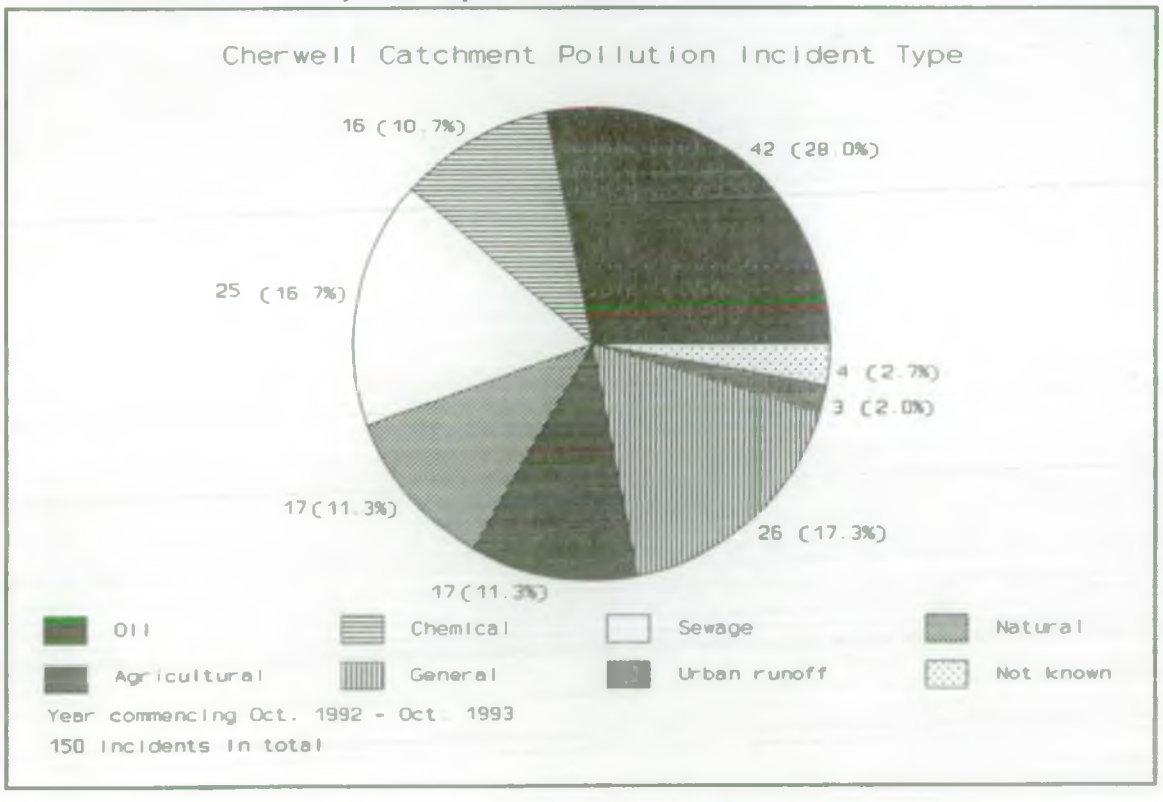


Figure 5

Point of Discharge (STWs owned by TWUL)	Population Equivalent	Volume (Ml/d)	Consent Conditions (mg/l)		
			Suspended Solids	BOD	Ammonia
Banbury STW	88400	46.80 (15.60)	i. 15 ii. 15	11 11	3 5
Bicester STW	27000	27.00 (9.00)	25	12	8
Byfield STW	2890	3.20	40	40	20
Chipping Warden STW	1836	1.84	45	30	-
Bletchingdon (new) STW	1650	1.15	40	20	15
Marsh Gibbon STW.	2000	4.14	45	30	20
Hook Norton STW	2050	1.90	45	30	-

2.9 Pollution Control

During the period from October 1992 to October 1993, there were 150 reported pollution incidents in the Cherwell Catchment. It was concluded that 13 of these pollution incidents could be classed as 'significant'. The remaining 137 pollution incidents were classed as 'minor' incidents. Out of all these incidents, 91 were clearly cases of pollution whilst 59 were not.



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Water Resources

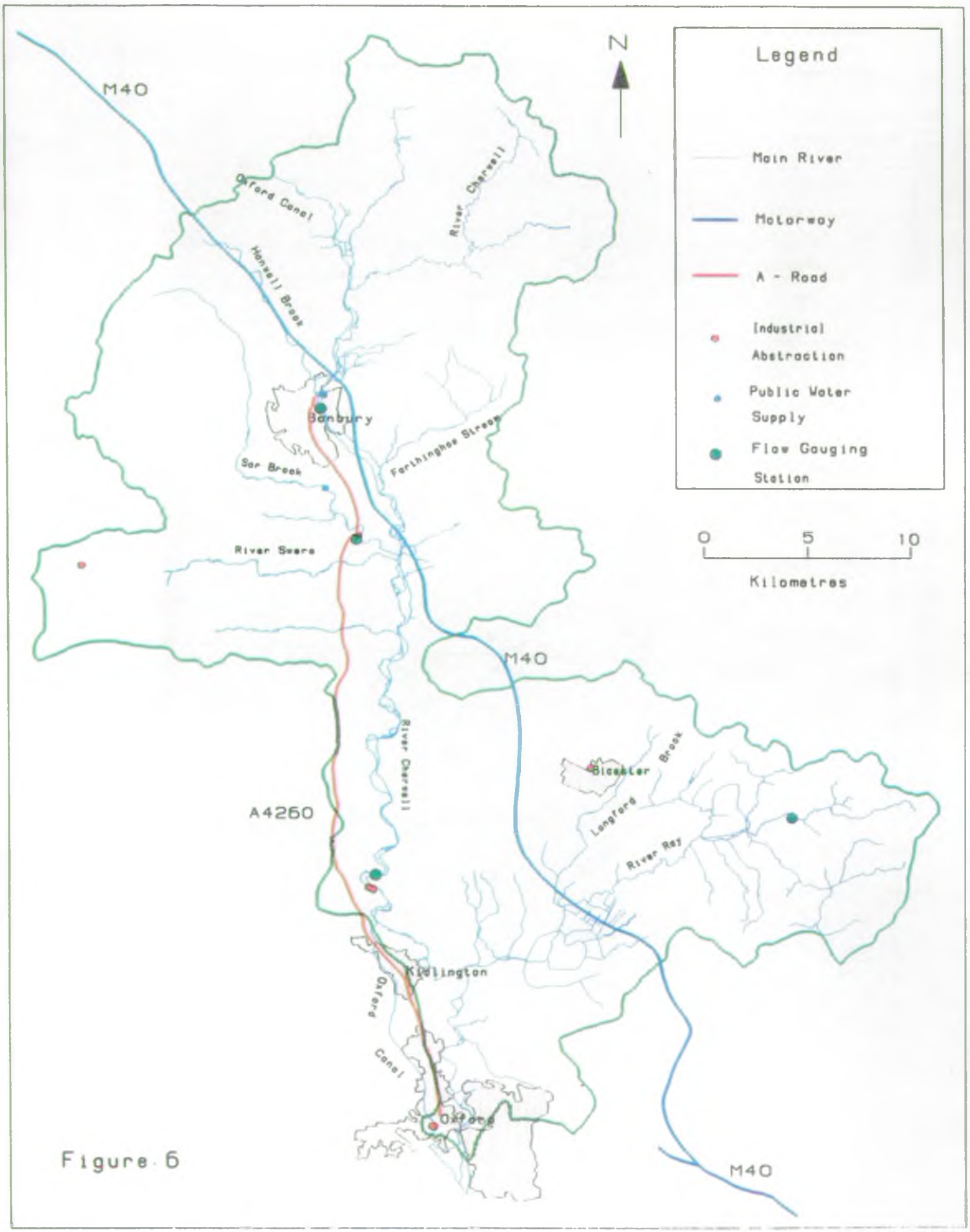

Figure 6

2.10 Water Resources

The average rainfall of the Cherwell Catchment is 682mm (between 1941 - 1970).

Actual Abstractions In The Cherwell Catchment in 1991 (Ml/d)

	River	Lias	Great Oolite
Public Water Supply	6.48	-	-
Private Water Supply	0.25	0.006	-
Spraying- Agriculture	0.08	-	0.005
Agriculture	-	0.013	0.025
Cooling	0.1	-	-
Industrial	0.01	0.016	0.09
Transfer	0.03	-	-
Total	6.96	0.035	0.012

Figure 6 shows points of industrial abstraction, water supply abstraction and flow gauging stations in the River Cherwell Catchment. There are currently 198 abstraction licences in the Cherwell catchment, of which many are agricultural. TWUL are licensed to abstract at Grimsbury (9.96Ml/d) and at Bodicote (4.5 Ml/d) for public water supply. Water is also supplied by TWUL from Farmoor Reservoir to Banbury through a pipeline.

2.11 Flood Defence

The NRA has powers under the Water Resources Act (1991) to maintain designated main rivers of which there are 506 km in the Cherwell Catchment. The exercising of these powers is left to the discretion of NRA Flood Defence and therefore it is necessary for the NRA to prioritise its undertakings. Works include:-

- alleviating flooding problems
- river maintenance
- operating five river control structures in the River Cherwell Catchment and those on the River Ray at Otmoor

The NRA Flood Defence section are developing agreed standards of service. All Flood Defence activities must satisfy these standards although the scheme is constrained by available resources.

Figure 7 shows the area known to have flooded (or the floodplain) in the Cherwell catchment. The most serious flooding to have occurred in the Cherwell Catchment was in March 1947. NRA Flood Defence are developing a system to assess the appropriate standards of service. This system relates Flood Defence Standards of Service to current land use in the floodplain. Different land uses have been brought together into 5 land use bands ranging from A (heavily urbanised) to E (unintensive agriculture). Each land use band has a target range of service levels. The River Cherwell Catchment has been divided into 45 reaches. As the Cherwell Catchment is mostly rural in character most of the main river reaches have been ascribed a land use band of E. The Cherwell upper reaches have been ascribed a land use band C (agriculture or amenity land).

2.12 Fisheries and Conservation

(i) The River Cherwell hosts a variety of fish species. Upstream of Banbury the fish population is dominated by roach, dace, and chub with a small number of grayling and trout present in the Cropredy

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Fisheries and Conservation

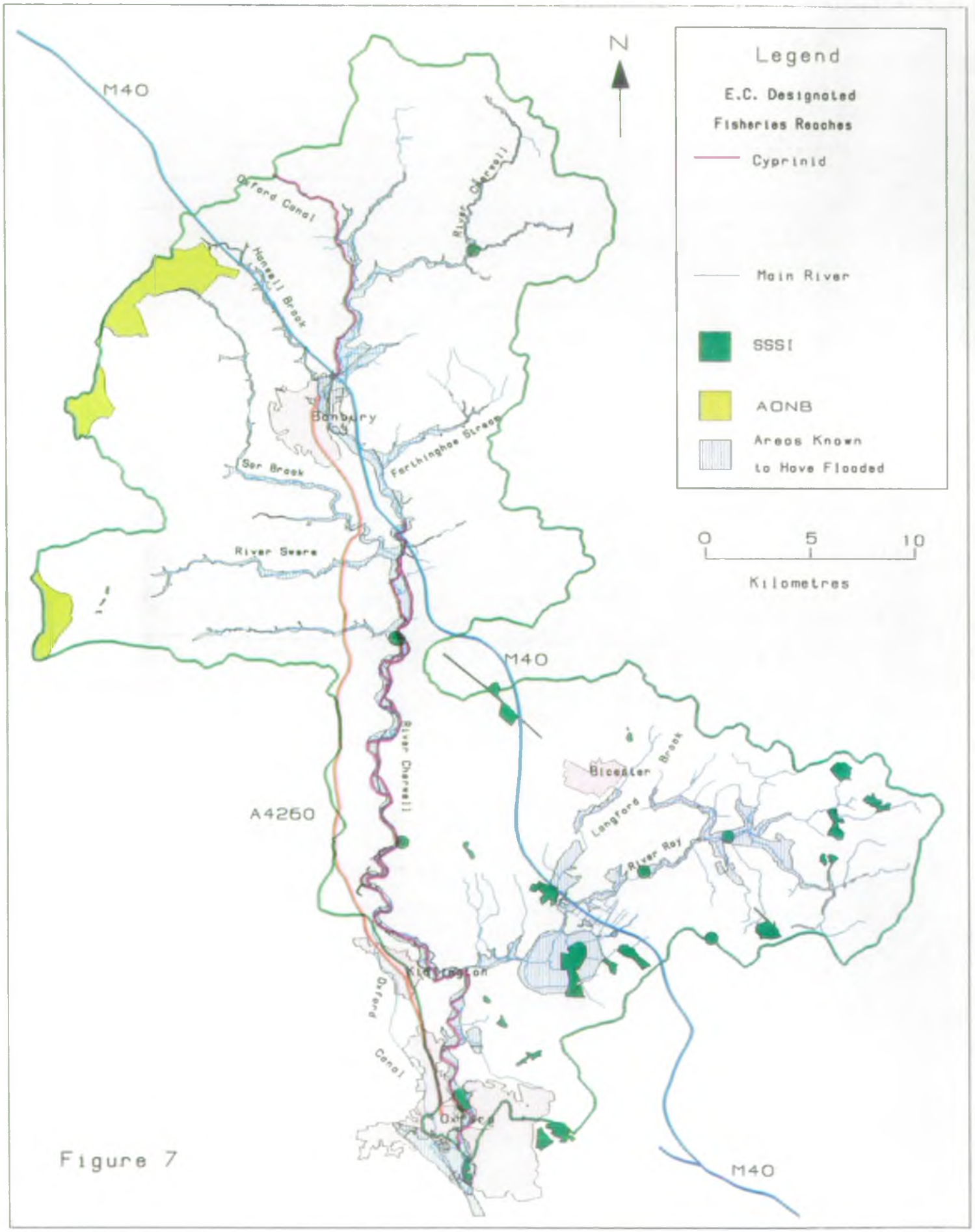

Figure 7

area.

The River Cherwell and its tributaries below Twyford hold excellent stocks of all the major coarse fish. Large carp and large barbel are specialities of the River Cherwell.

The EC Directive (78/659/EC) designates some rivers and canal reaches as capable of supporting either salmonid or cyprinid fish. There are three EC designated areas within the Cherwell Catchment (shown on Figure 7) and all three have met their RQO. Two of the reaches are on the Oxford Canal and one is situated on the River Cherwell. On the River Cherwell, the designated length is between Kings Sutton Stream and the River Thames, a distance of 52.1km.

(ii) The Upper Thames environmentally sensitive area (ESA) is being designated from January 1994 and this affects the Cherwell Catchment. The table below shows the SSSIs in the Cherwell Catchment adjacent to watercourses.

Site	Area	Main River	Habitat
1.Arncott Bridge Meadows	8.7ha	River Ray	Marginal and inundation, and neutral grassland
2.Bestmoor	12.4ha	River Cherwell Deddington Brook	Neutral Grassland
3.Finmere Wood	45.7ha	River Ray	Calcareous Grassland, scrub, woodland and grassland
4.Grendon and Doddershall Woods	67.1ha	River Ray	Woodland
5.Long Herdon Meadow	4.5ha	Grange Farm Ditch, River Ray	Grassland
6.Murcott Meadows	22.8ha	Panshill Brook	Grassland
7.New Marston Meadows	44.2ha	River Cherwell, Marston Brook	Hedge, swamp, grassland
8.Otmoor	211.6ha	Beckley Brook, Otmoor Inner Circle Dike	Marsh and grassland
9.Rushbeds Wood and Railway Cutting	80.2ha	Ludgershall Ditch	Scrub, woods and grassland
10.Trafford House	18.6ha	River Cherwell, Ashby Brook	Other habitat
11.Wendlebury Meads	73.2ha	Langford Brook	Hedge
12.Whitecross Green and Oriel Woods	64.1ha	Panshill Brook	Marsh and marshy, grassland

2.13 Navigation and Recreation

"The NRA has a responsibility to improve and maintain inland waters and their facilities for the use by the public" where the NRA is the navigation authority. It is not part of the NRA's statutory duties to maintain a navigation channel on the River Cherwell although the watercourse through Oxford is used regularly for punting and rowing by the colleges. The ownership of navigation rights lies with the riparian owner and therefore it is up to them to decide if people can use the watercourse for navigation purposes. The NRA does have a duty to promote the general amenity and recreational use of inland waters and is therefore able to support appropriate recreational schemes on rivers such as the River Cherwell and its tributaries.

3. CATCHMENT ISSUES

3.1 Banbury

i. Low Flows

TWUL currently hold a licence to abstract 9.96Ml/d of water from Grimsbury, upstream of Banbury for public water supply. The licence has no flow constraint as it was granted before the 1960s. Most of this water is eventually returned to Banbury Sewage Treatment Works (STW) which discharges effluent into the River Cherwell downstream of the point of abstraction. This causes a depletion of flows through Banbury between the points of abstraction and discharge during the summer months, which has led to a continued reduction in the ecological value of the river corridor.

ii. The NRA has considered a number of options (see below) to increase flows through Banbury but has yet to carry out in depth appraisal of options:-

a) To feed treated water back into the River Cherwell upstream of the STW.

b) To negotiate a reduction in the amount of water TWUL abstract from Grimsbury. This is a very sensitive issue between TWUL and the NRA, as TWUL would have to be provided with financial compensation for a reduction in their licence and this is not cost effective for the NRA.

c) The addition of another pipeline from Farmoor Reservoir to Grimsbury is a possibility for increasing the water supply to Banbury. This would be costly and may have to be co-funded by the NRA.

The underlying issue is whether the River Cherwell through Banbury should be given priority for action comparative to other low flow rivers in the Thames Region.

3.2 Banbury

i. Water Resources

The planned growth of Banbury in the next century is going to lead to greater demands on water resources. Options for obtaining more water in the future are being considered. Currently the water supply for Banbury is obtained from Farmoor Reservoir through a pipeline and from a source on the River Cherwell at Grimsbury and from a source on the Sor Brook at Bodicote.

3.3 Banbury

i. Water Quality

Due to the low flows through Banbury during the summer, treated effluent subsequently discharged from Banbury STW into the River Cherwell has remained largely undiluted. This has led to a large impact on the water quality of the river for several miles downstream and has in turn reduced the value of the flora and fauna of the river. Banbury STW has been recently upgraded in line with River Quality Objectives and the Freshwater Fisheries Directive. This has led to improvements in the water quality. BOD levels have been reduced and some invertebrate life is thriving again.

ii. Trade effluent from Kraft General Foods coffee manufacturing plant, has caused discoloured effluent from Banbury STW to be discharged into the River Cherwell. This problem is not one of pollution but one of aesthetics and has caused numerous complaints from river users. At present there is no colour standard on the consent conditions for Banbury STW.

iii. Nitrate concentrations at the Grimsbury abstraction often exceed the surface water abstraction directive limit of 11.3mg/l. This means that the catchment upstream could be designated as a nitrate vulnerable zone by the Department of the Environment but the NRA are still awaiting a decision. If the area is designated as a nitrate vulnerable area the agricultural practice may need to be reviewed.

iv. TWUL has been monitoring the Grimsbury Water intake for MCPAs and MCPBs - mecoprops (herbicides). Concentrations have been exceeding the guidelines.

v. It is felt that an automatic quality monitoring station is required at Grimsbury water intake due to the size and importance of the abstraction.

3.4 Banbury

i. Surface Water Run-off
Banbury has a complex surface water drainage system. The situation is exacerbated by half of the town having an inefficient combined foul and surface water sewerage system. During heavy rainfall, this can increase flooding problems. The urban drainage of Banbury needs to be investigated so that the impact of new development does not worsen the situation.

ii. Close to the STW, Banbury has a balancing pond which was built to attenuate peak flows in surface water run-off. The NRA has undertaken an investigation of the balancing pond and its operating regime and this is being kept under review in case any opportunities arise from new local development.

iii. Banbury possesses a number of industrial estates and is surrounded largely by agricultural land. There are concerns over oil storage compounds and that surface water run-off containing pollutants from industry and agriculture is draining into the river without going through an interceptor, balancing pond or trapped gully.

3.5 Banbury

i. Development Pressures
The completion of the M40 has made Banbury very accessible to London and Birmingham. This and the diversion of growth from Oxford to Banbury has caused the town to experience increased development pressure over the last twenty years. Both commercial and residential development pressures exist in Banbury and land has been designated for development in the Cherwell District Council's Local Plan. Oxford County Council have identified Banbury as one of the 5 market towns for growth into the next century.

ii. British Rail have a large holding in West Banbury, which is in the floodplain, and they have recently been looking to develop this land. The NRA is strongly resisting this.

iii. Land has been allocated for three large residential developments in Banbury; two in the south of the town and one in the north east. There is a possibility that a link road may be built around the south side of Banbury to meet the access needs of these new estates. This will entail a major drainage study as the road will cross the floodplain.

iv. Future developments in Banbury need to include trapped gullies, oil interceptors, balancing ponds (incorporating reed beds where appropriate) to safeguard against pollutants getting into the river, improve water quality and attenuate peaks in run-off.

3.6 Banbury

i. Litter Problem
Due to the general lack of interest for the watercourse through Banbury (a litter problem has developed).

3.7 Banbury

i. Flood Defence

As can be seen in figure 7, a large section of Banbury adjacent to the Oxford Canal and the River Cherwell is in the floodplain. There are flood meadows downstream which regularly flood. Therefore many potential development sites will be affected by flooding.

ii. Cherwell District Council has recently built the Spiceball Sports Centre in Banbury in the floodplain beside the River Cherwell despite NRA advice to the contrary. This has been flooded regularly since it was constructed. Cherwell District Council are now looking to build a small flood alleviation scheme.

3.8 M40

i. Water Quality

The M40 motorway route crosses the River Cherwell twice and the River Ray once (see figure 1). During construction the rivers were diverted and straightened slightly. To prevent direct run-off from the motorway getting into the river, a complex system of interceptors and balancing ponds were built in. Concerns are now being expressed that at some points along the M40, this system is failing because it is not being maintained. This has more serious pollution implications when faced with an emergency situation such as a chemical tanker spill. Ineffective interceptors would not prevent the pollution of a large section of river in such circumstances.

3.9 Sor Brook

i. Water Resources

TWUL licence to abstract from the Sor Brook at Bodicote has been revised to permit the abstraction of 4.54Ml/d and to implement a flow constraint of 13.6Ml/d. Construction of a more environmentally sensitive means of abstraction is taking place. The issue has now been overcome, although attention needs to be drawn to on going actions that are taking place on the Sor Brook. A crump weir gauging station is due to be constructed during the summer of 1994.

3.10 Inadequate Consent Conditions

i. The NRA has indicated to TWUL through the Asset Management Planning Process (AMP) the following STWs in the Cherwell Catchment which require a review of consent conditions:- Banbury (colour only), Byfield, Cropredy, Croughton, Hook Norton, Kidlington, Kings Sutton, Launton, Marsh Gibbon and Middleton Cheney.

Negotiations are taking place with TWUL under AMP2 to tighten the consent conditions at Bicester STW. Bicester STW will need to be upgraded to improve overall effluent quality if the River Ray is to be improved to class 2B.

ii. Water Quality

Summertown Ditch has been the only river to fail its RQO in the Cherwell catchment. The cause of this is thought to be Marsh Gibbon Sewage Treatment Works which has been identified in AMP2.

3.11 River Ray

i. Water Quality

The NRA has carried out a macrophyte survey of the Langford Brook/ River Ray during 1992 and 1993, and the NRA has proposed that both rivers be classed as 'sensitive' under the (91/271/EC) Urban Waste Water Treatment Directive due to eutrophication. The final decision rests with the Department of Environment.

ii. **Low flows**
On the Langford Brook (a tributary of the River Ray) at Bicester, natural low flows exist which are having an impact on the ecological value of the river corridor.

iii. **Flood Defence / Conservation and Fisheries**
The operation of the weirs system on the River Ray at Otmoor, which affects the river levels has been raised as an issue. English Nature are concerned that the Otmoor which is a designated SSSI is not being flooded sufficiently to maintain the habitat. This issue has aroused conflict between NRA Flood Defence section and NRA Conservation and Fisheries section.

iv. **Conservation and Fisheries**
River drainage works carried out on the River Ray in the past are resulting in poor habitat quality.

3.12 **Oxford Canal**

i. **Water Supply**
The Oxford Canal reaches its summit north of Banbury where a lot of water is displaced to allow boat traffic over. This water has to be replaced and is a drain on water resources for the canal. During the summer months water is pumped from the River Cherwell at Cropredy into the canal. The shortage of water in the catchment area which subsequently drains via the canal lockings to the River Cherwell Catchment has caused concern within the NRA and BWB, as there is only a small catchment area with limited storage to replace the resources. Discussions have taken place regarding the reliability of Boddington Reservoir (a natural spring reservoir owned by BWB) as a source of supply for the Oxford Canal.

ii. **Water Quality**
Silt transfer occurs between the Oxford Canal and the River Cherwell which results in 'murky' water (with high suspended solids) and an aesthetic / visual amenity impact.

3.13 **Fisheries and Conservation**

i. Reaches have been designated under the EC Fisheries directive 78/659/EEC. The purpose is to define freshwaters needing protection or improvement in order to support fish life. Three EC designated cyprinid fisheries are located in the Cherwell Catchment.

ii. No specific actions are planned to date, but the recovery of the otter population in the Cherwell Catchment is a long term aspiration.

3.14 **Oxford**

i. **Water Quality**
The River Cherwell in Oxford is a major amenity, used by the University and the public for punting and rowing, however, at St Clements the water is stagnant.

3.15 **Wendlebury**

i. **Flooding**
Flooding in the area of Wendlebury is thought to be due to the general condition of the watercourse through the village combined with other factors, namely

a) possible improvements to road works above the village;
b) BP discharging into the river downstream of the village;
c) a restricted structure built about 10 years ago in the village.

Clearance work has recently been undertaken and further investigations are being carried out to look into these matters.

3.16 Main Rivers

i. **Flood Defence**
Cherwell District Council have proposed to the NRA Flood Defence Section that there are a number of non main rivers in the Cherwell catchment that they would like to see identified as main rivers.

ii. The NRA has recently received a complaint regarding increased flooding of the River Cherwell south of Old Twyford Mill at Sutton Lodge Farm.

3.17 Development Pressures

i. **Upper Heyford**
Future development particularly on a large scale could have significant and serious implications for the water environment in the Thames Region. Upper Heyford American Air Base is a large site which although not allocated in the local plan may in the future become available for development.

3.18 Availability of Data

i. The NRA needs to obtain relevant floodplain data. This is essential if the NRA is to successfully object to development in the floodplain where the appropriate mitigations measures cannot be taken.

4. ACTIONS FOR THE CATCHMENT

Listed below are the activities that will be carried out by the NRA and other organisations in response to the issues that have arisen and as part of their routine statutory work. The actions have been numbered to correspond with the catchment issues as far as possible.

4.1 Banbury

i. **Water Quality**
TWUL have recently upgraded Banbury STW and this should produce significant improvements over time in the water quality and eventually the ecological value of the river corridor downstream of Banbury STW. The ecological value is also limited by habitat quality. This has yet to be addressed to improve the overall value of the reach.

ii. **Low Flows**
The reach of the River Cherwell between Grimsbury water intake and Banbury STW has been identified as experiencing low flows along with 9 other rivers in the Thames Region. A methodology has been developed by Scott Wilson Kirkpatrick to assess the overall condition of low flow rivers nationally. This will be used to give an overall score for each river for comparative purposes and to then prioritise works within the Thames Region. The methodology is composed of 4 indicators which have been broken down into several criteria:-

a) Hydrological severity index (calculated using existing data).

b) Ecological severity index (calculated using existing data).

c) Landscape and Amenity index. Additional survey work had to be carried out as described below:

- A landscape assessment using the Scott Wilson Kirkpatrick methodology to identify development of the landscape in a planning context, a breakdown of landscape types and a short evaluation.
- A recreation survey undertaken during the summer 1993 by applying the recreation and amenity Scott Wilson Kirkpatrick methodology.

d) Public Perception severity index (calculated by external consultation).

iii. The NRA will continue to investigate and discuss with TWUL cost effective methods of reducing the level of abstraction by TWUL from the River Cherwell at Grimsbury.

4.2 Banbury

i. **Water Resources**
Forecast demands for water supply in Banbury are anticipated to increase. Methods of sustaining the present water resources and providing for the future are continually being investigated by TWUL and the NRA. There is a minimum residual flow in the River Cherwell at Grimsbury.

4.3 Banbury

i. **Water Quality**
The NRA is continuing to monitor the River Cherwell downstream of Banbury STW to detect any improvements in the water quality after the recent improvements to Banbury STW.

ii. The NRA is continuing to investigate this issue in order to identify any actions that need to be taken.

iii. The NRA is still awaiting a decision from the DOE on the proposal to designate the River Cherwell upstream of Grimsbury Water Intake a Nitrate Vulnerable Zone.

4.4 Banbury

i. **Surface Water Run-off**
The possible impact of new development on the urban drainage of Banbury is being monitored to prevent the present status being exacerbated.

ii. If TWUL decide to make use of currently redundant land around Banbury STW then the NRA may be able to negotiate, through the planning process, for TWUL to improve the operating regime of the adjacent balancing pond.

iii. For future developments in Banbury the NRA will be seeking attenuation of peak flows discharged to the River Cherwell even where increased rates of surface water run-off would not exacerbate flooding problems. The object is to avoid ecological damage that can result from high urban run-off into the watercourse, which particularly during the summer months has very low flows. The standard to be adopted will limit peak flow rates from new development to 5 litres per second per hectare for events up to a 2 year return period. Above this return period flows from upstream in the catchment would adequately cushion discharges and dilute pollutants.

4.5 Banbury

i. **Development Pressures**
Assimilation of information by NRA Technical Services:
Hydraulic modelling has been used by the NRA to define the floodplain through Banbury for the purpose of identifying if new development actually impinges on the floodplain. A comprehensive internal report ('A hydrological Investigation of the River Cherwell up to Banbury') was produced in 1991.

ii. The NRA is strongly resisting any development on the site British Rail wish to develop as it is located in the floodplain and would exacerbate flooding in Banbury.

iii. The NRA within routine planning liaison activities, will use its powers to encourage developers to introduce safeguards against pollution where necessary.

4.6 Banbury

i. **Litter Problem**
NRA Flood Defence section will clear any litter that is obstructing the flow on the watercourse during river maintenance works.

4.7 Banbury

i. **Flood Defence**
The NRA has a policy to prevent development in the identified floodplain.

ii. The Flood Defence Section have in conjunction with Cherwell District Council been discussing a small flood alleviation scheme for Spiceball Sports Centre which has been regularly flooding. A proposal has been put forward by the NRA Flood Defence and Projects team to be implemented, resources permitting in 1994.

4.8 M40

i. **Water Quality**
Monitoring of the M40 is being undertaken to provide more information on the possible pollution risks. four mobile group meters were used this summer to monitor conductivity and ammonia.

4.9 Sor Brook

i. **Water Resources**
The NRA are intending to place a Gauging Station on the Sor Brook during 1994/95 to monitor the flow and level. Prior to this, hydraulic modelling of the Sor Brook is being undertaken to identify the water levels at different locations. This will provide knowledge of river levels so the results can be recorded and compared to levels once abstraction has commenced. The hydraulic modelling was completed in 3/94.

4.10 Inadequate Consent Conditions

i. **Water Quality**
Negotiations with TWUL under AMP2 are taking place to review consent conditions at Bicester STW. This will need to be upgraded to improve overall effluent quality if the River Ray is to be improved to class 2B.

The NRA have identified a number of STWs in the Cherwell Catchment from the TWUL Asset Management Planning Process, which need their consent conditions reviewed.

ii. Marsh Gibbons STW has been identified as needing a review of its consent conditions under AMP2.

4.11 River Ray

i. **Water Quality**
The NRA is awaiting a decision from the DOE regarding the designation of Langford Brook and the River Ray as 'sensitive waters' under the (91/271/EC) Urban Waste Water Treatment Directive.

ii. **Flood Defence / Conservation and Fisheries**
The NRA have commissioned consultants to do a hydrological investigation on the Otmoor with the objective of assessing hydrology and making recommendations to reverse reductions of winter flooding and to maintain optimum spring water levels in the ditches within the SSSI to benefit breeding waders.

4.12 Oxford Canal

i. **Water Supply**
British Waterways have carried out a silt survey of the full length of the Oxford Canal.

4.13 Fisheries and Conservation

i. Within the Cherwell Catchment 3 reaches are designated as EC designated cyprinid fishery waters. This designation will ensure that the fisheries are fully protected by the NRA in the carrying out of it's duties.

ii. The River Cherwell is a potential focus for otter recolonisation in the Thames Region. There are no definite plans at present for encouraging this.

4.14 Oxford

i. **Water Quality**
The NRA will seek to further investigate this issue.

4.15 Wendlebury

i. **Flooding**
The NRA Flood Defence Section will investigate this issue and identify if actions are needed to alleviate the flooding. Actions will be programmed according to available resources.

4.16 Main Rivers

i. **Flood Defence**
NRA Flood Defence Section have visited sites in the Cherwell catchment with personnel from Cherwell District Council. Cherwell District Council must now prepare a case to justify changing the identified non main rivers into main rivers and present this to NRA Flood Defence Section. If the NRA is convinced from an operational point of view, then Flood Defence will present the case to the Flood Defence Committee. They will have the final decision.

ii. NRA Flood Defence Section have reprogrammed dredging of the River Cherwell south of Old Twyford Mill for January 1994. Previously this has been postponed due to weather conditions and the need for urban areas to be given top priority to satisfy standards of service.

4.17 Development Pressures

i. **Upper Heyford**
The NRA are undertaking a proactive role to anticipate areas of land which although not currently designated in local plans may become available for development in the future by producing area specific studies. The aim is to anticipate implications for the water environment and limit serious impacts. A site which in the future will become available for new development is at Upper Heyford American Air Base.

4.18 Availability of Data

i. Section 105 surveys will be carried to facilitate floodplain mapping.

5. ROUTINE WORK

i. **Flood Defence**

- The NRA Flood Defence team every year clean up litter (tree and shrubs) obstructing the flow of the River Cherwell through Oxford as part of their routine work. This is in cooperation with Oxford City Council.

- In April 1994 the automation of the control structures on the River Ray at Otmoor will be completed so that the Flood Defence Section can take charge of operation and maintenance.

- NRA Flood Defence Section will identify the responsibilities for on-going operations and maintenance of control structures and carry out river dredging and bank trimming where necessary.

ii. **Conservation**

Enhancement Schemes Undertaken by Fisheries and Conservation staff:

(i) Riffle creation and off river supplementary unit (ORSU) to aid spawning on the River Cherwell at Red Lunch Barn from the 7/8/93 to 3/8/93.

(ii) Riffle and ORSU creation on the River Cherwell at Kings Sutton in Spring 1993.

(iii) Creation of groynes and pools on the River Cherwell upstream of Red Lunch Barn.

Future opportunities for enhancement identified in the Cherwell Catchment are:-

(i) Bestmoor SSSI at Summerton;

(ii) Downstream of Grimsbury Reservoir.

There are opportunities to carry out enhancements in coordination with the Upper Thames Environmentally Sensitive Area which is being designated from January 1994. Some degraded poor structures and the diversity of the riparian habitats provide opportunities for buffer strips, flood meadows and wetland creation.

iii. **Recreation**

The Regional Recreation staff, as part of the 'River Thames Information Strategy', are proposing to produce a leaflet promoting recreational use of the watercourse in the Oxford area. It is hoped that this will be a partnership project with both Oxford City Council and British Waterways.

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